DEVELOPING AND TESTING A LINEAR PROGRAMMING MODEL OF A GRAIN ELEVATOR AND FEED FIRM

Thesis for the Degree of M. S.
MICHIGAN STATE UNIVERSITY
Dale Joseph Menkhaus
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ABSTRACT

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By

Dale Joseph Menkhaus

Technologies in the producing and marketing sectors of agriculture have put burdens on the management of marketing outlets for farm products. This study is directed toward building and testing a model which will be beneficial to managers of feed and grain firms in their decision-making process.

A linear programming model was developed and tested for a sample elevator and feed business. The factors involved in choosing the sample firm were storage capacity, grains handled, facilities, location, availability of data, willingness of managers to be of assistance, and the future of the firm. In particular, the firm used in this study has a storage capacity of 315,000 bushels, handles corn, wheat, soybeans, oats, and field beans; is close to the university; has a feed operation and is progressive.

The model developed in this study uses monthly data and breaks down activities to give the manager a better overall picture of the business. For example, instead of aggregating fertilizers into one category, the current study breaks

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Technologies in the producing and marketing sectors of agriculture have put burdens on the management of marketing outlets for farm products. This study is directed toward building and testing a model which will be beneficial to managers of feed and grain firms in their decision-making process.

A linear programming model was developed and tested for a sample elevator and feed business. The factors involved in choosing the ideal firm were storage capacity, grains handled, facilities, location, availability of data, willingness of managers to do advertising, and the future of the firm. In particular, the firm used in this study has a storage capacity of 315,000 bushels, handles corn, wheat, soybeans, oats, and field beans; is close to the university; has a feed operation and is progressive.

The model developed in this study used monthly data and breaks down activities to give the manager a better overall picture of the business. For example, instead of aggregating

fertilizers down into urea, potash, mixed bulk, and mixed bag. Also, feeds are broken down to include supplement and complete feeds for dairy, beef, poultry, and hogs as well as miscellaneous feeds. Besides selling fertilizers and feeds, other activities used in the current study include hiring labor, receiving dry grains, receiving wet grains, buying grains, storing grains for farmers, selling grains, selling coal, and selling chemicals. Constraints in the model include capital, labor, drier capacity, receiving capacity, grains available to purchase, availability of grains to store, and sales outlets for fertilizers, feeds, and sidelines.

Use of a linear programming model requires a great amount of data. For a typical country elevator, the data may not be readily available. Also, few businesses have access to a computer which will handle a linear programming problem the size of the one in this study. To overcome these problems, a typical firm in a region could be programmed and inferences made from the results to apply to other firms with similar characteristics.

The linear programming technique proved useful. It was able to handle the large number of activities and constraints of a feed and grain operation. The linear programming solution was also helpful in pointing out weak spots in the sample firm.

The programming solution showed that the manager of the sample firm should study the complete feed business, especially the labor input, since excess labor was indicated. The

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manager might also want to consider the possibility of eliminating the complete feed business which apparently is losing money. The manager should consider the effect of such a closing on his grain, fertilizer, sideline, and supplement feed businesses. The linear programming technique is a useful aid, but the manager is still responsible for exploring business alternatives available to him and making further studies using the data produced by the program.

The programming solution also revealed that the sample firm could afford to increase grain prices if it would increase volume. The manager might want to experiment a bit with increasing prices to find out what effect such an action would have on his business.

The program was run for 10 percent and 20 percent increases in business potential to see how the business would be affected with respect to profit and resources. The results revealed that the increased farm production results in increased net income both because of larger grain volume and the increases in fertilizer and sideline sales needed to achieve this production.

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Dale Thomas Wendling

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Gratitude is also extended to the author's fellow graduate students who offered many helpful suggestions.

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TABLE OF CONTENTS

Page

LIST OF TABLES..... vii

Chapter 1: INTRODUCTION..... 1

The Objective..... 2
Why Linear Programming?..... 4
Other Studies Using Linear Programming..... 6
Plan of Attack..... 8

Chapter 2: DEVELOPING THE MODEL..... 10

The Sample Firm..... 11
Defining the Activities..... 12
Hiring Labor..... 13
Receiving and Storing Grains..... 13
Receiving Wet Grains..... 14
Buying Grains..... 14
Store Grains..... 14
Loading Out and Selling Grains..... 14
Transfer Grains from Inventory..... 14
Selling Feeds..... 14
Grinding, Rolling, Grinding and Mixing..... 15
Shelling Corn..... 15
Selling Fertilizer..... 15
Selling Sidelines..... 15
Production and Marketing Constraints..... 16
Capital Constraint..... 16
Labor Constraint..... 19
Drier Capacity..... 19
Receiving and Storing Capacity..... 19
Grains to Purchase..... 19
Buying, Storing, and Receiving Grain..... 19
Grains Available for Storage..... 20
Grain Inventory..... 20
Total Storage Capacity..... 20
Transfer Grains into Inventory or Minimum Inventory Limitation..... 20
Sales Outlet for Feeds..... 20
Sales Outlet for Fertilizer..... 20
Sales Outlet for Sidelines..... 20
Percentage Wet Grains..... 20
The Model..... 21

LIST OF TABLES vii

Chapter 1: INTRODUCTION 1

The Objective 2
Why Linear Programming? 4
Other Studies using Linear Programming 6
Plan of Attack 8

Chapter 2: FORMULATING THE MODEL 10

The Bean Jo Firm 11
Defining the Activities 12
Hiring Labor 13
Receiving and Storing Grains 13
Receiving Wet Grains 14
Buying Grains 14
Sale Grains 14
Loaning Out and Selling Grains 14
Transfer Grains from Inventory 14
Selling Feed 14
Grinding, Pelling, Grinding and Mixing 15
Mailing Corn 15
Selling Fertilizer 16
Selling Oilcakes 16
Production and Marketing Constraints 16
Capital Constraint 16
Labor Constraint 19
Drier Capacity 19
Receiving and Storing Capacity 19
Grains to Purchase 19
Buying, Storing, and Receiving Grain 19
Grains Availal le for Storage 20
Grain Inventory 20
Total Tons o Capacity 20
Transfer Grains into Inventory or Storage
Inventory Limitation 20
Sales Outlet for Grains 20
Sales outlet for Fertilizer 20
Sales Outlet for Oilcake 20
Increase Wet Grains 20
The Model 21

Table of Contents (Cont'd)

	Page
Chapter 3: THE DATA	26
Data Presentation	26
Repair Costs	26
Power Costs	26
Ingredient and Supply Costs	27
Labor Utilization	28
Coefficients in the Matrix	28
Constraints and Limitations	29
Working Capital	29
Receiving and Storing Capacity	30
Drier Capacity	31
Grains to Purchase	31
Grains Available for Storage	32
Total Storage Capacity	32
Sales Outlet for Feeds	32
Sales Outlet for Sidelines	33
Sales Outlet for Fertilizers	34
Sales Outlet for Grinding	34
Grinder and Sheller Capacity	35
Transfer Grain into Inventory or Minimum Inventory	35
Chapter 4: THE RESULTS	37
Activity Level	38
Hiring Labor	38
Buying Grains	38
Storing Grains	38
Selling Grains	39
Selling Fertilizers	39
Selling Feeds	39
Selling Sidelines	39
Reduced Profits	40
Excess Resources	40
Marginal Value Products	42
Maximum Net Revenue	43
Implications	45
Chapter 5: SUMMARY AND EVALUATION	48
Evaluating the Techniques	51
What Needs To Be Done?	52
LIST OF REFERENCES	54
APPENDIX A: COMPLETED QUESTIONNAIRE	55

Table of Contents (cont'd)

Page

Chapter 3: THE DATA 26

Data Presentation 26
Repair Costs 26
Labor Costs 26
Implement and Supply Costs 27
Labor Utilization 28
Coefficients in the Tractor 28
Constraints and Limitations 29
Working Capital 29
Receiving and Storing Capacity 30
Drier Capacity 31
Grains to Process 31
Grains Available for Storage 32
Total Storage Capacity 32
Sales Limit for Products 32
Sales Limited for Milling 33
Sales Limited for Fertilizers 34
Sales Limit for Trimming 34
Grinder and Alfalfa Capacity 35
Transfer Grain into Inventory to Obtain
Inventory 35

Chapter 4: THE RESULTS 37

Activity Level 38
Hiring Labor 38
Layoff Costs 38
Storing Grain 38
Milling Grains 39
Selling Fertilizers 39
Selling Feeds 39
Selling Sunflower 39
Reducing Milling 40
Excess Capacity 40
Marginal Value Products 42
Maximum Net Returns 43
Limitations 45

Chapter 5: [illegible] 49

Evaluating the Technique 51
What Needs To Be Done? 52

LIST OF REFERENCES 54

APPENDIX A: [illegible] 55

Table of Contents (Cont'd)

		Page
APPENDIX B:	THE DATA.....	66
APPENDIX C:	PRICES, SALES AND RECEIPT DATA.....	92
APPENDIX D:	THE RESULTS.....	114

APPENDIX D: [illegible] 114

APPENDIX C: [illegible] 92

APPENDIX B: [illegible] 67

LIST OF TABLES

Table		Page
1.	List of Activities	17
2.	List of Constraints	22
3.	Sample Model for October and November	24
Appendix Tables		
1B.	Estimated Repair Costs for Machinery	66
2B.	Power Costs	69
3B.	Ingredient and Supply Costs by Activity	71
4B.	Variable Costs	72
5B.	Net Revenue	75
6B.	Revenue, Cost and Net Revenue for the Loading Out and Selling Activity	78
7B.	Labor Requirements for Grain Elevator and Feed Mill Processes	80
8B.	Labor Requirements by Processes Defined in Kansas Study	83
9B.	Labor Requirements by Activity	84
10B.	Labor Available	87
11B.	Receiving and Storing Capacities	88
12B.	Grains Available to Purchase	89
13B.	Grains Available for Storage	90
14B.	Sales Outlet for Fertilizer	91

List of Tables

Table Page

1. List of Activities 17

2. List of Constraints 22

3. Sample Model for Oats, Corn and Hay Year 24

Appendix Tables

1B. Estimated Repair Costs for Machinery 66

2B. Power Costs 69

3B. Implement and Hourly Costs by Activity 71

4B. Variable Costs 72

5B. Net Returns 73

6B. Fuel, Oil, Grease, Cost and Net Returns for the Initial Soil and Rolling Activity 78

7B. Labor Requirements for Grain Elevator and Feed Mill Processes 80

8B. Labor Requirements by Processes Defined in Matrix A 83

9B. Labor Requirements by Activity 84

10B. Labor Available 87

11B. Receiving and Storing Capacities 88

12B. Grains Available to Process 89

13B. Grains Available for Storage 90

14B. Daily Demand for Feasibility 91

List of Tables (Cont'd)

Appendix Table		Page
1C.	Prices Received by Michigan Farmers (Corn).....	92
2C.	Prices Received by Michigan Farmers (Wheat).....	93
3C.	Prices Received by Michigan Farmers (Oats).....	94
4C.	Prices Received by Michigan Farmers (Soys).....	95
5C.	Prices Received by Michigan Farmers (Navy and Dark Red Beans).....	96
6C.	Corn Receipts (bu.).....	97
7C.	Wheat Receipts (bu.).....	98
8C.	Oat Receipts (bu.).....	99
9C.	Soybean Receipts (bu.).....	100
10C.	Dark Red Kidney Receipts (lbs.).....	101
11C.	Navy Bean Receipts (lbs.).....	102
12C.	Feed Sales.....	103
13C.	Feed Sales by Month (tons).....	104
14C.	Feed Revenues and Costs.....	105
15C.	Percentages of Mixed Fertilizers.....	106
16C.	Fertilizer Sales.....	107
17C.	Fertilizer Revenues and Costs.....	108
18C.	Coal Sales.....	109
19C.	Sales for Building Supplies, Chemicals and Other.....	110
20C.	Wages.....	112
21C.	Grinding Sales.....	113
1D.	Activity Levels for the Base Solution (RHSI) by Month.....	114

List of Tables (Cont'd)

Appendix Table		Page
1C.	Prices Received by Michigan Farmers (Corn)	92
2C.	Prices Received by Michigan Farmers (Wheat)	93
3C.	Prices Received by Michigan Farmers (Oats)	94
4C.	Prices Received by Michigan Farmers (Rye)	95
5C.	Prices Received by Michigan Farmers (Navy and Dark Red Beans)	96
6C.	Corn Receipts (Bu.)	97
7C.	Wheat Receipts (Bu.)	98
8C.	Oat Receipts (Bu.)	99
9C.	Soybean Receipts (Bu.)	100
10C.	Dark Red Kidney Receipts (Lbs.)	101
11C.	Navy Bean Receipts (Lbs.)	102
12C.	Feed Sales	103
13C.	Feed Sales by Month (Tons)	104
14C.	Feed Purchases and Costs	105
15C.	Percentage of Mixed Fertilizers	106
16C.	Fertilizer Sales	107
17C.	Fertilizer Purchases and Costs	108
18C.	Coal Sales	109
19C.	Sales for Building Supplies, Chemicals and Other	110
20C.	Wages	112
21C.	Grinding Rates	113
1D.	Activity Levels for the Base Solution (MRSI) by Month	114

List of Tables (Cont'd)

Appendix Table		Page
2D.	Activity Levels for a 10% Increase in the Sales Potential (RHSII) by Month.....	115
3D.	Activity Levels for a 20% Increase in Sales Potential (RHSIII) by Month.....	116
4D.	Profit Reduction Per Unit of Forced Activity....	117
5D.	Excess Resources for the Three Business Potentials.....	118
6D.	Marginal Value Products for the Three Business Potentials.....	120

List of Tables (cont'd)

Appendix Table Page

5D. Activity Levels for a 10% Increase in the Sales Potential (Unit) by Year.... 115

6D. Activity Levels for a 20% Increase in Sales Potential (Unit) by Year.... 116

4D. Profit Reduction for Unit of Zero Activity.... 117

5D. Excess Resources for the Three Business Potentials.... 119

6D. Marginal Value Products for the Three Business Potentials.... 120

Chapter 1

INTRODUCTION

Changing technologies have required continual adjustments in the firms that serve agriculture. The agricultural production sector has been affected by advances in fertilizers, hybrid seeds, chemicals and machineries. These technologies have increased the volume of production as well as the speed of planting and harvesting. Production improvements have put increasing demands on the marketing sector of agriculture.

Marketing outlets for farm products have also been required to make adjustments as a result of new technologies. The feed and grain business, which is of concern in this study, has been affected by the increased production of grain. The elevator must be equipped with facilities to handle high volumes of dry and wet grains with speed and efficiency. Receiving facilities of elevators are strained by the high volumes of grain which are rapidly transported from the farm to the elevator.

Changing technology within the feed and grain industry are also worth noting. These include covered hopper cars, mechanical samplers, automatic grain handling machines, drying equipment, electric eye samplers for field beans,

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Changing technology within the feed and grain industry drying equipment, electric eye samplers for field loans, mechanical samplers, automatic grain handling machines, are also worth noting. These include covered hopper cars,

pellet mills, etc.

Adjustments by the feed and grain industry to these changing technologies have been handicapped by capital limitations. This is especially true with the small country elevators. Often they are unable to compete with the bigger and more progressive firms.

Another factor which has become critical to the elevator manager is the shortage of trained manpower. In order to compete with other industries, managers of feed and grain firms must offer wages which will attract personnel who can be trained in the new technologies available to the industry.

The Objective

Skilled management has become increasingly important in the feed and grain industry. The manager is being forced to use better accounting and decision-making techniques in order to remain competitive and progressive in the industry. This study is concerned with building a model which will be beneficial to the manager of a feed and grain business in decision making. The model should provide a way of:[1]

1) Organizing and interpreting a large volume of data and facts. (A major difficulty in decision-making lies in the area of selecting, gathering, processing and interpreting facts and information.)

2) Using approximations in mathematical processing of data and facts.

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[1] Ferguson, F.O., and Sargent, F.L., Linear Programming: Fundamentals and Applications, (New York: McGraw-Hill Book Co., Inc., 1958).

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3) Evaluating the benefits or profits that should come from apportioning or allocating the available resources to different opportunities or combinations of opportunities.

The model used in this study is the linear programming model. Linear programming provides a way of allocating scarce resources among various opportunities. Using linear programming can yield several advantages to management. It can serve to increase managerial effectiveness by:[2]

1) Giving insight and perspective into problem solutions.

2) Yielding better and more successful decisions.

3) Yielding solutions in specific quantitative terms.

4) Providing better tools for adjusting plans to meet changing conditions.

5) Increasing dollar returns to management through more effective use of existing facilities and more accurate planning.

It is important to realize that linear programming is a tool to aid the manager in making decisions. It is not a "cure all" and should not be used as such.

Specifically, in this study, a general linear programming model of a grain elevator and feed firm will be built. The model will include the feed, fertilizer, and sideline operations in addition to the grain elevator. After the general model is developed, it will be tested on a sample firm. The model will be applied to this sample firm to determine the activity levels which maximize profit at the current business level as well as with expansions in business potential of 10

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[2] Ibid.

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The model should prove to be useful to the industry through extension work. In this respect the model could be applied to operations of various sizes to determine the activity levels which maximize profit. The model can be used to study the effects of changes in margins; changes in storage capacities; changes in specific enterprises, e.g., the effect of deleting the feed enterprises; changes in machinery capacities; changes in the amount of labor hired; and changes in other resource limitations.

Why Linear Programming?

The problem of concern in this study is one of optimizing profit subject to production and marketing constraints. This is precisely what linear programming does. Other optimizing techniques such as calculus are of little assistance in solving programming problems such as the one dealt with in this study.

There is little difficulty in fitting the activities of a grain elevator and feed mill operation to the assumptions of linear programming. The mathematics are well suited to allocating the resources of the business to the various

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alternatives available.

Also of concern is the problem of collecting accurate data. The linear programming model, although it requires much data, can be built with data provided by the records of the business and through interviews with the manager.

An alternative is that of budgeting. Budgeting and linear programming are similar in that both require essentially the same information:

1. Specification of alternatives along with the physical and economic restrictions -
2. Estimation of the various resource requirements along with the relative profitability of each enterprise or activity -

The principle task in both instances is that of assembling input-output data and price cost information.

Linear programming and budgeting differ in that the solution in budgeting is often an approximation, whereas the solution in linear programming is the one best or optimum solution. Linear programming is ideally adapted to deal with large numbers of limited resources along with their allocation to an even larger number of enterprises or production situations. Furthermore, the larger the number of interrelated choices, the less obvious is the one best choice. Hence the linear programming model's ability to consider a large number of alternatives and to trace the effect of all of the resources that limit production is advantageous for the larger scale problems. The linear programming model can specify the optimum solution in a fraction of the time required for the more cumbersome

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budgeting. Due to the size of the problem in this study, linear programming has definite advantages over budgeting.

Other Studies Using Linear Programming

Two studies which have used linear programming in the analysis of a feed and grain business are A Linear Programming Model of a Grain Elevator and Feed Firm[3] and The Application of Linear Programming to the Management of a Country Elevator.[4] The present study will attempt to broaden the scope of these two studies, consider and exploit new and different areas and hopefully be of more practical use to the elevator manager.

The Kansas study seeks to develop an analytical method whereby managers in the grain and feed industries can improve their decision making. The Kansas study deals with the month of July only. Thus many of the activities which would be more pertinent in the remaining months of the year are dormant. The current study expands the model used in the Kansas study to twelve months and breaks down the activities in more detail than did the Kansas study. For example, instead of aggregating fertilizers into one category, the current study breaks fertilizers down into urea, potash, mixed bulk and mixed bag. This gives the manager a better overall picture

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The study from Illinois also employs a linear programming model to be used as an aid in decision making. The elevator is programmed for a one year period and it was assumed that the elevator manager was concerned only with the merchandising, storing and drying of corn and soybeans. All physical facilities except driers, storage and associated equipment were assumed constant during the study.

The model used in the Illinois study was solved for three different resource situations and these results were compared. When there was no labor restriction, only flat storage was built and both continuous flow and batch driers were purchased. When a labor restriction was included, flat storage was purchased, but upright storage was found to be more profitable for that capacity which is filled and refilled often, and purchases were made in only continuous flow drying facilities. The results showed that differences in methods of storage and drying facilities may be explained by the availability of labor. It was also found that the fixed cost of storage has only a small influence on the optimum total capacity.

The Illinois study also revealed the importance of high-volume merchandising. The increased profit available with each additional bushel of grain purchased indicates that elevator operators should welcome the increased business due to the increase in farm production and the trend toward

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Plan of Attack

First, a model which includes the various activities of a typical feed and grain operation was developed. The model was then tested on a sample firm. Data for this model were obtained by use of a questionnaire designed to provide the information essential to the model. Cost, revenues, and labor utilization data were taken from secondary sources. All data were transformed to meet the special requirements of the linear programming model. The model was then applied to the problem of changing business potential. In particular, receipt and sales limitations were increased by 10 percent and 20 percent above the initial limits. The effects of these changes were then analyzed. Finally, the use of linear programming as a tool for managers of feed and grain businesses was evaluated.

The presentation which follows begins with a discussion of the linear programming technique; the business activities of the sample firm are then defined as are its production and marketing limitations. The data are presented in Chapter 3. Next, the results of the linear programming model will be presented. Finally, a summary and evaluation will

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ascertain such pertinent questions as: Is the linear programming technique useful in aiding managers of load and drain operations? What are the merits and limitations of the technique?

Chapter 2

DEVELOPING THE MODEL

The objective assumed for the elevator manager in this study is profit maximization. The profit function can be algebraically expressed as follows: $C_1X_1 + C_2X_2 + \text{---} C_mX_m =$ maximum, where C_1, C_2, ---, C_m are constants derived from cost and revenue data and X_1, X_2, ---, X_m are the levels of the activities which are pertinent to the firm being programmed. These activities will be defined later in this chapter.

The objective function is maximized subject to certain production and marketing constraints. The constraints represent physical and economic limitations, e.g., capital, labor, machinery capacities, grains available to purchase, and amounts of feeds and fertilizers which can be sold. In algebraic terms, these constraints are expressed as follows:

$$A_{11}X_1 + A_{12}X_2 + \text{---} + A_{1m}X_m \leq B_1$$
$$A_{21}X_1 + A_{22}X_2 + \text{---} + A_{2m}X_m \leq B_2$$
$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$
$$A_{n1}X_1 + A_{n2}X_2 + \text{---} + A_{nm}X_m \leq B_n$$

A_{ij} is the amount of each resource needed for each unit of activity and B_i is the amount of each resource available. A further stipulation is that $X_j \geq 0$, $j=1,2,\text{---},m$. That is,

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a negative level of an activity is not permitted. The above inequalities can be changed to equalities by adding disposable or slack variables.

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The problem is to select values of X_j which will maximize the profit function subject to the limitations of the firm being programmed.

The activities of the firm must be defined. The X_1, --- X_m refer to the levels at which the activities will enter the final solution. This involves the concept of linearity, i.e., a unit change in one activity results in the same changes in profit and the same change in resource requirements regardless of the level of the activity.

To make the best use of linear programming, the activities must be interdependent. If the activities are independent, the problem becomes one of budgeting. Linear programming is a means by which limited resources are allocated among competing activities so as to maximize profit or minimize costs.

The Sample Firm

In order to test the model and evaluate the techniques presented in this study, a sample firm was used. The factors

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Procedure

In order to test the model and evaluate the techniques presented in this study, a hardware firm was used. The factors

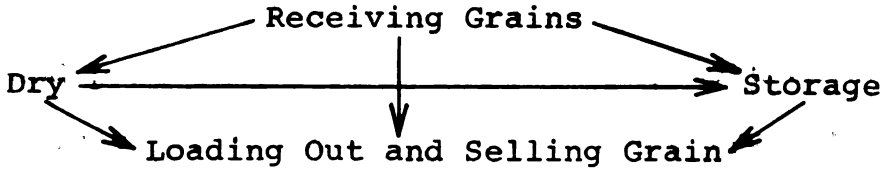
involved in choosing the sample firm were storage capacity, grains handled, facilities, location, availability of data, willingness of manager to be of assistance and the future of the firm. A firm was sought which had a storage capacity between 250,000 and 400,000 bushels, handled field beans, was close to the university, was a feed and grain operation and was progressive.

The general model developed in this study can be applied to any grain and feed mill operation. The applications of the model were demonstrated by the use of a sample firm.

Defining the Activities

In general, the basic processes of any grain elevator-feed mill operation are similar. The differences occur mainly with respect to the merchandise handled. As a starting point the following flow charts are helpful.

Grain Elevator



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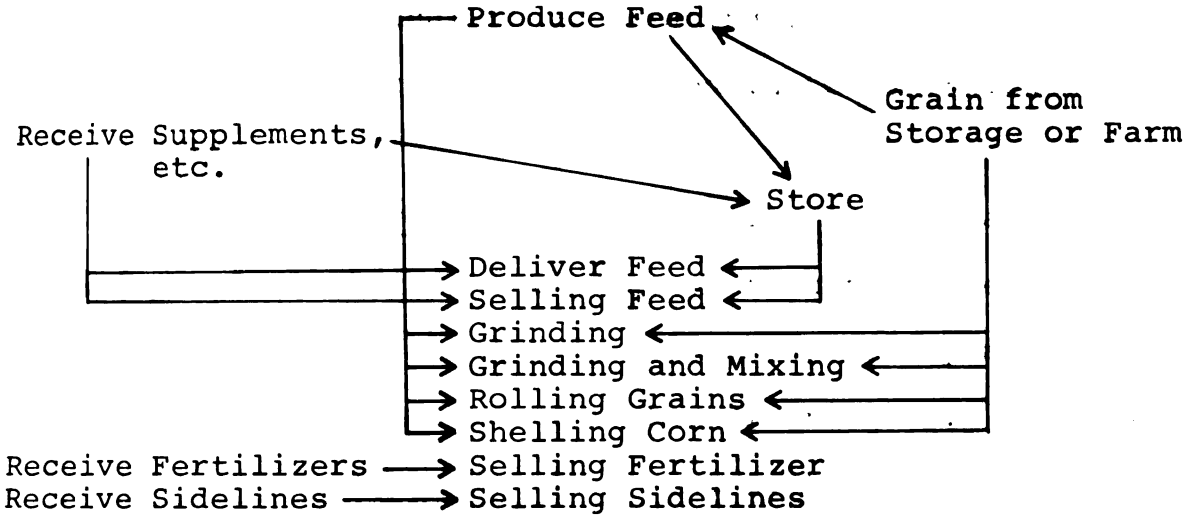
Feed Mill, Fertilizer and Sidelines



The activities which make up these processes must be defined in order that the costs and labor requirements can be calculated. These activities are similar for most operations. Peculiarities of a particular firm can be ascertained by interviewing the manager of the firm in question. In general, the basic activities can be defined as follows:

Hiring Labor - Usually there are four types of labor available: full-time regular, full-time overtime, part-time regular, and part-time overtime. The only cost which occurs in this activity is the hourly rate of each type of labor.

Receiving and Storing Grains - This activity includes weighing the truck, sampling the grain, moisture testing, storing the grain (includes leg and distributor use), and cleaning the grain if necessary. If ear corn is received, the shelling process is added. After the grain is received, it is stored or sent directly to the terminal or processing plant. In the case of field beans, storage is according to

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grades and they are bagged when sold. If the grain is stored, costs of innoculating, aerating and heat checking are incurred. The grain is then used in feeds or loaded out and sold.

Receiving Wet Grains - This activity is the same as the receiving and storing activity except that that the grain is distributed to the grain drier, dried, carried by auger to the leg, and then is returned to the distributor. At this point the grain can be stored or sent to the terminal or processing plant.

Buying Grains - The buying process is included in this activity. No labor is required.

Store Grains - These are the grains stored by the farmer. This activity is the same as the receiving and storing activity except there is a net revenue associated with it.

Loading Out and Selling Grains - This activity consists of distributing grains to a rail car or truck, which includes preparing the car or truck, adjusting the spout to load and loading. Beans are bagged and then sent out.

Transfer Grains from Inventory - This activity is used to transfer grain inventories from one month to the next. Costs of storing are incurred in this activity.

Selling Feeds - This activity includes retrieving and preparing the corn and other ingredients, e.g., grinding, elevating to overhead scale, mixing and elevating to bagging bins or overhead bulk bins. If the feed is bagged, included are receiving the bags, bagging, and storing in the warehouse

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or loading on a truck for delivery. The delivery process consists of loading, taking the feed to the farm, and returning to the feed mill. If the feed is received from the home plant, transportation of the feed from the home plant to the elevator is included along with the loading and unloading processes. If the feed goes directly from the home plant to the farmer, costs of the salesmen are the only costs incurred.

Grinding, Rolling, Grinding and Mixing - The grinding activity includes retrieving the grain from the dump pit of the feed mill or from the elevator, grinding, bagging (bulk) and loading on the customer's truck or continuing the feed producing activity. The rolling activity is the same as grinding. For mixing and grinding, the mixing process is added to the grinding activity.

Shelling Corn - Dumping ear corn into the dump pit, conveying to sheller, shelling, storing, bagging, or loading into a truck are the processes which could be included in this activity.

Selling Fertilizer - If the customer picks up the fertilizer, only the loading process is included. If the fertilizer is delivered, the loading, transportation, and unloading processes are included. Receiving and storing processes also enter into this activity.

Selling Sidelines - This includes selling the item to the customer and loading it for him or making the delivery, as the case may be.

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In the model developed in this study the grains include corn, wheat, soybeans, oats, dark red kidney beans, and navy beans. The feeds consist of dairy supplement, dairy complete, beef supplement, beef complete, poultry supplement, poultry complete, hog supplement, hog complete, and miscellaneous which includes rabbit feed, horse feed, mineral feeds, salt, etc. Fertilizers include potash, urea, mixed bulk, and mixed bag. Sidelines are broken down into building supplies, coal, chemicals, and all other farm supplies. Since feed and sideline sales are relatively constant (see Appendix C), they were programmed on a yearly basis in order to reduce the size of the model. Fertilizer sales are not stable from month to month; therefore they were programmed on a monthly basis.

A complete list of the activities used in this study is given in Table 1.

Production and Marketing Constraints

Grain elevator-feed mill operations have basic production and marketing limitations. The next step is to incorporate these limitations into the model. The following sections will deal with defining these constraints.

Capital Constraint - A limited amount of working capital is available to the firm. This constraint obviously limits the business in financing new facilities, buying new machinery, buying grains, etc. The capital available was derived by calculating an average working capital (current assets minus current liabilities) figure over four years. Since the inventories of feed and sidelines remain relatively stable the

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Table 1. List of Activities. [1/]

Activity	Unit	Activity	Unit
Hiring Full Time Labor Regular	Man-Hrs.	Selling Building Supplies (Y)	$5
Hiring Full Time Labor Overtime	Man-Hrs.	Selling Coal (Y)	Ton
Hiring Part Time Labor Regular	Man-Hrs.	Selling Chemicals (Y)	$5
Hiring Part Time Labor Overtime	Man-Hrs.	Selling all Other Farm Supplies	$5
Receiving and Storing Shelled Corn	100 bu.	Selling Mixed Bag Fertilizer	Ton
Receiving and Storing Ear Corn 2/	100 bu.	Store Corn	100 bu.
Receiving and Storing Wheat	100 bu.	Store Wheat	100 bu.
Receiving and Storing Soys	100 bu.	Store Soys	100 bu.
Receiving and Storing Oats	100 bu.	Store Oats	100 bu.
Receiving and Storing Dark Red Kidneys	100 lbs.	Store Dark Red Kidneys	100 lbs.
Receiving and Storing Navies	100	Store Navies	100 lbs
Receiving Wet Corn	100 bu.	Transfer Corn from Inventory	100 bu.
Receiving Wet Wheat	100 bu.	Transfer Wheat from Inventory	100 bu.
Receiving Wet Soys	100 bu.	Transfer Soys from Inventory	100 bu.
Receiving Wet Oats	100 bu.	Transfer Oats from Inventory	100 bu.
Receiving Wet Dark Red Kidneys	100 lbs.	Transfer Dark Red Kidneys from Inventory	100 lbs.
Receiving Wet Navies	100 lbs.	Transfer Navies from Inventory	100 lbs.
Buying Shelled Corn	100 bu.	Loading Out and Selling Corn	100 bu.
Buying Ear Corn	100 bu.	Loading Out and Selling Soys	100 bu.
Buying Wheat	100 bu.	Loading Out and Selling Oats	100 bu.
Buying Soys	100 bu.	Loading Out and Selling DRK	100 lbs.
Buying Oats	100 bu.	Loading Out and Selling Wheat	100 bu.
Buying Dark Red Kidneys	100 lbs.	Loading Out and Selling Navies	100 lbs.
Buying Navies	100 lbs.	Selling Dairy Supplement (Y)	Ton
Selling Hog Complete (Y) 3/	Ton	Selling Dairy Complete (Y)	Ton
Selling Miscellaneous Feeds (Y)	Ton	Selling Beef Supplement (Y)	Ton
Selling Potash	Ton	Selling Beef Complete (Y)	Ton
Selling Urea	Ton	Selling Poultry Supplement (Y)	Ton
Selling Mixed Bulk Fertilizer	Ton	Selling Poultry Complete (Y)	Ton
Grinding	100 lbs.	Selling Hog Supplement (Y)	Ton

Table 1. Lists of Vocabulary Items

Category	Vocabulary	Gloss
Banking Terms	Bank Manager	Man-bank
	Bank Robber	Man-rob bank
	Bank Teller	Man-bank
	Cash Machine	Machine money
	Cashier	Man-bank
	Check	Paper money
	Credit Card	Card money
	Customer	Man-bank
	Deposit	Put money bank
	Loan	Money bank
	Money	Money
	Mortgage	House bank
	Overdraft	Money bank
	Safe Deposit Box	Box money
	Savings Account	Money bank
	Withdrawal	Take money bank
Colours	Black	Black
	Blue	Blue
	Brown	Brown
	Green	Green
	Grey	Grey
	Orange	Orange
	Pink	Pink
	Purple	Purple
	Red	Red
	White	White
	Yellow	Yellow
Computer Terms	Computer	Machine think
	Computer Program	Machine think
	Computer Programmer	Man-machine think
	Computer Programming	Machine think
	Computer Terminal	Machine think
	Disk	Machine think
	Floppy Disk	Machine think
	Hard Disk	Machine think
	Keyboard	Machine think
	Memory	Machine think
	Microchip	Machine think
	Microcomputer	Machine think
	Monitor	Machine think
	Mouse	Machine think
	Printer	Machine think
	Screen	Machine think
	Software	Machine think
	Word Processor	Machine think
Days of the Week	Monday	Day 1
	Tuesday	Day 2
	Wednesday	Day 3
	Thursday	Day 4
	Friday	Day 5
	Saturday	Day 6
	Sunday	Day 7
Directions	Down	Down
	Left	Left
	Right	Right
	Up	Up
Emotions	Angry	Angry
	Happy	Happy
	Sad	Sad
	Surprised	Surprised
Family	Aunt	Sister parent
	Brother	Man-child same parents
	Child	Child
	Cousin	Child parent's sibling
	Daughter	Woman-child
	Father	Man parent
	Grandchild	Child child
	Grandfather	Man parent parent
	Grandmother	Woman parent parent
	Mother	Woman parent
	Nephew	Man-child sibling
	Niece	Woman-child sibling
	Parent	Parent
	Sister	Woman-child same parents
	Son	Man-child
	Uncle	Brother parent
Food	Apple	Apple
	Banana	Banana
	Beef	Cow meat
	Bread	Bread
	Butter	Butter
	Cake	Cake
	Carrot	Carrot
	Cheese	Cheese
	Chicken	Chicken
	Chocolate	Chocolate
	Egg	Egg
	Fish	Fish
	Fruit	Fruit
	Ham	Ham
	Lamb	Lamb meat
	Meat	Meat
	Milk	Milk
	Orange	Orange
	Pork	Pig meat
	Potato	Potato
	Rice	Rice
	Salad	Salad
	Sausage	Sausage
	Tomato	Tomato
	Vegetable	Vegetable
Geography	Africa	Africa
	Asia	Asia
	Australia	Australia
	Britain	Britain
	Canada	Canada
	China	China
	Europe	Europe
	France	France
	Germany	Germany
	Ireland	Ireland
	Italy	Italy
	Japan	Japan
	Russia	Russia
	Scotland	Scotland
	Spain	Spain
	United States	United States
	Wales	Wales
Health	Ambulance	Car help sick
	Blood	Blood
	Body	Body
	Brain	Brain
	Dentist	Man-doctor teeth
	Doctor	Man-doctor
	Ear	Ear
	Eye	Eye
	Hand	Hand
	Head	Head
	Hospital	House doctor
	Leg	Leg
	Medicine	Medicine
	Nose	Nose
	Nurse	Woman-doctor
	Patient	Sick
	Tooth	Tooth
Household Items	Bed	Bed
	Chair	Chair
	Clock	Clock
	Cooker	Cooker
	Cup	Cup
	Curtains	Curtains
	Fork	Fork
	Glass	Glass
	Kettle	Kettle
	Knife	Knife
	Lamp	Lamp
	Plate	Plate
	Refrigerator	Refrigerator
	Sofa	Sofa
	Spoon	Spoon
	Table	Table
	Telephone	Telephone
	Television	Television
	Toilet	Toilet
	Washing Machine	Washing machine
Months	April	Month 4
	August	Month 8
	December	Month 12
	February	Month 2
	January	Month 1
	July	Month 7
	June	Month 6
	March	Month 3
	May	Month 5
	November	Month 11
	October	Month 10
	September	Month 9
Numbers	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	10	10
	11	11
	12	12
	13	13
	14	14
	15	15
	16	16
	17	17
	18	18
	19	19
	20	20
	21	21
	22	22
	23	23
	24	24
	25	25
	26	26
	27	27
	28	28
	29	29
	30	30
	31	31
Personality	Aggressive	Angry
	Bad-tempered	Angry
	Boring	Sad
	Calm	Happy
	Cheerful	Happy
	Clever	Think
	Confident	Think
	Cruel	Angry
	Dull	Sad
	Easy-going	Happy
	Friendly	Happy
	Generous	Happy
	Gentle	Happy
	Hard-working	Think
	Honest	Happy
	Intelligent	Think
	Kind	Happy
	Lazy	Sad
	Mean	Angry
	Nervous	Sad
	Polite	Happy
	Rude	Angry
	Selfish	Angry
	Shy	Sad
	Stupid	Think
	Unfriendly	Angry
	Violent	Angry
	Wicked	Angry
Professions	Actor	Man-act
	Architect	Man-build
	Artist	Man-draw
	Author	Man-write
	Baker	Man-bake
	Barber	Man-cut hair
	Builder	Man-build
	Butcher	Man-cut meat
	Carpenter	Man-build
	Chef	Man-cook
	Dentist	Man-doctor teeth
	Doctor	Man-doctor
	Electrician	Man-electricity
	Engineer	Man-machine
	Farmer	Man-farm
	Fireman	Man-fire
	Gardener	Man-garden
	Hairdresser	Man-cut hair
	Journalist	Man-write
	Lawyer	Man-law
	Mechanic	Man-machine
	Musician	Man-music
	Nurse	Woman-doctor
	Painter	Man-paint
	Photographer	Man-photograph
	Pilot	Man-fly
	Plumber	Man-water
	Policeman	Man-police
	Postman	Man-post
	Scientist	Man-science
	Secretary	Man-write
	Soldier	Man-fight
	Teacher	Man-teach
	Vet	Man-doctor animal
	Waiter	Man-serve food
Sports	Athletics	Run
	Badminton	Hit shuttlecock net
	Basketball	Throw ball net
	Boxing	Fight
	Cricket	Hit ball
	Cycling	Ride bicycle
	Football	Kick ball
	Golf	Hit ball
	Gymnastics	Exercise
	Hockey	Hit ball
	Horse Racing	Ride horse
	Ice Skating	Skate ice
	Rugby	Throw ball
	Skiing	Ride snow
	Swimming	Swim
	Tennis	Hit ball net
	Volleyball	Hit ball net
Time	Afternoon	Day middle
	Day	Day
	Evening	Day end
	Hour	Hour
	Minute	Hour part
	Morning	Day start
	Night	Day end
	Second	Minute part
	Week	Week
	Year	Year
Transport	Aeroplane	Machine fly
	Bicycle	Machine ride
	Boat	Machine water
	Bus	Machine road
	Car	Machine road
	Helicopter	Machine fly
	Lorry	Machine road
	Motorbike	Machine ride
	Ship	Machine water
	Train	Machine road
	Van	Machine road

Table 1. (continued)

1/ All activities unless otherwise noted will be for each of twelve periods. That is, the activities are divided according to the twelve months of the year. Jan. (1), Feb. (2), Mar. (3), Apr. (4), May (5), June (6), July (7), Aug. (A), Sept. (S), Oct. (Ø), Nov. (N), Dec. (D). If the activities are not month by month they will be yearly (Y).

2/ Ear corn is on a shelled corn basis.

3/ (Y) - yearly - See footnote 1 above.

Q.10 [continued]

(c) All activities unless otherwise noted will be for each of twelve periods. That is, the activities are divided according to the twelve months of the year. (1), (2), Jan., Feb., Mar., (3), Apr., May (5), June (6), July (7), Aug. (A), Sept. (9), Oct., (M), Nov., Dec. (D). If the activities are not monthly they will be Yearly (Y).

(d) Alt coin is on a specific coin basis.

(e) (Y) - Yearly - see footnote 1 above.

average inventory values for these products were subtracted from the average working capital figure to give the capital available used in this study. By using this procedure we were able to take into account capital tied up in inventories.

Labor Constraint -- A given amount of each type of labor is available. During certain months more labor is available than in others due to the availability of part-time and over-time labor. The amount of labor available is a function of the number of men and the number of hours worked per time period.

Drier Capacity - This is the number of bushels which can be dried during the time period used in the study (one month in this study). This capacity is a function of time, amount of moisture taken out, and the type of grain.

Receiving and Storing Capacity - This is the amount of each grain which can be received and put into storage per time period. This constraint is affected by the type of grain received, whether it is wet or dry and the length of the time period.

Grains to Purchase - This is essentially the amount of each grain which is available to purchase by the firm being programmed. The average amount of each grain received per month in the last four years was used for this figure. Using marketing data is probably more accurate than using production data.

Buying, Storing, and Receiving Grain - This constraint is added to assure that the amount of grains received is

average inventory values for these products were subtracted from the average working capital figure to give the capital available used in this study. By using this procedure we were able to take into account capital tied up in inventories.

Labor Constraint - A given amount of each type of labor is available. During certain months more labor is available than in others due to the availability of part-time and over-time labor. The amount of labor available is a function of the number of men and the number of hours worked per time period.

Dryer Capacity - This is the number of bushels which can be dried during the time period used in the study (one month in this study). This capacity is a function of time, amount of moisture taken out, and the type of grain.

Receiving and Storing Capacity - This is the amount of each grain which can be received and put into storage per time period. This constraint is affected by the type of grain received, whether it is wet or dry and the length of the time period.

Grains to Purchase - This is essentially the amount of each grain which is available to purchase by the firm being programmed. The average amount of each grain received per month in the last four years was used for this figure. Using marketing data is probably more accurate than using production data.

Buying, Storing, and Receiving Grain - This constraint is added to assure that the amount of grains received is

equal to the amount of grains bought and stored.

Grains Available for Storage - The model used in this study was designed so that grains were available for storage only during harvest.

Grain Inventory - This is to make sure that the grain bought plus the grain transferred from the previous month is equal to the grain sold, used in feeds and transferred to the next month.

Total Storage Capacity - This constraint makes certain that the model does not buy more grains than can be stored. Space allocations have been made for those grains which are stored and loaded out in the same month. The procedure used for this will be explained later.

Transfer Grains into Inventory or Minimum Inventory Limitation - This assures that the grain inventory never gets below a desired amount. This way the business always has grains available to use in producing mixed feeds.

Sales Outlet for Feeds - This is the amount of each feed that can be sold per year to the farmers.

Sales Outlet for Fertilizers - Same as for feeds except they are monthly data.

Sales Outlet for Sidelines - This is the same as the feed limitation above.

Percentage Wet Grains - This is a constraint which forces wet grains into the solution at a specified level. Wet grains are received only during harvest. If this constraint were not added, chances are that no wet grains would

equal to the amount of grains bought and stored.

Grains Available for Storage - The term used in this study was designed so that grains were available for storage only during harvest.

Grain Inventory - This is to make sure that the grain bought plus the grain transferred from the previous month is equal to the grain sold, used in feeds and transferred to the next month.

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Sales Outlet for Fertilizers - Same as for feeds except they are monthly data.

Sales Outlet for Fidelines - This is the same as the feed limitation above.

Processing Wet Grains - This is a constraint which forces wet grains into the solution at a specified level. Wet grains are received only during harvest. If this constraint were not added, chances are that no wet grains would

be accepted by the program. A complete list of constraints used in this study is given in Table 2.

The Model

After the activities and limitations were defined, a partial model was constructed. This model was useful in setting up the complete model and in collecting data. A sector of the model used in this study is laid out in Table 3. Note that only two of the twelve periods were used in this sample model and that only one grain, one feed, one fertilizer, one sideline, and one type of labor were used. This simplified the writeup considerably. One merely needs to expand this sample model to get the complete model. The data and coefficients in the matrix will be demonstrated in the next chapter.

be accepted by the program. A complete list of constraints used in this study is given in table 2.

Table 1

After the activities and limitations were defined, a partial model was constructed. This model was used in setting up the complete model and in collecting data. A sector of the model used in this study is laid out in Table 3. Note that only two of the twelve periods were used in this sample model and that only one grain, one feed, one fertilizer, one sideline, and one type of labor were used. This simplified the writeup considerably. One merely needs to expand this sample model to get the complete model. The data and coefficients in the matrix will be demonstrated in the next chapter.

Table 2. List of Constraints.[1/]

Constraint	Unit	Constraint	Unit
Capital Constraint	$	Oats Available for Storage	100 bu.
Labor Utilization	Man-Hrs.	Dark Red Kidneys Available for Storage	100 lbs.
Full Time Regular Labor Available	Man-Hrs.	Navies Available for Storage	100 lbs.
Full Time Overtime Labor Available	Man-Hrs.	Corn Inventory	100 bu.
Part Time Regular Labor Available	Man-Hrs.	Wheat Inventory	100 bu.
Part Time Overtime Labor Available	Man-Hrs.	Soy Bean Inventory	100 bu.
Drier Capacity	100 bu.	Oat Inventory	100 bu.
Receiving and Storing Capacity	100 bu.	Dark Red Kidney Inventory	100 lbs.
Shelled Corn Available to Purchase	100 bu.	Navy Inventory	100 lbs.
Ear Corn Available to Purchase	100 bu.	Total Storage Capacity	100 bu.
Wheat Available to Purchase	100 bu.	Sales Outlet Dairy Supplement(Y)	Ton
Soys Available to Purchase	100 bu.	Sales Outlet Dairy Complete (Y)	Ton
Oats Available to Purchase	100 bu.	Sales Outlet Beef Supplement (Y)	Ton
Dark Red Kidney Available to Purchase	100 lbs.	Sales Outlet Beef Complete (Y)	Ton
Navies Available to Purchase	100 lbs.	Sales Outlet Poultry Supplement (Y)	Ton
Buy., Stor. and Rec. Shelled Corn	100 bu.	Sales Outlet Poultry Complete(Y)	Ton
Buying, Storing and Receiving Ear Corn	100 bu.	Sales Outlet Hog Supplement (Y)	Ton
Buying, Storing and Receiving Wheat	100 bu.	Sales Outlet Hog Complete (Y)	Ton
Buying, Storing and Receiving Soys	100 bu.	Sales Outlet Miscellaneous (Y)	Ton
Buying, Storing and Receiving Oats	100 bu.	Sales Outlet Potash	Ton
Buying, Storing and Receiving Dark Red Kidneys	100 lbs.	Sales Outlet Urea	Ton
Buying, Storing and Receiving Navies	100 lbs.	Sales Outlet Mixed Bulk	Ton
Shelled Corn Available for Storage	100 bu.	Sales Outlet Mixed Bag	Ton
Wheat Available for Storage	100 bu.	Sales Outlet Grinding	100 lbs.
Soys Available for Storage	100 bu.	Percent Wet Corn	%
Sales Outlet Building Supplies (Y)	$5	Percent Wet Wheat	%
Sales Outlet Coal (Y)	Ton	Percent Wet Soys	%
Sales Outlet Chemicals (Y)	$5	Percent Wet Oats	%
Sales Outlets for all Other Farm Supplies (Y)	$5	Percent Wet Dark Red Kidneys	%
Shelling Capacity	100 bu.	Percent Wet Navies	%
Grinding Capacity	100 lbs.		

Table 7. List of Commands.

Command	Unit	Command
Capital Construction	S	Main-Hrs.
Labor Utilization		Main-Hrs.
Part Time Regular Labor Available		Main-Hrs.
Part Time Casual Labor Available		Main-Hrs.
Part Time Contract Labor Available		Main-Hrs.
Direct Charges		Main-Hrs.
Indirect Charges		Main-Hrs.
Overhead Charges		Main-Hrs.
Total Charges		Main-Hrs.
Total Expenditure		Main-Hrs.
Total Income		Main-Hrs.
Total Profit		Main-Hrs.
Total Loss		Main-Hrs.
Total Cost		Main-Hrs.
Total Revenue		Main-Hrs.
Total Assets		Main-Hrs.
Total Liabilities		Main-Hrs.
Total Equity		Main-Hrs.
Total Debt		Main-Hrs.
Total Interest		Main-Hrs.
Total Dividends		Main-Hrs.
Total Taxes		Main-Hrs.
Total Depreciation		Main-Hrs.
Total Amortization		Main-Hrs.
Total Depletion		Main-Hrs.
Total Obsolescence		Main-Hrs.
Total Salvage		Main-Hrs.
Total Scrap		Main-Hrs.
Total Waste		Main-Hrs.
Total Loss		Main-Hrs.
Total Gain		Main-Hrs.
Total Profit		Main-Hrs.
Total Loss		Main-Hrs.
Total Cost		Main-Hrs.
Total Revenue		Main-Hrs.
Total Assets		Main-Hrs.
Total Liabilities		Main-Hrs.
Total Equity		Main-Hrs.
Total Debt		Main-Hrs.
Total Interest		Main-Hrs.
Total Dividends		Main-Hrs.
Total Taxes		Main-Hrs.
Total Depreciation		Main-Hrs.
Total Amortization		Main-Hrs.
Total Depletion		Main-Hrs.
Total Obsolescence		Main-Hrs.
Total Salvage		Main-Hrs.
Total Scrap		Main-Hrs.
Total Waste		Main-Hrs.
Total Loss		Main-Hrs.
Total Gain		Main-Hrs.

Table 2. (continued)

Constraint	Unit
Transfer Corn into Inventory	100 bu.
Transfer Wheat into Inventory	100 bu.
Transfer Oats into Inventory	100 bu.
Transfer Soys into Inventory	100 bu.
Transfer Dark Red Kidneys into Inventory	100 lbs.
Transfer Navies into Inventory	100 lbs.

1/ See footnote 1, Table 1.

Table 2. (continued)

Constituent	Unit
Xylene (total)	100 ppb
Antimony	100 ppb
Arsenic	100 ppb
Asbestos	100 MFL
Barium	100 ppb
Beryllium	100 ppb
Cadmium	100 ppb
Chromium	100 ppb
Cyanide	100 ppb
Fluoride	4.0 ppm
Mercury	100 ppb
Nickel	100 ppb
Selenium	100 ppb
Thallium	100 ppb
Gross alpha particle activity	15 pCi/l
Uranium	5 pCi/l
Radium 226 & 228 (combined)	5 pCi/l
Gross beta particle activity	50 pCi/l
Strontium 90	8 pCi/l
Tritium	20,000 pCi/l
Coliform (total)	1 per 100 ml
Fecal coliform	1 per 100 ml
Fecal streptococci	1 per 100 ml
Enteroviruses	1 per 100 ml
Giardia lamblia	1 per 100 ml
Legionella	1 per 100 ml
Leptospira	1 per 100 ml
Salmonella	1 per 100 ml
Shigella	1 per 100 ml
Vibrio cholerae	1 per 100 ml
Yersinia	1 per 100 ml
Total trihalomethanes	100 ppb
Vinyl chloride	1 ppb

Table 3. Sample Model for October and November.

	Hiring Full Time Lbr. (Ø)	Rec. & Stor. Shelled Corn	Rec. Wet Corn (Ø)	Buying Shelled Corn (Ø)	Store Corn (Ø)	Load. Out & Selling Corn (Ø)	Prod. & Selling Dairy Complete (Y) 16/	Selling Potash (S) 7/	Grinding (Ø)	Selling Bldg. Supp. (Y)	Hiring Full Time Lbr. (N)	Rec. & Stor. Shld. Corn (N)	Rec. Wet Corn (N)	Buying Shelled Corn (N)	Store Corn (N)	Loading Out and Selling Corn (N)	Selling Potash (N)	Grinding (N)	Transfer Corn from Inventory (Ø)	Transfer Corn from Inventory (N)	Selling Potash (N) 8/	Transfer Corn from Inventory (D)		
Profit 4/	X	X	X	X	-X	-X	-X	-X	-X	-X	X	X	X	X	-X	-X	-X	-X	X	X	-X	X		
Capital Constraint 1/ (Ø)	Y	Y	Y	Y	-Y	-Y	-Y	-Y	-Y	-Y									Y		Y			≤Ø 15/
Labor Utilization 5/ (Ø)	-1	Σ	Σ		Σ	Σ	Σ		Σ	Σ							Σ		Σ					=Σ
Full Time Lbr. Available (Ø)	1																							≤P
Drier Capacity (Ø)			1																					≤P
Receiving & Storing Capacity (Ø)		1	1																					≤P
Shelled Corn to Purchase (Ø)				1																				≤P
Buy, Store, and Receive Shld. Corn (Ø)		-1	-1	1	1																			=Σ
Shelled Corn Available for Storage (Ø)					1																			≤P
Corn Inventory (Ø)				1		-1	-.0179 12/												1	-1 13/				=Σ
Total Storage Capacity (Ø) 2/		1	1		-.5 6/		-.0335												1	-1				≤P
Sales Outlet for Dairy Complete (Y)							1																	≤P
Sales Outlet for Potash (Ø)																	1							≤P
Sales Outlet for Grinding (Ø)									1															≤P
Sales Outlet for Bldg. Supp. (Y)										1														≤P
Grinding Capacity (Ø) 2/		14/					1.5	1																≤P
Ø Wet Corn (Ø)		.95	-.05																					=Σ
Capital Constraint (N) 3/											Y	Y	Y	Y	-Y	-Y	-Y	Y		Y				≤P
Labor Utilization (N)											-1	Σ	Σ		Σ	Σ		Σ		Σ	Σ			=Σ
Full Time Lbr. Available (N)											1													≤P
Drier Capacity (N)													1											≤P
Receiving & Storing Capacity (N)					9/							1	1											≤P
Shelled Corn to Purchase (N)					-.4									1										≤P
Buy, Store, & Receive Shld. Corn (N)												-1	-1	1	1									=Σ
Shld. Corn Available for Storage (N)															1									≤P
Corn Inventory (N)							-.0179							1		-1				1		-1		=Σ
Total Storage Capacity (N)							-.0335					1	1		-.5					1		-1		≤P
Capital Constraint (D)																					-Y	Y		≤P
Labor Utilization (D)																						Σ		=Σ
Sales Outlet for Potash (N)																					1			≤P
Sales Outlet for Grinding (N)																		1						≤P
Grinding Capacity (N)							1.5											1						≤P
Ø Wet Corn (N)												.95	-.05											=Σ
Capital Constraint (S)																	Y							≤P
Labor Utilization (S)								Σ																=Σ
Shelled Corn to Purchase (D) 10/					-.2										-.4									≤P
Shelled Corn to Purchase (1) 11/					-.1										-.2									<P
Transfer Corn into Inventory (Ø)																			1					≥M
Transfer Corn into Inventory (N)																				1				≥M

Table 3. Sample Model for October and November.

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Profit 4/	X	X	X	X	-X	-X	-X	-X	-X	-X	X	X	X	X	-X	-X	-X	-X	X	X	-X	X	
Capital Constraint 1/ (Q)	Y	Y	Y	Y	-Y	-Y	-Y	-Y	-Y	-Y									Y		Y		≤p 15/
Labor Utilization 5/ (Q)	-1	z	z		z	z	z		z	z							z		z				=z
Full Time Lbr. Available (Q)	1																						≤p
Drier Capacity (Q)			1																				≤p
Receiving & Storing Capacity (Q)		1	1																				≤p
Shelled Corn to Purchase (Q)				1																			≤p
Buy, Store, and Receive Shld. Corn (Q)		-1	-1	1	1																		=z
Shelled Corn Available for Storage (Q)					1																		≤p
Corn Inventory (Q)				1			-1	-.0179 12/											1		-1 13/		=z
Total Storage Capacity (Q) 2/		1	1				-.5 6/	-.0335											1		-1		≤p
Sales Outlet for Dairy Complete (Y)							1																≤p
Sales Outlet for Potash (Q)																	1						≤p
Sales Outlet for Grinding (Q)									1														≤p
Sales Outlet for Bldg. Supp. (Y)										1													≤p
Grinding Capacity (Q) 2/		14/						1.5	1														≤p
Wet Corn (Q)		.95		-.05																			=z
Capital Constraint (N) 3/											Y	Y	Y	Y	-Y	-Y	-Y	Y		Y			≤p
Labor Utilization (N)											-1	z	z		z	z		z		z	z		=z
Full Time Lbr. Available (N)											1												≤p
Drier Capacity (N)													1										≤p
Receiving & Storing Capacity (N)					9/							1	1										≤p
Shelled Corn to Purchase (N)					-.4									1									≤p
Buy, Store, & Receive Shld. Corn (N)												-1	-1	1	1								=z
Shld. Corn Available for Storage (N)															1								≤p
Corn Inventory (N)								-.0179						1		-1				1		-1	=z
Total Storage Capacity (N)								-.0335				1	1			-.5				1		-1	≤p
Capital Constraint (C)																					-Y	Y	≤p
Labor Utilization (C)																						z	=z
Sales Outlet for Potash (N)																					1		≤p
Sales Outlet for Grinding (N)																			1				≤p
Grinding Capacity (N)								1.5											1				≤p
Wet Corn (N)												-.05		.95									=z
Capital Constraint (S)																	Y						≤p
Labor Utilization (S)									z														=z
Shelled Corn to Purchase (I) 10/					-.2										-.4								≤p
Shelled Corn to Purchase (I) 11/					-.1										[illegible]								<p
Transfer Corn into Inventory (Q)																			1				≥M
Transfer Corn into Inventory (N)																				1			≥M

Table 3. (continued)

1/ Ø = October

2/ Y = Yearly

3/ N = November

4/ The OPTIMA program is a minimizing program; therefore the signs in the profit function are changed.

5/ The X's, Y's, and Z's can be found in the net revenue, capital constraint and labor utilization tables of the next chapter. These are given by activity.

6/ All grains brought in during a month may not be sold during that month. This model assumes 1/2 of the grain brought in during a month is sold during that month.

7/ S = September

8/ Notice that the capital constraint is affected for fertilizer sales. Fertilizer is bought one month, sold the next and paid for the following month. Therefore, the capital constraint is affected by this lag in payment. Feeds and sidelines are assumed not to be affected in such a manner, as the sales for these items are more constant.

9/ Grains are bought out of storage for 6 months following the month in which they were stored. They are bought in the following proportions for these six months: .4, .2, .1, .1, .1, .1. These proportions were obtained from the records of the sample firm. Grains are stored only during their harvest months. Note that inventory is affected in the same proportions. Three months have been shown in the sample model.

10/ D = December

11/ 1 = January

12/ This is the amount of corn in 100 bu. units in 1 ton of dairy feed divided by 12. That is there are .2143 100 bu. units of corn used for every ton of dairy feed produced. (See footnote 16.)

13/ These transfer activities bring grains into the present month from the inventory of the previous month.

14/ This assumes 95 percent of the corn that comes in is wet. This holds for harvest only.

15/ P, M, and Z are the right hand side values (the production and marketing constraints) given in the next chapter.

16/ The coefficients in the yearly activity volumes must be divided by twelve when they are associated with the twelve monthly constraints.

Table 3. (continued)

1/ O = October

2/ Y = Yearly

3/ N = November

4/ The OPTIMA program is a minimizing program; therefore the signs in the profit function are changed.

5/ The X's, Y's, and Z's can be found in the net revenue, capital constraint and labor utilization tables of the next chapter. These are given by activity.

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10/ D = December

11/ J = January

12/ This is the amount of corn in 100 bu. units in 1 ton of dairy feed divided by 12. That is there are .2143 100 bu. units of corn used for every ton of dairy feed produced. (See footnote 16.)

13/ These transfer activities bring grains into the present month from the inventory of the previous month.

14/ This assumes 95 percent of the corn that comes in is wet. This holds for harvest only.

15/ P, M, and Z are the right hand side values (the production and marketing constraints) given in the next chapter.

16/ The coefficients in the yearly activity volumes must be divided by twelve when they are associated with the twelve monthly constraints.

Chapter 3

THE DATA

The data for the programming model were obtained from several sources. These included a questionnaire completed by the manager of the sample firm (see Appendix A), secondary sources, firm income statements and balance sheets, and supplementary interviews with the manager of the sample firm.

Data Presentation

Repair Costs - Unit repair costs were found by dividing the annual repair costs by the volume handled per year. The annual repair costs were obtained from the questionnaire and the volume data were obtained from receipt and sales figures. The repair cost data are presented in Table 1B.[1]

Power Costs - The majority of the power comes from electricity. Power costs are divided into two categories: harvest and non-harvest. The rates used for these two categories were $.035/KWH and $.04/KWH respectively. Using the above rates along with motor sizes and capacities of the various equipment items (motor sizes and capacities are given in the questionnaire), power costs per unit were calculated. These calculations are shown in Table 2B.

[1] In Table 1B, the "B" refers to Appendix B. Similarly, the "C" and "D" in Table 1C and Table 1D refer to the Appendix in which the tables can be found.

Chapter 3

THE DATA

The data for the programming model were obtained from several sources. These included a questionnaire completed by the manager of the sample firm (see Appendix A), secondary sources, firm income statements and balance sheets, and supplementary interviews with the manager of the sample firm.

Data Presentation

Repair Costs - Unit repair costs were found by dividing the annual repair costs by the volume handled per year. The annual repair costs were obtained from the questionnaire and the volume data were obtained from receipt and sales figures. The repair cost data are presented in Table IB.[1]

Power Costs - The majority of the power comes from electricity. Power costs are divided into two categories: harvest and non-harvest. The rates used for these two categories were $.035/KWH and $.04/KWH respectively. Using the above rates along with motor sizes and capacities of the various equipment items (motor sizes and capacities are given in the questionnaire), power costs per unit were calculated. These calculations are shown in Table 2C.

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[1] In Table IF, the "F" refers to Appendix B. Similarly, the "C" and "A" in Table IC and Table IG refer to the Appendix in which the tables can be found.

Ingredient and Supply Costs - These costs are outlays for the purchase of productive inputs that are sold without further processing or are processed and then sold. Included in this category are grain, fertilizer and sideline costs. For grains, the average of the monthly prices received by farmers from 1964-1967 were used (see Appendix C). Feed, fertilizer and sideline costs are a function of the cost to the farmer and the margin received by the sample firm. The margins used in this study are as follows: feeds (16 percent), fertilizers (10 percent), building supplies (15 percent), coal (40 percent), chemicals (12 percent) and all other farm supplies 20 percent. These are the markups on cost. Ingredient and supply costs by activity are shown in Table 3B.

Table 4B shows variable costs by activity and Tables 5B and 6B display revenue and net revenue data. To determine which equipment items listed in Tables 1B and 2B are used in each activity, consult the "Defining the Activities" section of the previous chapter. The repair and power costs listed in Table 4B were derived from the information given in the "Defining the Activities" section and Tables 1B and 2B. The variable costs and net revenue data will appear as profit and capital coefficients in the matrix of the model. For fertilizer, it was assumed that the loading out cost was incurred when the fertilizer was bought. Fertilizer was bought one month, sold the next and revenue was received from the farmer the third month. This put a more realistic bind on capital than if fertilizer was bought and sold the same month.

Ingredient and Supply Costs - These costs are outlays for the purchase of productive inputs that are sold without further processing or are processed and then sold. Included in this category are grain, fertilizer and sidelines costs. For grains, the average of the monthly prices received by farmers from 1954-1957 were used (see Appendix C). Feed, fertilizer and sideline costs are a function of the cost to the farmer and the margin received by the sample firm. The margins used in this study are as follows: foods (15 percent), fertilizers (10 percent), building supplies (15 percent), coal (40 percent), cube loafs (12 percent) and all other farm supplies 20 percent. These are the markups on cost. Ingredient and supply costs by activity are shown in Table 3B.

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Labor Utilization

Data on labor requirements were obtained from A Linear Programming Model of a Grain Elevator and Feed Firm.[2] These data were then manipulated so as to best fit the activities used in this study. Inaccuracies will be present in our model by using these data due to differences in management, technologies, and activity definitions. The Kansas Study should be consulted for the process definitions used therein. Table 7B presents the labor requirement data developed for the processes defined in the Kansas Study.

Table 8B shows the processes defined in the Kansas Study changed to the units used in this study. Note that man-minutes were changed to man-hours. Table 9B shows the processes which were used from the Kansas Study to define the activities presented in this study. Labor requirement data for each activity are also given.

Coefficients in the Matrix

The coefficients in the matrix are the transformation or substitution rates specifying the amount of fixed revenue added or subtracted due to the entry of one unit of activity into the problem solution. Matrix coefficients fall in one of two categories, those that add to their corresponding resource supply and those that subtract from it. Each coefficient has either increasing or decreasing effects on

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[2] A Linear Programming Model of a Grain Elevator and Feed Firm, Kansas Study, op. cit., pp. 9-14.

Labor Utilization

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The coefficients in the matrix are the transformation or substitution rates specifying the amount of fixed revenue added or subtracted due to the entry of one unit of activity into the problem solution. Matrix coefficients fall in one of two categories, those that add to their corresponding resource supply and those that subtract from it. Each coefficient has either increasing or decreasing effects on

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[2] A Linear Programming Model of a Grain Elevator and Feed Plant, Kansas Study, op. cit., pp. 9-13.

its corresponding resource supply equal to its value multiplied by the activity level it represents.

Many of the coefficients used in this study have already been discussed, i.e., profit, cost, and labor utilization coefficients. The only confusing part associated with these coefficients is the way in which fertilizer was handled. For fertilizer, the capital constraint coefficients were staggered. That is, when fertilizer is received, capital is depleted during that month; it is sold the next month and capital is received the third month. Costs of selling the fertilizer were assumed to be in the purchase cost. Other coefficients were matched with the activity and the associated constraint. Table 3 demonstrates how the coefficients fit into the model.

Constraints and Limitations

In order to complete the model, production and marketing constraint data were obtained. Some of the data used here were obtained from the questionnaire, e.g., machinery capacity, drier capacity, receiving capacity, labor availability, etc. Other data were obtained from the records of the business. In the case of the receipt data, the daily data were aggregated to obtain the monthly figures. The constraints (R. H. S.) used in this study are listed below. Those constraints not listed are identically zero.

Working Capital - The average working capital was calculated from the balance sheet of the business. This figure was found to be $78,372. From this figure, the capital tied

its corresponding resource supply equal to its value multiplied by the activity level it represents.

Many of the coefficients used in this study have already been discussed, i.e., profit, cost, and labor utilization coefficients. The only confusing part associated with these coefficients is the way in which fertilizer was handled. For fertilizer, the capital constraint coefficients were staggered. That is, when fertilizer is received, capital is depleted during that month; it is sold the next month and capital is received the third month. Costs of selling the fertilizer were assumed to be in the purchase cost. Other coefficients were matched with the activity and the associated constraint. Table 3 demonstrates how the coefficients fit into the model.

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Working Capital - The average working capital was calculated from the balance sheet of the business. This figure was found to be $78,272. From this figure, the capital tied

up in feed and sideline inventory was subtracted ($51,000),[3] which left a working capital constraint of $27,372.

Labor - Table 10B shows the labor which was available. The business is open from 7:30 A.M.-5:00 P.M. Monday through Friday and from 7:30 A.M.-12:00 P.M. on Saturday during the non-harvest period. During harvest the business is open for sixteen hours Monday through Friday and eight hours on Sunday. There are twelve full-time men available; six of these men are available for overtime work. Part-time labor is available from July through December. One man is available in October and November and two men are available the other months. When overtime work is necessary, part-time laborers work two hours overtime during Monday-Friday, ten hours on Saturday, and zero hours on Sunday. Forty hours per week is assumed for full-time regular labor. One hour is taken each day for lunch. Weekly figures were multiplied by four to get monthly data.

Receiving and Storing Capacity - To be consistent with the labor data, the number of working hours during non-harvest are 188 and during harvest are 352 (8½ hours for 5 days + 4½ hours on Saturday = 47 and 47 x 4 weeks/month = 188 -- non-harvest; for harvest, 5 additional hours are put in for 5 days + 8 hours on Saturday + 8 hours on Sunday = 41 and (41 + 47) x 4 weeks/month = 352). The receiving capacities for each grain were recorded in the questionnaire, however,

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[3]From questionnaire, see Appendix A.

up in feed and shelling inventory was subtracted ($51,903),[3] which left a working capital constraint of $27,372.

Labor - Table 10E shows the labor which was available. The business is open from 7:30 A.M.-5:30 P.M. Monday through Friday and from 7:30 A.M.-12:00 P.M. on Saturday during the non-harvest period. During harvest the business is open for sixteen hours Monday through Friday and eight hours on Sunday. There are twelve full-time men available; six of these men are available for overtime work. Part-time labor is available from July through December. One man is available in October and November and two men are available the other months. When overtime work is necessary, part-time laborers work two hours overtime during Monday-Friday, ten hours on Saturday, and zero hours on Sunday. Forty hours per week is assumed for full-time regular labor. One hour is taken each day for lunch. Weekly figures were multiplied by four to get monthly data.

Receiving and Storing Capacity - To be consistent with the labor data, the number of working hours during non-harvest are 133 and during harvest are 352 (7½ hours for 5 days + 4½ hours on Saturday = 47 and 47 x 4 weeks/month = 188 -- non-harvest; for harvest, 5 additional hours are put in for 5 days + 8 hours on Saturday + 8 hours on Sunday = 41 and (41 + 47) x 4 weeks/month = 352). The receiving capacities for each grain were recorded in the questionnaire, however,

[3] From questionnaire, see Appendix V.

these must be combined to get the capacity for each month. For this study it was assumed that the receiving capacity for non-harvest months would be that of dry corn since this would be the grain received most. During harvest months capacities for the respective grains were used. The harvest month receiving data were weighted to take into account all grains received and their moisture content. Table 11B shows the capacities used and the total receiving and storing capacities for each period. Note that the receiving capacity is in bushels per hour which means that the dark red kidney and the navy bean activities had to be corrected for this. This was done by manipulating the entry in the matrix. (100 lbs. of beans equals 1.67 bushels.)

Drier Capacity - Corn and wheat are the only two grains dried. Therefore, the drier capacity is related to its capacity for each of these grains, Corn (1,000 bu./hr.), Wheat (1,200 bu./hr.).. It was assumed that the drier is operated 20 hours per day for 20 days per month. This means that the capacity for corn is 400,000 bushels per month and for wheat is 480,000 bushels per month. Wet grains are received only during harvest months. Harvest months for corn are October-December and for wheat July-August. The drier capacity for the remaining months and grains is zero.

Grains to Purchase - Grains which are brought into the elevator are either stored or bought. Therefore the volume of grain stored was subtracted from the total grain received (see Appendix C) to obtain the amount of grains available to

these must be combined to get the capacity for each month. For this study it was assumed that the receiving capacity for non-harvest months would be that of dry corn since this would be the grain received most. During harvest months capacities for the respective grains were used. The harvest month receiving data were weighted to take into account all grains received and their moisture content. Table IIF shows the capacities used and the total receiving and storing capacities for each period. Note that the receiving capacity is in bushels per hour which means that the dark red kidney and the navy bean activities had to be corrected for this. This was done by manipulating the entry in the matrix. (100 lbs. of beans equals 1.67 bushels.)

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Grains to Purchase - Grains which are brought into the elevator are either stored or bought. Therefore the volume of grain stored was subtracted from the total grain received (see Appendix C) to obtain the amount of grains available to

purchase. To arrive at this figure, the percent of the grain receipts which were put into storage had to be known (39 percent).[4] Storage was allowed only during the harvest months for each grain. The amount of ear corn available to purchase was assumed to be 8 percent of the total corn receipts. No ear corn is received during corn harvest. Purchases also come from grains sold out of storage by farmers. This was done by buying stored grains out of storage in the following proportions: .4, .2, .1, .1, .1, .1. That is 40 percent of the grain stored for farmers in month X is purchased during month X + 1. Similarly, 20 percent of the grain stored in month X is purchased during month X + 2. (Remember grains are only stored during harvest months.) Table 12B shows the amounts of grain available to purchase during each period.

Grains Available for Storage - These data were calculated from the receipt data. As mentioned above, 39 percent of the receipts were used to arrive at a storage figure. This information is presented in Table 13B.

Total Storage Capacity - The total storage capacity of the sample elevator is 315,000 bushels. All grains must be converted to bushels.

Sales Outlet for Feeds - These data were put on a yearly basis in order to reduce the size of the model. It was felt that no information was lost by doing this, since feed sales are pretty much constant. Coefficients in the

[4]From questionnaire, see Appendix A.

purchase. To arrive at this figure, the percent of the grain receipts which were put into storage had to be known (39 percent).[4] Storage was allowed only during the harvest months for each grain. The amount of ear corn available to purchase was assumed to be 8 percent of the total corn receipts. No ear corn is received during corn harvest. Purchases also come from grains sold out of storage by farmers. This was done by buying stored grains out of storage in the following proportions: .4, .2, .1, .1, .1, .1. That is 40 percent of the grain stored for farmers in month X is purchased during month X + 1. Similarly, 20 percent of the grain stored in month X is purchased during month X + 2. (Remember grains are only stored during harvest months.) Table 12B shows the amounts of grain available to purchase during each period.

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[4] From questionnaire, see Appendix A.

matrix were weighted according to the percentages of feed sold per month to aggregate data from monthly to yearly. These percentages can be found in Appendix C. The R. H. S.'s for the feed sales were calculated by using the following facts.[5] Total complete feeds sold were 3,000 tons and total supplements sold were 1,000 tons; percentages of total complete feed for each type of feed are dairy (35 percent), beef (5 percent), hog (20 percent), and poultry (40 percent), percentages of total supplement sold for each type of feed are dairy (35 percent), beef (15 percent), hog (20 percent) and poultry (30 percent). R.H.S.'s for each feed then are as follows: dairy supplement (350 tons), dairy complete (1,050 tons), beef supplement (150 tons), beef complete (150 tons), hog supplement (200 tons), hog complete (600 tons), poultry supplement (300 tons), poultry complete (1,200 tons), and miscellaneous (2 tons). All data used were obtained from an interview with the manager of the sample firm.

Sales Outlet for Sidelines - Sidelines were handled the same as feeds. As with feeds, yearly instead of monthly figures were used. When the data were aggregated from monthly to yearly, the monthly coefficients were weighted with the percent of sales for each month to obtain a yearly coefficient. These figures are shown in Appendix C. Data for building supplies, chemicals, coal, and all other farm

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supplies were obtained from the records of the sample firm. Because of an accounting change only one year of data was available (see Appendix C). The R.H.S.'s for coal were obtained by averaging dollar sales data for the past three years and then converting this figure to tons (using $19/ton). The R.H.S.'s for sidelines are as follows: building supplies ($17,282), coal (1,739 tons), chemicals ($40,390), and all other farm supplies ($77,717).

Sales Outlet for Fertilizers - Monthly sales outlets for fertilizers were calculated by using the amounts of each fertilizer sold per year (this information was obtained from the questionnaire) and percentages of fertilizer sold per month. (These percentages were obtained from dollar sales of fertilizer for the past three years.) It was assumed that these percentages were constant for all fertilizers. The calculation of these percentages is shown in the Appendix C. Table 14B shows the breakdown of the fertilizer sales by months.

The mixed fertilizers in Table 14B were divided into mixed bag and mixed bulk. The coefficients for these were obtained by weighting the unaggregated coefficients with the percent of each mixed fertilizer of the total mixed fertilizer sold. See Appendix C for these percentages.

Sales Outlet for Grinding - Grinding sales outlets were obtained by averaging the monthly dollar sales from grinding

supplies were obtained from the records of the sample firm. Because of an accounting change only one year of data was available (see Appendix C). The R.M.S.'s for coal were obtained by averaging dollar sales data for the past three years and then converting this figure to tons (sale\ton). The R.M.S.'s for sidelines are as follows: building supplies ($17,282), coal (1,739 tons), chemicals ($40,340), and all other farm supplies ($77,717).

Sales Outlet for Fertilizers - Monthly sales outlets for fertilizers were calculated by using the amounts of each fertilizer sold per year (this information was obtained from the questionnaire) and percentages of fertilizer sold per month. (These percentages were obtained from dollar sales of fertilizer for the past three years.) It was assumed that these percentages were constant for all fertilizers. The calculation of these percentages is shown in the Appendix C. Table IA9 shows the breakdown of the fertilizer sales by months.

The mixed fertilizers in Table IA8 were divided into mixed bag and mixed bulk. The coefficients for these were obtained by weighting the aggregated coefficients with the percent of each mixed fertilizer of the total mixed fertilizer sold. See Appendix C for these percentages.

Sales Outlet for Grinding - Grinding sales outlets were obtained by averaging the monthly dollar sale from grinding

for the past three years and dividing by 12¢[6] to get hundredweight. These hundredweight figures by month are as follows: 11,621 (1); 11,250 (2); 12,547 (3); 12,238 (4); 12,840 (5); 11,682 (6); 12,161 (7); 13,704 (A); 13,071 (S); 12,686 (Ø); 14,352 (N); and 16,590 (D).[7]

Grinder and Sheller Capacity - These capacities were obtained through the questionnaire. (Grinder 20 tons per hour and sheller 600 bushels per hour). These figures are then multiplied by 188 hours per month, which is the amount of regular work time. It was assumed that no grinding or shelling is done during overtime periods in harvest months. The following are the capacities used in the study: grinding (75,222 cwt.) and shelling (112,800 bu.). Note that grinding capacity was changed from tons to hundredweight.

Transfer Grain into Inventory or Minimum Inventory - Some grain inventories must be held above a specified level. These are grains which must be available for feeds, as was the case in this study. In this study the following levels of corn and oats must be maintained: corn (10,000 bu.) and oats (3,000 bu.).

The model was also solved for 10 percent and 20 percent increases in the receipt and sales data presented above. This was done to make comparisons among various levels of business. If the business increases by the above amounts,

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[6]The revenue for grinding was given in the questionnaire.

[7]The month codes are given in footnote 1, Table 1.

for the past three years and dividing by 112[6] to get hundredweight. These hundredweight figures by month are as follows: 11,621 (1); 11,250 (2); 12,347 (3); 12,233 (4); 12,840 (5); 11,682 (6); 12,161 (7); 13,704 (8); 13,071 (9); 12,056 (10); 14,352 (11); and 10,240 (12).[7]

Grinder and Shelter Capacity - These capacities were obtained through the questionnaire. Grinder 20 tons per hour and shelter 600 bushels per hour). These figures are then multiplied by 168 hours per month, which is the amount of regular work time. It was assumed that no grinding or shelling is done during overtime periods in harvest months. The following are the capacities used in the study: grinding (75,222 cwt.) and shelling (112,800 bu.). Note that grinding capacity was changed from tons to hundredweight.

Transfer Grain into Inventory or Minimum Inventory - Some grain inventories must be held above a specified level. These are grains which must be available for feed, as was the case in this study. In this study the following levels of corn and oats must be maintained: corn (10,080 bu.) and oats (3,000 bu.).

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[6]The reason for grinding was given in the questionnaire.

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some idea can be obtained as to what resources will become limiting. The manager then can make decisions as to whether he wants to increase resource capacities. He must also decide whether the increase in sales and receipts can be obtained. It was assumed that prices remained constant for these increases in business potential and that there was no retaliation by competition.

After processing the data, it was made ready for the computer. The Control Data Corporation OPTIMA linear programming routine was used in this analysis. After the computational processes are completed by the computer the remaining task is to present and interpret the results, which is the topic of the following chapter.

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After processing the data, it was made ready for the computer. The Control Data Corporation OMPLMA linear programming routine was used in this analysis. After the computational processes are completed by the computer the remaining task is to present and interpret the results, which is the topic of the following chapter.

Chapter 4

THE RESULTS

The manager of a feed and grain operation is faced with many economic problems. Such questions as the following may arise in a typical feed and grain business. Are there any excess resources? Which resources limit expansion? Is the feed enterprise paying for itself? What would happen if the business potential were increased? Is there ample storage space? Should we specialize in grain handling? These questions become quite difficult to answer when dealing with a large number of business activities and resource constraints as is the case in this study.

The linear programming solution can aid the manager in answering the above questions. The manager of a feed and grain firm can gain insight as to the level of business at which he should be operating in order to maximize profit. The linear programming solution also gives the manager the level of resources remaining after attaining a maximum profit situation as well as the marginal value products of those resources which were depleted. The maximum net revenue possible from the production and marketing activities is also available.

The results obtained in this study will be presented and

Chapter 4

The Problem

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The results obtained in this study will be presented and

discussed in the following sections of this chapter. For each activity set, the initial solution (RHSI) will first be presented followed by the solution for 10 percent (RHSII) and 20 percent (RHSIII) increases in sales potential.

Activity Level

In order to maximize profit subject to the various constraints of the business, the following activity levels should be attained. Tables 1D, 2D, and 3D show these results.

Hiring Labor - The program only hired a fraction of the labor which was available. This seems reasonable as the high labor-using feed operation did not enter the solution. Labor will be discussed in greater detail later.

Buying Grains - All of the grains which were available for purchase by the elevator were bought with the exception of the following: December oats for RHSI, 3110 bushels; November shelled corn for RHSII, 15,461 bushels; November oats for RHSII, 1639 bushels; December oats for RHSII, 2437 bushels; November shelled corn for RHSIII, 13,583 bushels; July oats for RHSIII, 3991 bushels; November oats for RHSIII, 1787 bushels. These grains were not purchased because total storage capacity was exhausted during the months these purchases could have been made.

Storing Grains - The program accepted all grains from the farmers to be stored by the elevator except the following: November corn for RHSI, 36,060 bushels; December corn for RHSI, 10,355 bushels; October corn for RHSII, 22,006 bushels;

discussed in the following sections of this chapter. For each activity set, the initial solution (RHSI) will first be presented followed by the solution for 10 percent (RHSII) and 20 percent (RHSIII) increases in sales potential.

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Storing Grains - The program accepted all grains from the farmers to be stored by the elevator except the following: November corn for RHSI, 35,060 bushels; December corn for RHSI, 10,355 bushels; October corn for RHSII, 22,006 bushels;

November corn for RHSII, 44,020 bushels; December corn for RHSII, 11,391 bushels; October corn for RHSIII, 14,006 bushels; November corn for RHSIII, 48,022 bushels; December corn for RHSIII, 10,154 bushels. Again, as with the buying activities, storage space was the limiting resource.

Selling Grains - All of the grains which were available to be sold were sold by the program. The solution indicated that the manager should study grain price trends in order to unload his grain during the periods of highest price. This, of course, was expected as the program sells all the grains it can when the price is the highest.

Selling Fertilizers - Fertilizer sales came in at their full level. The fertilizer operation appears to be quite profitable. This will be discussed later.

Selling Feeds - The program sold all of the supplements and miscellaneous feeds it could. However, none of the complete feeds were sold. This indicates that the manager should analyze this particular part of the business. He might find that this operation is too labor consuming for the revenue received from it. With the price of labor increasing, it might be wise to do some labor efficiency studies. Or it might be best to drop this part of the business completely. Possibly the margins on complete feeds should be reviewed. Whatever the case, the high labor-using operations such as the feed mill should be given special attention.

Selling Sidelines - All sidelines were sold at the maximum level.

November corn for RHIII, 44,020 bushels; December corn for RHSII, 11,391 bushels; October corn for RHSIII, 14,556 bushels; November corn for RHSIII, 45,022 bushels; December corn for RHSIII, 10,154 bushels. Again, as with the buying activities, storage space was the limiting resource.

Selling Grains - All of the grains which were available to be sold were sold by the program. The notation indicated that the manager should study grain price trends in order to unload his grain during the periods of highest price. This, of course, was expected as the program sells all the grains it can when the price is the highest.

Selling Fertilizers - Fertilizer sales came in at their full level. The fertilizer operation appears to be quite profitable. This will be discussed later.

Selling Feeds - The program sold all of the supplements and miscellaneous feeds it could. However, none of the complete feeds were sold. This indicates that the manager should analyze this particular part of the business. He might find that this operation is too labor consuming for the revenue received from it. With the price of labor increasing, it might be wise to do some labor efficiency studies. Or it might be best to drop this part of the business completely. Possibly the margins on complete feeds should be reviewed. Whatever the case, the high labor-using operations such as the feed mill should be given special attention.

Selling Sidelines - All sidelines were sold at the maximum level.

Reduced Profits

What would happen if the activities which were rejected by the program were forced into the solution? The most obvious answer is that profit would be reduced. This is what does happen; Table 4D shows how much profit would be reduced if these activities were allowed to come into the optimal solution.

Of major concern should be the complete feed business. Profits would be reduced substantially if this operation were forced into the optimal solution. The question then comes up as to whether this operation should be dropped from the business. We can say that the operation as it is should not be expanded, but we don't know for sure if it should be eliminated. Information such as farmer's opinions and competitor reaction to such a move need to be known. Also, salvage prices need to be known before a decision can be made to drop the complete feed operation. The program then has found a weak spot in the business, but it is still up to the manager to make the final decision.

Excess Resources

Of major importance for decision purposes are the amounts of resources which were not used to attain the maximum net revenue position. These data (Table 5D) reveal areas of excess supplies, market potentials, or remaining amounts of other restrictions which were established in the initial formulation of the problem. These are the items

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which do not limit expansion of the firm.

Of particular concern should be the amount of excess labor. A big portion of this comes from the elimination of the feed producing enterprise. Also, it must be recalled that accurate labor data were difficult to obtain. It could be that some of this excess labor comes from the inability to obtain more precise labor figures for each activity. Some of the excess labor undoubtedly comes from the problem of uneven work loads. In the real world this has to be dealt with. The program did not consider this problem and used only that amount of labor which was necessary to bring in the level of activities in the profit maximizing solution. The problem of uneven work loads is hard to remove without losing good will. Nevertheless, the manager should further analyze the labor situation, particularly with respect to the feed producing operation.

Excess amounts of grains available to purchase and store are due to the storage capacity limitation. Table 6D should be consulted to see if the returns to more storage capacity meet the costs of expanding this facility. This will be discussed in greater detail later.

Excess resources in drying and receiving capacities were not tabulated. These factors are hard to measure over time, since one day they may become limiting and the next day they may be idle. It is up to the manager as to whether these factors need to be reviewed.

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Next to be considered will be the returns to adding resources which are limiting.

Marginal Value Products

Total storage capacity seems to be the most limiting physical facility of the sample firm. In order to make decisions directed toward the acquisition of more storage space, it would be beneficial to know the returns to such an undertaking. This information is given in Table 6D. If the returns to another unit of total storage space (marginal value product) are greater than the costs of adding this storage capacity, expansion should be carried out. Elevator managers have a pretty good idea of what the costs of adding on an additional resource would be. Certain rules of thumb are also available in the business which might be useful in estimating the costs of adding an additional resource. It must be remembered that the MVP's given in Table 6D are the returns to the first units of expansion.

Also of concern to management is which restriction or limiting factor should be expanded first. This problem can be solved by looking at the magnitude of the MVP's.

The MVP's for feed supplements are quite high, whereas the MVP's for complete feeds are zero. The ideal situation would be to sell supplements but not complete feeds. This might not be possible as the two operations might have to be combined. The clientele and competition of the market will determine the feasibility of this suggestion. It would also

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be interesting to run the program without any feed operation and see how much profit is affected. The decision to omit the feed business or any part of it is up to the management. Nevertheless, the management needs to look at production of complete feeds rather carefully. Possibly the margins on complete feeds should be reviewed.

The MVP's of fertilizer also seem to indicate that this operation can be expanded. Perhaps it would be profitable to add more warehouse space, a blender, and a liquid fertilizer operation. The feasibility of these suggestions depends again on the competition and the costs involved.

The same is true for the grain business. If management thinks grain business can be pulled away from competition by adding more and better grain handling facilities, then they should do so, provided, of course, that the cost of adding such facilities does not exceed the MVP's of the additional grains received by carrying out such an action. Since the MVP's for grains to purchase are reasonably high, it would pay to increase grain prices in order to draw business away from the competitors. This is assuming that the extra grain can be handled. It might pay to experiment with increasing prices to see how the business is affected.

Maximum Net Revenue

The net revenue generated by the program by the base period (RHSI) is $198,000. This is the revenue received from the activities listed in the optimum solution minus repair costs, power costs, labor costs, and ingredient and

repair costs, power costs, labor costs, and ingredient and from the activities listed in the optimum solution minus period (RHS1) is $138,000. This is the revenue received

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supply costs. Costs such as interest charges, labor expenses for salaried personnel, taxes, insurance, depreciation, and miscellaneous expenses which include heat, light, and general repair costs on buildings were not included. From the yearly income statement for 1968 these costs add up to $100,000. Subtracting $100,000 from $198,000 leaves a net profit figure of $98,000. Likewise, the net profits for a ten percent and twenty percent increase in business potential are $116,000 and $130,000.

These profit figures are the profits generated by the program under perfect conditions. Grains were sold during months when the prices were at their peak. Even though this was expected, it does emphasize the importance of studying price trends. Note that hedging was not considered in the program. In reality price risk transference might be accomplished through hedging. Also, in the real world grains and feeds are lost due to spoilage. The program makes no allowances for unforeseen circumstances of this nature. The program also does not consider major repair costs which have a habit of popping up occasionally in businesses of all types. The absolute value of the net profit figure should therefore be viewed as being high. These profit figures are helpful though in making comparisons among different business potentials or modifications in sectors of the overall business.

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to receive as many grains and sell as much fertilizer and supplement feeds as possible. Remember that the program assumed that these increases could be achieved and that there would be no price or non-price retaliation by competitors. It is possible that business might be increased by improving receiving and handling facilities, advertising, or by changing prices. However, more research is needed in the area of what persuades a farmer to go to one firm over another. Nevertheless, as was concluded in the Illinois study, increased farm production should be welcomed by the grain elevator firm. At present, it seems that the major factor which is affected by an increase in business potential is the total storage capacity of the sample firm. A discussion concerning this was given in a previous section of this chapter.

Implications

The elevator manager might be more interested in a general discussion of the results rather than an economic interpretation of them. For example, the marginal value product of one more unit of storage capacity might not be of interest to a manager. He might be more interested in the MVP of the ten-thousandth unit of storage space, which is not given in the solution. The manager of the sample firm then might be more interested in the following type of discussion.

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to receive as many grains and could be more fertilizer and supplement feeds as possible. However that the previous assumed that these increases could be achieved and that there would be no price or non-price restriction by competitors. It is point to that feeding at no increased by improving receiving and marketing facilities, warehousing, or by changing prices. However, more research is needed in the area of what persuades a farmer to go to one firm over another. Nevertheless, as was concluded in the Illinois study, increased farm production should be welcomed by the grain elevator firm. At present, it seems that the major factor which is affected by an increase in business potential is the total storage capacity of the sample firm. A discussion concerning this was given in a previous section of this chapter.

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operation. The manager might want to do a labor efficiency study in this part of the business. He might find that the machinery he is using is outdated or that the feed producing operation is not set up efficiently. The manager might also want to consider the possibility of dropping the complete feed business. Before he does this though, he should make sure that he will not lose his present customers' grain, fertilizer, sideline, and supplement feed business. Also to be considered is the salvage value of the resources associated with the complete feed operation. It might be that after a labor efficiency study is conducted and after other relevant factors are considered it would not pay to drop the business. Or possibly the manager might find that it would be better to update the equipment in the feed mill. Another alternative is to increase the margin on complete feeds. These and other alternatives are available to the manager and he should consider them all carefully before making a decision.

The manager must also be concerned with the type of farming in his marketing area, the services which his clientele require, and the competition. These are factors which must be considered before a major decision can be made.

With respect to storage space, the manager might decide that it would be wise to expand this facility. Before he does, he must first consider how limiting this resource is and if business will increase enough in the next few years to warrant such an expansion. Will new and better facilities

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in handling attract more customers? What about increasing prices? These are other questions which have to be considered.

The program showed that fertilizer is quite profitable for the sample firm. In this light, the manager might want to consider expanding this enterprise. Before expanding, the gains from additional facilities, the costs of adding facilities, and such factors as competition, planting acreages, and his present fertilizer facilities should be considered.

The linear programming technique is a useful aid, but the manager is still in charge of exploring business alternatives available to him and making further studies on the data produced by the program. The results given for the sample firm used in this study should be useful to similar firms in the industry.

This concludes the presentation and interpretation of the results. The next chapter will summarize the study, evaluate the linear programming technique as applied to a feed and grain firm and point out the areas where further research is required.

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Chapter 5

SUMMARY AND EVALUATION

Technological developments have been prevalent in the firms that serve agriculture. The feed and grain industry has been affected by technologies both internally and externally. Internally, new developments have taken place with respect to receiving and transportation facilities. Externally, technologies have increased farm production dramatically. These technologies have put burdens on the management of marketing outlets for farm products.

Little has been done to aid the manager of a feed and grain business in his decision-making process. This study used one of the business management techniques to help the manager solve the problems which he faces in resource use, expansion, etc. The technique used is linear programming.

The linear programming technique and the model developed in this study was tested on a sample firm. Several sources were used to obtain the data necessary to complete the model. Among these included a questionnaire, interviews with the manager of the sample firm, receipt and sales data from the records of the sample firm and secondary sources. After the data were collected and manipulated to suit the specification of the linear programming model, the model was ready to

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enter the computer.

The linear programming technique proved to be useful in picking out weak spots in the sample firm. The most obvious weakness was in the feed mill. This indicates that further study should be directed toward this part of the business. In particular, the labor used by this operation should be considered.

Some study should be given to the possibility of deleting the complete feed business and keeping the supplement and miscellaneous feeds. Possibly a survey should be conducted to determine farmers' feelings on this matter. It might be that further study of the complete feed operation would reveal that dropping it would not be beneficial. Farmers might object to the firm not offering complete feeds and grinding and mixing services. From all indications, it appears that marginal value product is below acquisition price (it would not be profitable to expand), but we cannot say for certain that the marginal value product is below salvage price (it would pay to salvage the operation). We therefore can say with reasonable assurance that the feed operation should not be expanded as it is, but we really cannot say, because of a lack of information, that it should be eliminated. The manager has to look at this part of the business and keep the above considerations in mind. Also to be considered are competition and increasing margins.

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Perhaps, if the sample firm were to invest in the new technologies available to the industry, customers could be

drawn away from the competitors. This would be a difficult decision for management to make. There is no definite way of knowing whether business would increase if more and better storage, receiving and handling facilities were added. More study needs to be directed toward defining why farmers go to one business over another. Price competition should also be considered.

The program revealed that the increased farm production should be welcomed along with the increase in fertilizer and sideline sales needed to achieve this production.

Fertilizer storage constraints were not added to the program. However, the manager indicated that fertilizer warehouse space would have to be increased to meet the needs of an increased business potential. This along with grain storage should be expanded as long as the costs of adding additional capacities do not exceed the revenue received from such expansions. It must be remembered that the increased business potential was assumed to be achievable and that competition would not retaliate with price or non-price competition.

The manager of the sample firm is still required to make the final decisions. Linear programming is merely a tool to aid the manager in decision-making. The manager needs to consider competition and other factors which are relevant to the firm and the real world after the programmed solution is obtained.

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Evaluating the Techniques

The linear programming technique has been highly useful in this study. It was able to handle the large set of activities and constraints of a feed and grain operation. The solution to the linear programming model proved to be helpful in giving management an insight into problem solutions. It was also helpful in pointing out the weak spots of the business as well as analyzing the affects of a changing business potential.

The model built in this study could also be used to test the effects of the sideline and feed operation by dropping these operations from the model. One could also test the effect of adding and subtracting particular resources such as labor, capital and storage capacity. It would also be interesting to decrease the cost of an activity which did not come into the optimal solution to see how much costs must be reduced before the activity enters the solution. The effects of changing margins might also be interesting.

A sensitivity analysis might be helpful. This technique highlights the impact of a change in one variable on the other economic variables of a model. For example, it can show the amount of shift in profit when key inputs to an economic model (e.g., price, volume, and capital) are varied, one at a time.

Setting up and using a linear programming model does require a great amount of time and data. This time and data might not be available to all elevators. Also the business

Applying the Technique

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Setting up and using a linear programming model does require a great amount of time and data. This time and data might not be available to all operators. Also the business

might not have access to a computer to handle a linear programming problem the size of the one in this study. However, these problems could be solved by programming a typical firm in a region and then make inferences from the solution given. That is, the results obtained from programming one elevator might be helpful to similar elevators in the region. By choosing a "representative firm" of a particular class, insight into certain problems facing management for this particular category of firms could be gained.

Managers of feed and grain operations need to use all of the accounting and business management aids available to them for the business to survive. With the introduction of technologies, internal and external, decision-making is becoming more and more complex in the firms that serve agriculture. A successful manager must make use of all the tools available to him. If he does not, he might find that his firm will not be able to compete with the more progressive firms in meeting the demands of a highly productive farm sector. The model developed in the study should be useful to elevator managers and researchers working with the feed and grain industry in meeting these demands.

What Needs To Be Done?

As a result of this study, areas which require further research were discovered. More work needs to be directed toward obtaining better data, especially labor data. Factors which affect a farmer's decision to choose one firm over

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Many of the country elevators are in trouble. Studies should be directed toward helping managers of these firms analyze their business, their competitors, other business alternatives, and the clientele of the firm. Perhaps the business would be best suited to specialize in feed contracting. Possibly it would be best for the business to phase out the feed and grain business and specialize in fertilizer. Or perhaps it would be best for the manager to phase the business out completely. Studies should be directed toward helping managers review these alternatives and help him carry them out.

Managers could also be aided by solving the model developed in this study for elevators of all sizes and types. By doing this, managers can get an idea as to what levels of business they should be operating at, if they are to be operating at all. The above areas seem to be relevant in the grain and feed industry at the present time.

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APPENDIX A

COMPLETED QUESTIONNAIRE

APPENDIX V

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Dept. of Agr. Economics

APPENDIX A

COMPLETED QUESTIONNAIRE

Grains

1. What grains are handled?

   Corn, Wheat, Soys, Oats, Navy Beans, Dark Red Kidney Beans

2. Is ear corn handled? Yes - received and shelled.

3. Drier type and its capacity for each grain - Schanzer Continuous

Grain	Est. Drier Capacity (bu./hr.)
Wheat	1200
Corn	1000
Oats	800
Soys	1200

   Burner BTU --
   Rated Capacity 1000-1100 bu./hr.

4. How much grain can you receive during an eight hour day under "normal conditions" (bu./hr.)?

Grain	Amount (dry)	Amount (wet)
Wheat	32000	24000
Corn	10000	7500
Oats	20000	-0-
Soys	16000	-0-
Navies	10000	-0-
D.R.K.	4000	-0-

5. On an "average year" what percent of the grain received during harvest must be dried? What is the average moisture?

Grain	% dried	Ave. moisture
Corn	95%	25%
Wheat	10%	15%

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APPENDIX V

CONSERVING QUESTIONNAIRE

Grains

1. What grains are handled?

Corn, Wheat, Soys, Oats, Navy Beans, Dark Red Kidney Beans

2. Is ear corn handled? Yes - received and shelled.

3. Drier type and its capacity for each grain - Scharzer Continuous

Grain	Est. Drier Capacity (bu./hr.)
Wheat	1200
Corn	1000
Oats	800
Soys	1200

Farmer FTU --
Rated Capacity 1000-1100 bu./hr.

4. How much grain can you receive during an eight hour day under "normal conditions" (bu./hr.)?

Grain	Amount (dry)	Amount (wet)
Wheat	22000	24000
Corn	12000	7500
Oats	20000	-0-
Soys	10000	-0-
Navies	1000	-0-
D.R.K.	4000	-0-

5. On an "average year" what percent of the grain received during harvest must be dried? What is the average moisture?

Grain	% Dried	Ave. moisture
Corn	95%	25%
Wheat	10%	15%

6. What is the average variation in the price of navy beans and dark red kidney beans? Four dollar spread

7. What are the harvest months for each grain handled?

   Corn - Oct. 15-Dec. 15
   Soys - Oct. - Nov.
   Wheat - July-August
   DRK - Sept.
   Navy - Sept.
   Oats - Aug.

8. Are grains given in dry weight when they are received?

   Yes

9. Is there a certain amount of each grain you want to have on hand at all times? Yes

   Corn - 10,000 bushels
   Oats - 3,000 bushels

10. What percent of the grain receipts is ear corn? 8% - During corn harvest this decreases to zero.

11. What percent of each grain is wet?

   Corn - 95%
   Wheat - 10%
   Soys - --
   Oats - --
   Beans - --
   Grains are usually dry during non-harvest periods.

12. What percent of these grains are stored? 39% - Usually stored during harvest period only.

13. What is considered to be "dry" for each grain?

   Corn - 14.5% - 15.5%
   Soys - 13%
   Beans - 18%
   Wheat - 13%

14. What is the storage rate per bushel? 1½¢ per bu. per month.

15. What margin do you have for grain? 6.5%

16. What is the average time grains are stored? 6 months

6. What is the average variation in the price of navy beans and dark red kidney beans? Four dollar spread

7. What are the harvest months for each grain handled?

Corn - Oct. 15-Dec. 15
Soys - Oct. - Nov.
Wheat - July-August
DRK - Sept.
Navy - Sept.
Oats - Aug.

8. Are grains given in dry weight when they are received?

Yes

9. Is there a certain amount of each grain you want to have on hand at all times? Yes

Corn - 10,000 bushels
Oats - 3,000 bushels

10. What percent of the grain receipts in ear corn? 0% - During corn harvest this decreases to zero.

11. What percent of each grain is wet?

Corn - 95%
Wheat - 10%
Soys - --
Oats - --
Beans - --
Grains are usually dry during non-harvest periods.

12. What percent of these grains are stored? 30% - Usually stored during harvest period only.

13. What is considered to be "dry" for each grain?

Corn - 14.5% - 15.5%
Soys - 13%
Beans - 18%
Wheat - 13%

14. What is the storage rate per bushel? 1¢ per bu. per month

15. What margin do you have for grain? 6.5%

16. What is the average time grains are stored? 6 months

FEEDS

1. What feeds do you handle? (e.g., hog feed bulk, hog feed bag, dairy feed bag, cattle feed bulk). Dairy feed complete, dairy feed supplement, hog feed complete, hog feed supplement, poultry feed complete, poultry feed supplement, beef feed complete, beef feed supplement, miscellaneous (rabbit, horse, mineral feed, salt, etc.).

2. How much feed is sold? What percent of the total feed sold is each of the feeds listed in question 1?

   1000 tons of supplement
   3000 tons of complete

Feed	Complete (%)	Supplement (%)
Dairy	35	35
Beef	5	15
Hog	20	20
Poultry	40	30

   2 tons of miscellaneous feeds are sold per month.

3. What is the cost to the farmer for each feed?

Feed	Cost ($/ton)
Dairy supplement	106
Dairy complete	52
Beef supplement	100
Beef complete	52
Poultry supplement	120
Poultry complete	70
Hog supplement	112
Hog complete	62
Miscellaneous	120

4. How much of each grain is taken from storage in processing feeds?

   Hog complete 1600 lbs./ton - corn
   Dairy complete 1800 lbs./ton - 2/3 corn and 1/3 oats
   Beef complete 1800 lbs./ton - corn
   Poultry complete 1500 lbs./ton - corn
   Supplements make up the remainder of the feeds.

5. What percent of the feeds are delivered? 40% The costs of delivery equal the added expense to the farmer.

6. What percent of the feed is bulk? 65%

7. What is the margin on feeds? 16% on all feeds

FEEDS

1. What feeds do you handle? (e.g., hog feed bulk, hog feed bag, dairy feed bag, cattle feed bulk). Dairy feed complete, dairy feed supplement, hog feed complete, hog feed supplement, poultry feed complete, poultry feed supplement, beef feed complete, beef feed supplement, miscellaneous (rabbit, horse, mineral feed, salt, etc.).

2. How much feed is sold? What percent of the total feed sold is each of the feeds listed in question 1?

1000 tons of supplement
3000 tons of complete

Feed	Complete (%)	Supplement (%)
Dairy	35	35
Beef	5	15
Hog	20	20
Poultry	40	30

2 tons of miscellaneous feeds are sold per month.

3. What is the cost to the farmer for each feed?

Feed	Cost ($\ton)
Dairy supplement	106
Dairy complete	52
Beef supplement	100
Beef complete	52
Poultry supplement	120
Poultry complete	70
Hog supplement	112
Hog complete	52
Miscellaneous	120

4. How much of each grain is taken from storage in processing feeds?

Hog complete 1600 lbs.\ton - corn
Dairy complete 1800 lbs.\ton - 2\3 corn and 1\3 oats
Beef complete 1800 lbs.\ton - corn
Poultry complete 1500 lbs.\ton - corn
Supplements make up the remainder of the feeds.

5. What percent of the feeds are delivered? 40% The costs of delivery equal the added expense to the farmer.

6. What percent of the feed is bulk? 60%

7. What is the margin on feeds? 10% on all feeds

FERTILIZERS

1. What fertilizer analyses do you handle?

   Potash, urea, 17-17-17 bulk, 7-17,17 bag, 8-32-16 bulk, 8-32-16 bag, 6-24-24 bulk, 6-24-24 bag, 0-25-25 bulk, 0-25-25 bag, special corn starter bulk, special corn starter bag, special bean starter bulk, special bean starter bag, special beet starter bulk, special beet starter bag

2. How much of each fertilizer analysis is sold? 80% bulk

Fertilizer	Amount (tons)
Potash	400
Urea	500
17-17-17	100
8-32-16	450
6-24-24	450
0-25-25	100
Special Corn Starter	200
Special Bean Starter	50
Special Beet Starter	60

3. What is the cost to the farmer for each of the fertilizers?

Fertilizer (Bulk)	Cost ($/ton)
Urea	69
Potash	43
17-17-17	68
8-32-16	65
0-25-25	60
6-24-24	60
Special Corn Starter	90
Special Bean Starter	83
Special Beet Starter	84

   Bagged fertilizers are $5 more per ton.

4. What percent of the fertilizer is delivered? 25%
   The costs of delivery equal the added expense to the farmer.

5. What is the margin on fertilizers? 10% for all fertilizers

EXERCISES

1. What fertilizer analyses do you handle?

   Potash, urea, 17-17-17 bulk, 7-17,17 bag, 8-32-16 bulk,
   8-32-16 bag, 6-24-24 bulk, 6-24-24 bag, 0-25-25 bulk,
   0-25-25 bag, special corn starter bulk, special corn
   starter bag, special bean starter bulk, special bean
   starter bag, special beet starter bulk, special beet
   starter bag

2. How much of each fertilizer analysis is sold? 80% bulk

Fertilizer	Amount (tons)
Potash	400
Urea	500
17-17-17	100
8-32-16	450
6-24-24	450
0-25-25	100
Special Corn Starter	200
Special Bean Starter	50
Special Beet Starter	60

3. What is the cost to the farmer for each of the fertilizers?

Fertilizer (BULK)	Cost ($\ton)
Urea	69
Potash	43
17-17-17	63
8-32-16	65
0-25-25	60
6-24-24	60
Special Corn Starter	90
Special Bean Starter	83
Special Beet Starter	84

Bagged fertilizers are $5 more per ton.

4. What percent of the fertilizer is delivered? 25%
   The costs of delivery equal the added expense to the farmer.

5. What is the margin on fertilizers? 10% for all fertilizers

SIDELINES

1. Classify your sidelines. (Use classifications which are easiest to obtain sales figures for.)

   Building supplies
   Coal
   Chemicals
   All other farm supplies

2. What is the margin for each of the above sideline classifications?

Sideline	Margin
Building supplies	15%
Coal	40%
Chemicals	12%
All other farm supplies	20%

   The cost to the consumer for coal is $19/ton.

3. What percent of the coal is delivered? 90%. The costs of delivery equal the added expense to the consumer.

GENERAL

1. How many hours per day are you open for business during harvest? 16 hours Non Harvest? 8½ hours

2. Are you open for business on Saturday and Sunday during harvest? Yes Non Harvest? Until noon on Saturdays, closed Sundays

3. What is your total storage capacity? 315,000 bushels

4. What services do you offer to the farmer? (Check those which are appropriate.) What is the charge for each?

Service	Check if offered	Charge	Unit
Shelling	X	5¢	bu.
Grinding	X	12¢	cwt.
Mixing	X	12¢	cwt.
Rolling	---	---	---
Others (list)			
Spreading			
Spraying			
Trucking			

5. What are the salaries and wage rates for the employees?

Job	Salary or Wage
Manager	$10,000 - $15,000

Answers

1. Classify your eligibility. (Two classifications which are easiest to obtain earn figures I'm.)

   Building materials
   Coal
   Chemicals
   All other farm supplies

2. What is the margin for each of the above eligibility classifications?

Sideline	Margin
Building supplies	17%
Coal	4.5%
Chemicals	12%
All other farm supplies	27%

   The cost to the consumer for coal is $13/ton.

3. What percent of the coal is delivered? 95%. The costs of delivery equal the added expense to the consumer.

Answers

1. How many hours per day are you open for business during harvest? 16 hours Non Harvest? 8½ hours

2. Are you open for business on Saturday and Sunday during harvest? Yes Non Harvest? Until noon on Saturdays, closed Sundays

3. What is your total storage capacity? 315,000 bushels

4. What services do you offer to the farmer? (Check those which are appropriate.) What is the charge for each?

Service	Check if offered	Charge	Unit
Shelling	X	5¢	bu.
Grinding	X	12¢	cwt.
Mixing	X	12¢	cwt.
Rolling	---	---	---
Others (list)			
Spreading			
Spraying			
Trucking			

5. What are the salaries and wage rates for the employees?

Job	Salary or Wage
Manager	$10,000 - $15,000

Job	Salary or Wage
Asst. Manager	$8,000-$12,000
Sales Representative	7,000- 10,000
Average wage of wage people	$2.25-$3.00
Overtime scheme	Time and one-half
Part time wage	$2.00

6. What is the depreciation technique and the total depreciation for the last five years? Straight line

	1964	1965	1966	1967	1968
Depreciation	$22,000	$30,000	$32,000	$29,000	$27,000

7. How much part time labor could you hire?

2 men July, Aug., Sept., Dec.
1 man Oct.-Nov.

8. Judging from the status of the production factors of farmers in your area and the competition, do you expect your receipts to increase, decrease or stay the same during the next five years? If there is a change, what do you estimate the change to be for each category?

	Change (+,-,0)	Amount of change
Feed Sales		
Grain Receipts		
Sidelines		
Fertilizers		
Other:		
_____		
_____		

Comments: Hope there will be a 10% increase across the board - there is a decreasing agricultural potential in the area. Therefore, the increase in business must come from the competition.

9. What are the investment decisions which are likely to occur in the next five years?

1. Should we have more fertilizer storage?
2. Should we improve bean handling facilities (handling & processing)?
3. What about storage facilities, do we have enough?
4. Should we build a new feed plant?
5. Should we handle anhydrous ammonia?

10. What are the electric power rates? Check with another source.

Job	Salary or Wage
Asst. Manager	$9,000-12,000
Sales Representative	7,000- 10,000
Average wage of farm people	$2.25-3.00
Overtime scheme	Time and one-half
Part time wage	$2.00

6. What is the depreciation trending and the total depreciation for the last five years? Straight line

	1964	1965	1966	1967	1968
Depreciation	$22,000	$30,000	$32,000	$29,000	$27,000

7. How much part time labor could you hire?

2 men July, Aug., Sept., Dec.
1 man Oct.-Nov.

8. Judging from the status of the production factors of farmers in your area and the competition, do you expect your receipts to increase, duplicate or stay the same during the next five years? If there is a change, what do you estimate the change to be for each category?

	Change (+,-,0)	Amount of change
Feed Sales		
Grain Receipts		
Sidelines		
Fertilizers		
Other:		
_____		
_____		

Comments: More there will be a 10% increase across the board - there is a decreasing agricultural potential in the area. Therefore, the increase in business must come from the competition.

9. What are the investment decisions which are likely to occur in the next five years?

1. Should we have more fertilizer storage?
2. Should we improve bean handling facilities (handling & processing)?
3. What about storage facilities, do we have enough?
4. Should we build a new feed plant?
5. Should we handle anhydrous ammonia?

10. What are the electric power rates? Check with another source.

11. What is the overtime wage rate? Time and one-half

12. How much full time labor do you have? 12 men

13. Defining the activities:

Please read through the following activities and make necessary alterations.

Grain Elevator

Receive Truck -- This activity includes weighing the truck, sampling the grain, moisture test, dumping the truck, storing the grain (includes leg and distributor use), cleaning the grain if necessary. If ear corn, the shelling process is also added. The buying activity is also included. The grain is then stored, dried, or sent directly to the terminal or processing plant. (In the case of beans, storage is according to grade and are bagged when they are sold.)

Alterations: Always dried before stored

Drier -- If the grain is wet, the grain will be distributed to the grain drier, then carried by auger to the leg, to the distributor, and then to rail on truck or to storage.

Alterations:

Storage -- If the grain is stored, costs of aerating, innoculation and heat checking the grain are incurred. The grain is then used in feeds or merchandised. That is, the grain is distributed to the feed mill, rail car, or truck.

Alterations:

Loading Out Grain -- The grain is distributed to a rail car or truck. This includes preparing the car or truck and adjusting the spout to load. The loading process is also included. Beans are bagged and then sent out.

Alterations:

11. What is the overtime wage rate? Time and one-half

12. How much full time labor do you have? 12 men

13. Defining the activities:

Please read through the following activities and make necessary alterations.

Grain Elevator

Receive Truck -- This activity includes weighing the truck, sampling the grain, moisture test, dumping the truck, storing the grain (includes leg and distributor use), cleaning the grain if necessary. If ear corn, the shelling process is also added. The buying activity is also included. The grain is then stored, dried, or sent directly to the terminal or processing plant. (In the case of berne, storage is according to grade and are bagged when they are sold.)

Alternatives: Always dried before stored

Drier -- If the grain is wet, the grain will be distributed to the grain drier, then carried by auger to the leg, to the distributor, and then to rail on truck or to storage.

Alternatives:

Storage -- If the grain is stored, costs of aerating, innoculation and heat checking the grain are incurred. The grain is then used in feeds or merchandised. That is, the grain is distributed to the feed mill, rail car, or truck.

Alternatives:

Loading Out Grain -- The grain is distributed to a rail car or truck. This includes projuring the car or truck and adjusting the spout to load. The loading process is also included. Beans are bagged and then sent out.

Alternatives:

Producing and Selling Feed -- This activity includes retrieving and preparing the corn and other ingredients, e.g., grinding, elevating to overhead scale, mixing, elevating to bagging bins or overhead bulk bins. If the feed is bagged, included are receiving the bags, bagging into 50# bags, and storing in warehouse or loading on a truck for delivery. Also included is the delivery of both bag and bulk feed. This consists of the loading process, taking the feed to the farm, and returning to the feed mill. If the feed is received from the home plant, transportation of the feed from the home plant to the model elevator is included along with the loading and unloading processes. If the feed goes directly from the home plant to the farmer, costs of the salesmen are the only costs which are incurred.

Alterations:

Selling Sidelines -- Includes selling the item to the customer and loading it for the customer or making the delivery as the case may be.

Alterations:

Grinding: -- Includes retrieving the grain from the dump pit of the feed mill or from the elevator, grinding, bagging (bulk) and loading on to the customer's truck.

Alterations:

Rolling Grain -- Same as grinding

Alterations:

Grinding and Mixing -- Mixing process added to the grinding activity.

Alterations:

Shelling Corn -- Dumping ear corn into the dump pit, conveying to sheller, storing, bagging, grinding, or loading into truck are the processes which are included in this activity.

Alterations:

Producing and Feed Mill Load -- This activity includes receiving and placing the corn and other ingredients, e.g., grinding, elevating to overhead scale, mixing, elevating to bagging bins or overhead bulk bins. If the feed is bagged, included are receiving the bags, keeping into [illegible], and storing in warehouse or loading on a truck for delivery. Also included is the delivery of both bag and bulk feed. This consists of the loading process, taking the feed to the farm, and returning to the feed mill. If the feed is received from the home plant, transportation of the feed from the home plant to the retail elevator is included along with the loading and unloading processes. If the feed goes directly from the home plant to the farmer, costs of the salesman are the only costs which are incurred.

Alternatives:

Selling Activities -- Includes selling the item to the customer and loading it for the customer or making the delivery as the case may be.

Alternatives:

Grinding: -- Includes retrieving the grain from the dump pit of the feed mill or from the elevator, grinding, bagging (bulk) and loading on to the customer's truck.

Alternatives:

Rolling Grain -- Same as grinding

Alternatives:

Grinding and Mixing -- Mixing process added to the grinding activity.

Alternatives:

Shelling Corn -- Dumping ear corn into the dump pit, conveying to sheller, storing, bagging, grinding, or loading into truck are the process as which are included in this activity.

Alternatives:

Loading Out Fertilizer -- If the customer picks up the fertilizer, only the loading process is included. If the fertilizer is delivered then the loading transportation, and unloading processes are included. Receiving and storing processes also enter into this activity.

Alterations:

If necessary, add activities which have been omitted and explain the processes associated with each.

14. Machines and equipment --

Equipment	Capacity (Spec. units)	Motor Sizes HP	Est. Annual Repr. Costs
Elevator:			
2 Truck hoists & motors	5 HP	5	$100
3 Distributors	10 hole		
1 Aeration system & motor	Rholfe	7 1/2	100
1 Hot spot system	Rholfe		100
4 Legs & motors	1000 bu/hr.	7 1/2 ea.	400
3 Legs & motors	2000 bu/hr.	10 ea.	300
2 Cleaners & motors	1000 bu/hr.	5 ea.	200
1 Cleaner & motor	1500 bu/hr.	7 1/2	100
1 Moisture tester	Motomio		
0 Sampling device	-0-		
1 Drier & drier leg	1500 bu/hr.	30 drying 15 cooling 7 1/2 fan 52 1/2 tot.	300
1 Drier auger & motor	1500 bu/hr.	5	50

Loading Out Fertilizer -- If the customer picks up the fertilizer, only the loading process is included. If the fertilizer is delivered then the loading transportation, and unloading processes are included. Receiving and storing processes also enter into this activity.

Alterations:

If necessary, add activities which have been omitted and explain the processes associated with each.

14. Machines and equipment --

Equipment	Capacity (Spec. Units)	Motor Size HP	Est. Annual Oper. Costs
Elevator:			
2 Truck hoists & motors	5 HP	5	$100
3 Distributors	10 hole		
1 Aeration system & motor	Rolls	7 1/2	100
1 Hot spot system	Rolls		100
4 Legs & motors	1500 bu/hr.	7 1/2 ea.	400
3 Legs & motors	2000 bu/hr.	10 ea.	300
2 Cleaners & motors	1000 bu/hr.	5 ea.	200
1 Cleaner & motor	1500 bu/hr.	7 1/2	100
1 Moisture tester	Motorio		
0 Sampling device	-0-		
1 Drier & drier leg	1500 bu/hr.	30 drying 15 cooling 7 1/2 fan 52 1/2 tot.	300
1 Drier auger & motor	1500 bu/hr.	5	50

Equipment	Capacity (Spec. units)	Motor Sizes HP	Est. Annual Repair Costs
Additions:			
1 100' conveyor belt	2000 bu/hr.	5	$200
3 Automatic scales	10 bu		150
Feed Mill:			
2 Mixers & motors	5 tons	30 ea.	100
1 Mixer & motor	2 1/2 tons	15	50
1 Grinder & motor	20 tons/bu	75	200
4 Legs & motors	1000 bu/hr.	7 1/2 ea.	400
1 Molasses blender	5 tons/hr.	5	50
2 10 hole distr.	10 hole		
0 hand bagger			
1 Mixer leg & motor	1000 bu/hr.	3	100
2 Hopper scales	100 bu.		
1 Truck hoist & motor	7 HP	7	50
1 Truck hoist & motor	10 HP	10	50
1 Floor scale	2000 lbs.		
2 Platform scales	1000 lbs.		
1 Bulk truck	6 tons		400
1 Corn sheller & motor	600 bu/hr.	25	50
Fertilizer:			
1 Bulk Fert. loader	1000 lbs.		200

Equipment	Capacity (Per. units)	Motor Size HP	Rec. Annual Repair Costs
Additions:			
1 100' conveyor belt	2000 bu/hr.	5	$200
3 Automatic scales	10 bu		150
Feed Mill:			
2 Mixers & motors	5 tons	30 ea.	100
1 Mixer & motor	2 1/2 tons	15	50
1 Grinder & motor	20 tons/hr	75	200
4 Legs & motors	1000 bu/hr.	7 1/2 ea.	400
1 Molasses blender	5 tons/hr.	5	50
2 10 hole distr.	10 hole		
0 hand dapper			
1 Mixer leg & motor	1000 bu/hr.	3	100
2 Hopper scales	100 bu.		
1 Truck hoist & motor	7 HP	7	50
1 Truck hoist & motor	10 HP	10	50
1 Floor scale	2000 lbs.		
2 Platform scales	1000 lbs.		
1 Bulk truck	6 tons		400
1 Corn sheller & motor	600 bu/hr.	25	50
Fertilizer:			
1 Bulk Fert. loader	1000 lbs.		200

Equipment	Capacity (Spec. units)	Motor Sizes HP	Est. Annual Repr. Costs
3 Endless belt conveyors			
1 Truck scale	35 tons		200
1 2 ton truck with hoist	2 ton		
1 1 ton truck with hoist	1 ton		
0 1/2 ton pickup			

Additions:

_____

_____

_____

15. Other information needed includes:

1. Receipt data for grains for 3 years
2. Feed sales data for 3 years
3. Sideline sales data for 3 years
4. Income from services such as grinding for 3 years
5. Labor utilization data

The above data with the exception of mixing and shelling data were obtained by the researcher from the records of the model firm or from a secondary source. Data were not available for the mixing and shelling activities, so they were eliminated from the model.

Equipment	Capacity (lbs. grain)	Number of Units	Percent of Time Used
3 Knifes belt conveyors			
1 Truck scale	35 tons		2%
1 2 ton truck with hoist	2 ton		
1 1 ton truck with hoist	1 ton		
0 1\2 ton pickup			

Additions:

_____

_____

_____

15. Other information needed includes:

1. Receipt data for grains for 3 years
2. Feed sales data for 3 years
3. Hotline sales data for 3 years
4. Income from services such as grinding for 3 years
5. Labor utilization data

The above data with the exception of mixing and shelling data were obtained by the researcher from the records of the model firm or from a secondary source. Data were not available for the mixing and shelling activities, so they were eliminated from the model.

APPENDIX B

THE DATA

APPENDIX B

THE DATA

APPENDIX B

Table 1B. Estimated Repair Costs for Machinery.

Equipment	Est. Annual Repair Cost	Vol. Handled by Each[1]	Cost/bu. Handled
Elevator:			
2 Truck hoists and motors	$ 50 each	353,869 bushels	$ .0001413
3 Distributors	0		
1 Aeration system and motor	100	707,738 bushels	.0001413
1 Hot spot system	100	707,738 bushels	.0001413
4 Legs and motors	100 each	70,774 bushels	.0001413[8]
3 Legs and motors	100 each	141,548 bushel	.0007065[8]
2 Cleaners and motors	100 each	201,706 bushels	.0004958[9]
1 Cleaner and motor	100	304,327 bushels	.0003286[9]
1 Moisture tester	-0		
1 Drier and drier leg	300	189,619 bushels[2]	.0001582
1 100' Conveyor Belt	50		
3 Automatic scales	200	707,738 bushels	.0002637
Feed Mills			
2 Mixers and motors	$ 50 each	1,200 tons[3]	.04167
1 Mixer and motor	50	600 tons	.08388[10]
1 Grinder and motor	200	203,128 cwt[4]	.0009846
4 Legs and motors	100 each	Same as above[11]	.001413
1 Molasses blender	50	2,000 tons	.02500
2 10 hole distributors	0		
1 Mixer leg and motor	100	Same as above[11]	.001413[12]
2 Hopper scales	0		
1 Truck hoist and motor	100	Same as above[11]	.001413[13]
1 Truck hoist and motor	100	Same as above[11]	.001413
1 Corn Sheller and motor	50	6,873 bushels[5]	
1 Floor scale			
2 Platform scales			
1 Bulk truck	400	1,600 tons[6]	.2500

Equipment	Est. Annual Repair Cost	Avg. Hourly Equip Rate	Cost/Hour
Air Compressor	$ 20 each	$23,845 annual	$ 11.4663
Asphalt Distributor	0		
Asphalt Paver	100	$27,518 annual	.0066
Backhoe	100 each	$27,518 annual	.0066
Boom Truck	100 each	$27,518 annual	.0066
Bull Dozer	300	$84,819 annual	.0203
Concrete Batch Plant	0		
Concrete Mixer	100 each	$27,518 annual	.0066
Concrete Pump	100 each	$27,518 annual	.0066
Concrete Saw	100 each	$27,518 annual	.0066
Crane	500	$137,592 annual	.0330
Curb Machine	20		
Dump Truck	300 each	$82,555 annual	.0198
Excavator	100 each	$27,518 annual	.0066
Generator	100 each	$27,518 annual	.0066
Grader	100 each	$27,518 annual	.0066
Hydraulic Crane	100 each	$27,518 annual	.0066
Loader	100 each	$27,518 annual	.0066
Paint Striper, Self-Propelled	100 each	$27,518 annual	.0066
Pavement Profiler	100 each	$27,518 annual	.0066
Piles and Hammer	0		
Pneumatic Tire Roller	100 each	$27,518 annual	.0066
Road Reclaimer	100 each	$27,518 annual	.0066
Scraper	100 each	$27,518 annual	.0066
Slurry Seal Machine	100 each	$27,518 annual	.0066
Small Tools	2 % Labor	$ 323,849 annual	1.9400
Tractor	100 each	$27,518 annual	.0066
Trailer	100 each	$27,518 annual	.0066
Truck Mounted Attenuator (TMA)	100 each	$27,518 annual	.0066
Water Truck	100 each	$27,518 annual	.0066
Welder	0		
Work Zone Traffic Control	2 % Labor	$ 323,849 annual	1.9400

Table 18. Estimated Hourly Equipment Costs for Maintenance.

Table 1B, (continued)

Equipment	Est. Annual Repair Cost	Vol. Handled by Each[1]		Cost/bu, Handled
Fertilizer				
1 Bulk fertilizer loader	200	2,028	tons	.09826
3 Belt conveyors				
Other				
1 Truck scale	200	707,738	bushels[7]	.0002826
1 2-ton truck with hoist	0			
1 1-ton truck with hoist	0			
1 1-ton truck	0			

1/ Volume is according to the total grains handled, the total feed handled or that which is appropriate. In case there is more than one type of equipment, volume is divided according to the capacity of the equipment.

2/ Assuming wet grains are handled only during harvest and that 95% of the corn and 10% of the wheat that comes in during harvest is wet.

3/ 3000 tons of complete feed assumed.

4/ 154,325 cwt. for grinding activity and 48,800 cwt. for grinding complete feeds - Hog, 480 tons; Dairy, 945 tons; Beef, 135 tons; Poultry, 880 tons (these are amounts of corn in the various complete feeds.)

5/ Assuming 8% of corn brought in is ear corn. Only shelled corn is brought in during the corn harvest months.

6/ Assume 40% of the 4000 tons of feed sold is delivered.

7/ This is assuming only the grains are weighed. In reality coal, fertilizer, feed, etc. are also weighed.

8/ The average cost for the legs is $ .0010598.

9/ The average cost for the cleaners is $ .0004122

10/ The average cost for the mixers is $ .0625.

Table IA. (continued)

Equipment	Est. Annual Repair Cost	Vol. Handled by Each [1]	Cost/pc. Handled
Pertinent Data for Each Type of Material Handling Equipment			
Fork Lift Operator	2	2,038 tons	.0982
Fork Lift with Push Attachment	0		
Fork Lift with Skid Attachment	0		
Platform Truck	0	2,038 pieces [2]	.0002
Office			
Clerk Stenographer	1		

[1] Volume is associated to type of material handling equipment, the total load handled or piece weight is considered. In case of platform truck volume is expressed in terms of pieces handled.

[2] Assuming 8% of pieces to be damaged.

[3] Assuming wage rate plus fringe benefits and overhead is $3.00 per hour.

[4] Assuming 4% of time spent on fork lift, 25% of time spent on platform truck, 5% of time spent on skid attachment, 66% of time spent on push attachment.

[5] Assuming 8% of pieces damaged in receiving, storage and shipping. Only physical damage is considered.

[6] Assumes 4% of time spent on fork lift, 25% of time spent on platform truck, 5% of time spent on skid attachment, 66% of time spent on push attachment.

[7] This is assumed only for the purpose of illustration, Actual cost, depreciation, etc.

[8] Assumes wages and cost for fork lift operator is $ .00102.

[9] The average cost for platform truck is $ .00040.

[10] The average cost for skid attachment is $ .00052.

Table 1B. (continued)

11/ For this equipment, the same cost is used as had previously been used either in the elevator or feed mill.

12/ It will be helpful when working with feeds to have this figure in tons $ .0434/ton.

13/ This figure in tons is $ .00434/ton.

Notes 13. (continued)

11\ For this equipment, the same cost is used as had previously been used either in the development test with working models or the flight article.

12\ It is assumed that the same working models will be used in these tests.

13\ The flight article is estimated to have a weight of .0434 tons.

Table 2B. Power Costs.

Equipment	Motor HP	Kilowatts[1]	Power Costs $/hr. Harvest[2]	Power Costs $/hr. Non Harvest[3]	Machinery Capacity	Power Costs $/unit Harvest	Power Costs $/unit Non Harvest
Elevator:							
Hoist	7.5	6.0	.210	.240	(bu.)	$.0000161	$.0000184[5]
Aeration system	7.5	6.0	.210	.240	(bu.)	.00175	.00200
Legs (A)	7.5	6.0	.210	.240	1000 bu.	.00021[6b]	.00024[6a]
Legs (B)	10	8.0	.280	.320	2000 bu.	.00014	.00016
Cleaner	5	4.0	.140	.160	1000 bu.	.000140	.00016
Cleaner (B)	7.5	6.0	.210	.240	1500 bu.	.000140	.00016
Drier	52.5[4]	42.0	1.470	1.680	1500 bu.	.00098	.00112[11]
Drier auger	5	4.0	.140	.160	1500 bu.	.0000927	.000107
Conveyor	5	4.0	.140	.160	2000 bu.	.00007	.00008
Feed Mill:							
Mixer (A)	30	24.0	.840	.960	5 tons	.16800	.19200
Mixer (B)	15	12.0	.420	.480	2.5 tons	.16800	.19200
Grinder	75	60.0	2.10	2.40	20 tons	.10500[7b]	.14000[7a]
Legs	7.5	6.0	.210	.240	1000 bu.	.00021[8b]	.000240[8a]
Molasses blender	5	4.0	.140	.160	5 tons	.02800	.03200
Mixer leg	3	2.4	.0840	.0960	1000 bu.	.000084[9b]	.000096[9a]
Hoist (A)	7.5	6.0	.210	.240	(bu.)	.000016[10b]	.0000184[10a]
Hoist (B)	7.5	6.0	.210	.240	(bu.)	.0000161	.0000184
Sheller	25	20.0	.70	.80	600 bu.	.00117	.000133

1/ Kilowatts = HP X .800 - Used in the Kansas Study Technical Bulletin #137, op. cit., p. 32.

2/ During harvest a rate of $.035/KWH was used - July through December.

3/ During non-harvest a rate of $.04/KWH was used - January through June.

4/ Drier has 30 drying HP, 13 cooling HP and 7.5 HP motor for fan.

5/ This figure was taken from the Kansas Study, op. cit., p. 33.

6/ The average for the legs is (a) $.00020/bu. and (b) $.000174/bu.

Equipment	No.	Motor HP	Capacity (gpm)	Head (ft)	Efficiency (%)	Power Input (kW)	Annual Energy (kWh/yr)	Annual Cost ($/yr)
Primary Pumps:								
Chilled Water	3	75	1,500	60	85	44.5	389,820	$38,922
Condenser Water	3	100	2,000	55	86	56.2	492,312	$49,151
Secondary Pumps:								
Zone A	2	40	800	70	82	21.3	186,588	$18,630
Zone B	2	30	600	65	80	14.8	129,648	$12,944
Zone C	2	25	500	60	78	11.9	104,244	$10,409
Cooling Tower Fans	4	20	40,000 cfm			58.4	511,584	$51,076
Makeup Water Pump	1	5	50	80	55	3.1	27,156	$2,711
Chemical Feed	2	0.5	—	—	—	0.4	3,504	$350
Domestic Water Booster	2	3	100	90	60	2.8	24,528	$2,449
Sump Pump	1	1	150	30	50	1.1	9,636	$962
Total Pump Power							1,378,720	$137,606

[1] Motor efficiency assumed per NEMA Premium standards for the given horsepower range.

[2] Annual energy = Σ (HP × 0.7457 kW/HP × load factor / motor efficiency) × 8,760 hr/yr × 0.85 operating factor. See Appendix C for detailed calculations.

[3] Load factor = actual operating point / design point. Variable-speed pumps assumed to operate at reduced load during part-load hours.

[4] Annual cost = annual energy × $0.0998/kWh blended rate (peak/off-peak). See Section 5.2 for rate structure.

[5] Total pump power = 1,378,720 kWh/yr. Represents approximately 18% of total building electrical consumption.

[6] Primary chilled water pumps operate at constant speed; secondary pumps are variable speed with VFD control.

[7] Condenser water pumps operate whenever any chiller is running; cycling is controlled by chiller sequencing.

[8] Makeup water pump runs intermittently to maintain cooling tower basin level; annual hours estimated at 543 hr/yr.

[9] Chemical feed pumps operate continuously during occupied hours; power is negligible relative to total.

[10] Domestic water booster pumps maintain pressure in the upper floors; operate 24/7 with pressure-switch control.

[11] Sump pump operates only during rainfall events; annual hours estimated at 96 hr/yr based on local precipitation data.

Table 2B. (continued)

7/ These figures are (a) $.0070/cwt. and (b) $.00525/cwt.

8/ (a) $.00585/ton and (b) $.0075/ton -

9/ (a) $.003432/ton and (b) $.003/ton -

10/ (a) $.000658/ton and (b) $.000572/ton -

11/ Fuel costs (LP gas) must be added...

To dry corn from 25%-15% moisture it costs 2.5 cents/bu. To dry wheat from 15%-13% moisture it costs 2/3 cents/bu. These figures assume that LP gas costs 13 cents/gal. The moisture figures are the average figures as given in the questionnaire. The fuel costs were obtained with the help of the agricultural engineering department. The other grains are not dried; therefore, no fuel costs are figured for them.

7/ Three different values are (a) $0.00020/cm^2$, and (b) $0.00025/cm^2$.	
8/ (a) $0.00035/cm^2$, and (b) $0.00012/cm^2$	–
9/ (a) $0.00043/cm^2$, and (b) $0.00034/cm^2$	–
10/ (a) $0.00022/cm^2$, and (b) $0.00017/cm^2$	–
11/ Total cost (US $) of $12-$33 million.	

- Implementation of the proposed regulation would require the installation of new pollution control equipment on existing facilities. The cost of this equipment would be borne by the owners of the facilities.
- Implementation of the proposed regulation would require the installation of new pollution control equipment on existing facilities. The cost of this equipment would be borne by the owners of the facilities.

Table 3B. Ingredient and Supply Costs by Activity

	Prices for Each Period											
	1	2	3	4	5	6	7	A	S	O	N	D
Buying Shelled Corn[1] $/bu.	1.13	1.13	1.14	1.16	1.18	1.18	1.17	1.17	1.19	1.11	1.02	1.06
Buying Ear Corn 2/ $/bu.	1.13	1.13	1.14	1.16	1.18	1.18	1.17	1.17	1.19	1.11	1.02	1.06
Buying Wheat $/bu.	1.63	1.62	1.58	1.58	1.55	1.38	1.39	1.42	1.42	1.38	1.39	1.44
Buying Soys $/bu.	2.69	2.69	2.66	2.68	2.65	2.70	2.75	2.72	2.53	2.51	2.51	2.60
Buying Oats $/bu.	.71	.71	.70	.68	.67	.66	.63	.64	.65	.65	.67	.70
Buying Dk.Red.Kidneys[3] $/100A	11.05	11.10	10.95	10.85	10.65	10.38	10.55	10.65	10.95	11.48	11.45	11.53
Buying Navies $/100 lbs.	7.05	7.10	6.95	6.85	6.65	6.38	6.55	6.65	6.95	7.48	7.45	7.53

Activity[4]	Cost[5]	Activity[4]	Cost[5]
Selling Dairy Supplement	$91.38/ton	Selling Potash	$62.73/ton
Selling Dairy Complete	44.83/ton	Selling Urea	39.09/ton
Selling Beef Supplement	86.21/ton	Selling Mixed Bulk[6]	62.05/ton
Selling Beef Complete	44.83/ton	Selling Mixed Bag	66.59/ton
Selling Poultry Supplement	103.45/ton	Selling Building Supplies	4.348/$5
Selling Poultry Complete	60.34/ton	Selling Coal	13.57/ton
Selling Hog Supplement	96.55/ton	Selling Chemicals	4.464/ton
Selling Hog Complete	53.45/ton	Selling all other Farm Supplies	4.167/$5
Selling Miscellaneous Feeds	103.45/ton		

1/ The prices for the buying activities were taken from Michigan Agr. Statistics, July 1965, p. 41; June 1966, p. 30; Sept. 1967, p. 55; July 1968, p. 35. (See Appendix C.)

2/ The prices for ear corn are the same as for shelled corn, since ear corn is in shelled corn terms.

3/ Michigan Ag. Stat. gives prices for field beans. These prices were used for navy beans. To get the price of dark red kidneys four dollars were added to the navy bean price. The $4 was assumed to be the average spread between the two prices as estimated by the manager of the model firm.

4/ The following activities have constant costs throughout the year.

5/ These costs were derived by using the margins for each product and calculating the cost from the revenue figure. Costs and margins are given in the questionnaire (see Appendix A).

6/ Fertilizers have been combined into mixed bulk and mixed bag. The costs for these were calculated by weighting the costs of each with the percent quantity of sales. Assume bag and bulk sold in same proportions. Consult Appendix C for the percentages of each mixed fertilizer sold.

Table 38. Industrial and supply Costs by Activity

Activity [1]	Cost [2]	Activity [3]	Cost [2]
Primary Industries		**Supplies**	
Primary Extraction Industries	$1.13	Selling all other Farm	$1.04
Mining Ore, Beneficiated [4]	$/100#	Selling Coal	$/ton
Mining Ores $/ton.	$1.13	Selling Combustible	$/ton
Mining Misc. $/ton.	$1.03	Selling Purchased Supplies	$/ton
Mining Ear Corn [5] $/bu.	$1.13	Selling Mixed Feed	$5.02/ton
Mining Corn [5] $/bu.	$1.13	Selling Urea	$0.04/ton
Mining Custom Work	$1.13	Selling Forage	$25.13/ton
Activity [4]	**Cost [2]**		

Activity [1]	Cost [2]	Activity [3]	Cost [2]
Selling Miscellaneous Feeds	$103.42/ton		
Selling Hog Complete	23.42/ton		
Selling Hog Supplement	86.22/ton		
Selling Poultry Complete	60.34/ton		
Selling Poultry Supplement	$103.42/ton		
Selling Beef Complete	44.83/ton		
Selling Dairy Complete	80.51/ton		
Selling Dairy Supplement	44.83/ton		
Selling Swine Supplement	207.38/ton		

[1] Type prices for the primary activities were taken from Michigan Agric. Statistics, July 1, 1992, p. 44; Table 55 of Agric. Prices, 1991; p. 22; July 1988, p. 32. (See Bibliography)

[2] Costs and prices are assumed to be the same as for corn, since data are not available for most activities.

[3] Type activity for each primary activity. Assume a 1 to 1 correspondence between activity and product.

[4] Activities shown are those for which prices were taken. Assume 1 bu. of corn = 56 lbs. = 1 cwt. = 100 lbs. of mixed feed. Assume 1 ton of mixed feed = 20 cwt.

[5] Corn prices for the primary activities are given in the dependent variable (as yields) in Appendix C for the percentages of each mixed industry sold.

assume proportions. Counties Appendix C for the percentages of each mixed industry sold.

[6] Fertilizers have been combined into one activity to reduce the number of rows in the model. Assume mixed bag price = 10 x bulk price. Costs and prices for fertilizers were taken from Agric. Prices, July 1992, p. 44. Costs for fertilizers were obtained from Agric. Prices, 1991, p. 22; July 1988, p. 32. (See Bibliography)

Table 4B. Variable Costs.[1/]

Activity	Unit[2/]	Repr. Cost	Power Cost		Ingredient Cost	Total Cost	
			Harvest	Non Harvest		Harvest	Non Harvest
Hiring Full Time Labor Reg.	Man Hrs.						
Hiring Full Time Labor O'time	Man Hrs.						
Hiring Part Time Reg.	Man Hrs.						
Hiring Part Time Labor O'time	Man Hrs.						
Rec. & Storing Shelled Corn	100 bu.	$.20880	$.03211	$.03784		$.24091	$.24664
Rec. & Storing Ear Corn	100 bu.	.93590	.14911	.17084		1.08501	1.10674
Receiving & Storing Wheat	100 bu.	.20880	.03211	.03784		.24091	.24664
Receiving & Storing Soys	100 bu.	.20880	.03211	.03784		.24091	.24664
Receiving & Storing Oats	100 bu.	.20880	.03211	.03784		.24091	.24664
Receiving & Storing DRK	100 lbs.	.00348	.00054	.00063		.00402	.00411
Receiving & Storing Navies	100 lbs.	.00348	.00054	.00063		.00402	.00411
Receiving Wet Corn	100 bu.	.39347	2.64038	2.66054		3.03385	3.05401
Receiving Wet Wheat	100 bu.	.39347	.81038	.83054		1.20385	1.22401
Receiving Wet Soys	100 bu.	.39347	.14038	.16054		.53385	.55401
Receiving Wet Oats	100 bu.	.39347	.14038	.16054		.53385	.55401
Receiving Wet DRK	100 lbs.	.00656	.00234	.00268		.00890	.00924
Receiving Wet Navies	100 lbs.	.00656	.00234	.00268		.00890	.00924
Buying Shelled Corn	100 bu.				[3/]	[4/]	
Buying Ear Corn	100 bu.						
Buying Wheat	100 bu.						
Buying Soys	100 bu.						
Buying Oats	100 bu.						
Buying Dark Red Kidneys	100 lbs.						
Buying Navies	100 lbs.						
Store Corn	100 bu.	.02843	.17500	.20000		.20343	.22843
Store Wheat	100 bu.	.02843	.17500	.20000		.20343	.22843
Store Soys	100 bu.	.02843	.17500	.20000		.20343	.22843
Store Oats	100 bu.	.02843	.17500	.20000		.20343	.22843
Store Dark Red Kidneys	100 lbs.	.00047	.00292	.00333		.00349	.00380
Store Navies	100 lbs.	.00047	.00292	.00333		.00349	.00380

Table 43. Variable Costs. [1]

Activity	Unit	Labor Hours	Labor Cost	Material Cost	Total Cost	Management Cost	Total Cost per Unit
Hiring Full Time Labor Force.	Man Hrs						
Hiring Part Time Labor Force.	Man Hrs						
Purchasing & Receiving Raw Materials.	Lbs	100	$ 1,000.00	$ 10,000.00	$ 11,000.00	$ 1,100.00	$ 11.00
Raw & Semi-Finished Goods Storage.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Fabricating Parts.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Assembling Parts & Subassemblies.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Finishing Parts & Assemblies.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Packaging Finished Goods.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Finished Goods Storage.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Shipping Finished Goods.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Accounting & Payroll.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Purchasing & Receiving Supplies.	Lbs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Maintaining Buildings & Grounds.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Maintaining Machinery & Equipment.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Personnel Office.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Security Office.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Attendants.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Cooks.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Supervisors.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Dishwashers.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Busboys.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Hostesses.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Cashiers.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Waitresses.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Waiters.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Busboys.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Hostesses.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Cashiers.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Waitresses.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00
Staff Dining Room Waiters.	Hrs	100	1,000.00	10,000.00	11,000.00	1,100.00	11.00

[1] Costs are in dollars.

Table 4B. (continued)

Activity	Unit	Repr. Cost	Power Cost		Ingredient Cost	Total Cost	
			Harvest	Non Harvest		Harvest	Non Harvest
Transfer Corn from Inv.	100 bu.	$.02843	$.17500	$.20000		$.20343	$.22843
Transfer Wheat from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer Soys from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer Oats from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer DRK frcm Inv.	100 lbs.	.00047	.00292	.00333		.00349	.00380
Transfer Navies from Inv.	100 lbs.	.00047	.00292	.00333		.00349	.00380
Loading Out & Selling Corn	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Wheat	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Soys	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Oats	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling DRK	100 lbs.	.00047	.00012	.00013		.00059	.00060
Loading Out & Selling Navies	100 lbs.	.00047	.00012	.00013		.00059	.00060
Selling Dairy Supplement	Ton				$ 91.38	91.38	91.38
Selling Dairy Complete	Ton	.39061	.30907	.37567	44.83	45.52968	45.59628
Selling Beef Supplement	Ton				86.21	86.21	86.21
Selling Beef Complete	Ton	.39061	.30907	.37567	44.83	45.52968	45.596288
Selling Poultry Complete	Ton	.36561	.28107	.34467	60.34	60.98768	61.05028
Selling Hog Supplement	Ton				96.55	96.55	96.55
Selling Hog Complete	Ton	.36561	.28107	.34467	53.45	54.09668	54.16028
Selling Miscellaneous	Ton				103.45	103.45	103.45
Selling Potash	Ton	.09862			62.73	62.82862	62.82862
Selling Urea	Ton	.09862			32.09	39.18862	39.18862
Selling Mixed Bulk	Ton	.09862			62.05	62.14862	62.14862
Selling Mixed Bag	Ton				66.59	66.59	66.59
Shelling	100 bu.	.727	.11700	.13300		.84400	.86000
Grinding	100 lbs.	.00098	.00525	.00700		.00623	.007798
Selling Building Supplies	$5				4.348	4.348	4.348
Selling Coal	Ton				13.57	13.57	13.57
Selling Chemicals	$5				4.464	4.464	4.464
Selling all other Farm Supp.	$5				4.167	4.167	4.167
Selling Poultry Supplement	Ton				103.45	103.45	103.45

Table 4b. (continued)

Activity	Unit	Repr. Cost	Labor Cost Harvest	Labor Cost Non Harvest	Ingredient Cost	Total Cost Harvest	Total Cost Non Harvest
Transfer Corn from Inv.	100 bu.	$.02843	$.17500	$.20000		$.20343	$.22843
Transfer Wheat from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer Soys from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer Oats from Inv.	100 bu.	.02843	.17500	.20000		.20343	.22843
Transfer DHA from Inv.	100 lbs.	.00047	.00292	.00333		.00339	.00380
Transfer Navies from Inv.	100 lbs.	.00047	.00292	.00233		.00339	.00280
Loading Out & Selling Corn	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Wheat	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Soys	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling Oats	100 bu.	.02826	.00700	.00800		.03526	.03626
Loading Out & Selling DHK	100 lbs.	.00047	.00012	.00013		.00059	.00060
Loading Out & Selling Navies	100 lbs.	.00047	.00012	.00013		.00059	.00060
Selling Dairy Supplement	Ton				$ 91.39	91.39	91.39
Selling Dairy Complete	Ton	.39061	.30607	.37567	44.83	45.52668	45.59628
Selling Beef Supplement	Ton				86.21	86.21	86.21
Selling Beef Complete	Ton	.39061	.30607	.37567	44.83	45.52668	45.59628
Selling Poultry Complete	Ton	.36561	.28107	.34467	60.34	60.98668	61.05028
Selling Hog Supplement	Ton				96.55	96.55	96.55
Selling Hog Complete	Ton	.36561	.28107	.34467	53.45	54.09668	54.16028
Selling Miscellaneous	Ton				103.45	103.45	103.45
Selling Potash	Ton	.09862			62.73	62.82862	62.82862
Selling Urea	Ton	.09862			39.09	39.18862	39.18862
Selling Mixed Bulk	Ton	.09862			62.05	62.14862	62.14862
Selling Mixed Bag	Ton				66.59	66.59	66.59
Shelling	100 bu.	.727	.11700	.13370		.84400	.86070
Grinding	100 lbs.	.00093	.00530	.00700		.00623	.00793
Selling Building Supplies	$$				4.343	4.343	4.343
Selling Coal	Ton				13.57	13.57	13.57
Selling Chemicals	$$				4.464	4.464	4.464
Selling all other Farm Supp.	$$				4.167	4.167	4.167
Selling Poultry Supplement	Ton				103.45	103.45	103.45

Table 4B. (continued)

1/ This excludes labor because it has already been considered in the program. It does include machine repair costs, power costs, ingredient and supply costs as well as fuel costs for drying. Gas and oil costs for trucks were assumed to be offset by a charge for delivering. Remember that costs are month by month. Repair and power costs are calculated by figuring the cost for each machine used in the activity. Consult the "Defining the Activities" section of the previous chapter to determine which of the equipment items listed in Tables 1B and 2B were used in each activity.

2/ All costs are given in these units.

3/ The ingredient costs for the buying activities are found in Table 3B.

4/ Total cost is the same as the ingredient costs for these buying activities. See Table 3B.

Table 4B. (continued)

1/ This excludes labor required in the slurry feed circuit included in the program. It does include hauling repair costs, power costs, depreciation and supply costs as well as fuel costs for drying. Gas and oil costs for trucks were assumed to be offset by a charge for delivering. Remember that costs are rough by nature. Repair and power costs are calculated by figuring the cost for each machine used in the activity. Consult the "Finding the Activities" section of the previous chapter to determine which of the equipment items listed in Tables 1B and 2B were used in each activity.

2/ All costs are given in these units.

3/ The impredicent costs for the buying activities are found in Table 3B.

4/ Total cost is the sum as the impredicent costs for three buying activities. See Table 3B.

Table 5B. Net Revenue.

Activity	Unit	Revenue[1]	Total Cost[3] Harvest	Total Cost[3] Non Harvest	Net Revenue Harvest	Net Revenue Non Harvest
Hiring Full Time Labor Regular	Man-Hrs.		$2.93265[4]	$2.93265	$-2.93265	$-2.93265
Hiring Full Time Labor Overtime	Man-Hrs.		4.39898	4.39898	-4.39898	-4.39898
Hiring Part Time Labor Regular	Man-Hrs.		2.23440	2.23440	-2.23440	-2.23440
Hiring Part Time Labor Overtime	Man-Hrs.		3.35160	3.35160	-3.35160	-3.35160
Receiving & Storing Shelled Corn	100 bu.		.24091	.24664	- .24091	- .24664
Receiving and Storing Ear Corn	100 bu.		1.08501	1.10674	1.08501	-1.10674
Receiving and Storing Wheat	100 bu.		.24091	.24664	- .24091	- .24664
Receiving and Storing Soys	100 bu.		.24091	.24664	- .24091	- .24664
Receiving and Storing Oats	100 bu.		.24091	.24664	- .24091	- .24664
Receiving and Storing DRK	100 lbs.		.00402	.00411	- .00402	- .00411
Receiving and Storing Navies	100 lbs.		.00402	.00411	- .00402	- .00411
Receiving Wet Corn	100 bu.		3.03385	3.05401	-3.03385	-3.05401
Receiving Wet Wheat	100 bu.		1.20385	1.22401	-1.20385	-1.22401
Receiving Wet Soys	100 bu.		.53385	.55401	- .53385	- .55401
Receiving Wet Oats	100 bu.		.53385	.55401	- .53385	- .55401
Receiving Wet DRK	100 lbs.		.00890	.00924	- .00890	- .00924
Receiving Wet Navies	100 lbs.		.00890	.00924	- .00890	- .00924
Buying Shelled Corn	100 bu.		5/		5/	
Buying Ear Corn	100 bu.					
Buying Wheat	100 bu.					
Buying Soys	100 bu.					
Buying Oats	100 bu.					
Buying DRK	100 lbs.					
Buying Navies	100 lbs.					
Store Corn	100 bu.	$1.50	.20343	.22843	1.4657	1.27157
Store Wheat	100 bu.	1.50	.20343	.22843	1.4657	1.27157
Store Soys	100 bu.	1.50	.20343	.22843	1.4657	1.27157
Store Oats	100 bu.	.025	.20343	.22843	1.4657	1.27157
Store DRK	100 lbs.	.025	.00349	.00380	.02251	.02120
Store Navies	100 lbs.	.025	.00349	.00380	.02250	.02120

Description	Budget	Actual	Variance	Percent
Maintain Full Time Labor Force	$ 2,533,000	$ 2,533,000	$ 0	100.00%
Maintain Part Time Labor Force	4,433,000	4,433,000	0	100.00%
Maintain Temporary Labor Force	2,444,000	2,444,000	0	100.00%
Maintain Overtime Labor Force	3,322,000	3,322,000	0	100.00%
Maintain Full Time Supervisory	4,666,000	4,666,000	0	100.00%
Maintain Part Time Supervisory	1,666,000	1,666,000	0	100.00%
Maintain Temporary Supervisory	1,333,000	1,333,000	0	100.00%
Maintain Overtime Supervisory	2,444,000	2,444,000	0	100.00%
Maintain Full Time Clerical	1,333,000	1,333,000	0	100.00%
Maintain Part Time Clerical	1,333,000	1,333,000	0	100.00%
Maintain Temporary Clerical	1,333,000	1,333,000	0	100.00%
Maintain Overtime Clerical	1,333,000	1,333,000	0	100.00%
Maintain Full Time Skilled	1,333,000	1,333,000	0	100.00%
Maintain Part Time Skilled	1,333,000	1,333,000	0	100.00%
Maintain Temporary Skilled	1,333,000	1,333,000	0	100.00%
Maintain Overtime Skilled	1,333,000	1,333,000	0	100.00%
Maintain Full Time Unskilled	1,333,000	1,333,000	0	100.00%
Maintain Part Time Unskilled	1,333,000	1,333,000	0	100.00%
Maintain Temporary Unskilled	1,333,000	1,333,000	0	100.00%
Maintain Overtime Unskilled	1,333,000	1,333,000	0	100.00%
Maintain Full Time Management	1,333,000	1,333,000	0	100.00%
Maintain Part Time Management	1,333,000	1,333,000	0	100.00%
Maintain Temporary Management	1,333,000	1,333,000	0	100.00%
Maintain Overtime Management	1,333,000	1,333,000	0	100.00%
Maintain Full Time Executive	1,333,000	1,333,000	0	100.00%
Maintain Part Time Executive	1,333,000	1,333,000	0	100.00%
Maintain Temporary Executive	1,333,000	1,333,000	0	100.00%
Maintain Overtime Executive	1,333,000	1,333,000	0	100.00%
Maintain Full Time Professional	1,333,000	1,333,000	0	100.00%
Maintain Part Time Professional	1,333,000	1,333,000	0	100.00%
Maintain Temporary Professional	1,333,000	1,333,000	0	100.00%
Maintain Overtime Professional	1,333,000	1,333,000	0	100.00%
Maintain Full Time Technical	1,333,000	1,333,000	0	100.00%
Maintain Part Time Technical	1,333,000	1,333,000	0	100.00%
Maintain Temporary Technical	1,333,000	1,333,000	0	100.00%
Maintain Overtime Technical	1,333,000	1,333,000	0	100.00%
Maintain Full Time Support	1,333,000	1,333,000	0	100.00%
Maintain Part Time Support	1,333,000	1,333,000	0	100.00%
Maintain Temporary Support	1,333,000	1,333,000	0	100.00%
Maintain Overtime Support	1,333,000	1,333,000	0	100.00%
Maintain Full Time Admin	1,333,000	1,333,000	0	100.00%
Maintain Part Time Admin	1,333,000	1,333,000	0	100.00%
Maintain Temporary Admin	1,333,000	1,333,000	0	100.00%
Maintain Overtime Admin	1,333,000	1,333,000	0	100.00%
Maintain Full Time Staff	1,333,000	1,333,000	0	100.00%
Maintain Part Time Staff	1,333,000	1,333,000	0	100.00%
Maintain Temporary Staff	1,333,000	1,333,000	0	100.00%
Maintain Overtime Staff	1,333,000	1,333,000	0	100.00%
Maintain Full Time Personnel	1,333,000	1,333,000	0	100.00%
Maintain Part Time Personnel	1,333,000	1,333,000	0	100.00%
Maintain Temporary Personnel	1,333,000	1,333,000	0	100.00%
Maintain Overtime Personnel	1,333,000	1,333,000	0	100.00%
Maintain Full Time Employees	1,333,000	1,333,000	0	100.00%
Maintain Part Time Employees	1,333,000	1,333,000	0	100.00%
Maintain Temporary Employees	1,333,000	1,333,000	0	100.00%
Maintain Overtime Employees	1,333,000	1,333,000	0	100.00%
Maintain Full Time Workers	1,333,000	1,333,000	0	100.00%
Maintain Part Time Workers	1,333,000	1,333,000	0	100.00%
Maintain Temporary Workers	1,333,000	1,333,000	0	100.00%
Maintain Overtime Workers	1,333,000	1,333,000	0	100.00%
Maintain Full Time Staff	1,333,000	1,333,000	0	100.00%
Maintain Part Time Staff	1,333,000	1,333,000	0	100.00%
Maintain Temporary Staff	1,333,000	1,333,000	0	100.00%
Maintain Overtime Staff	1,333,000	1,333,000	0	100.00%
Maintain Full Time Personnel	1,333,000	1,333,000	0	100.00%
Maintain Part Time Personnel	1,333,000	1,333,000	0	100.00%
Maintain Temporary Personnel	1,333,000	1,333,000	0	100.00%
Maintain Overtime Personnel	1,333,000	1,333,000	0	100.00%
Maintain Full Time Employees	1,333,000	1,333,000	0	100.00%
Maintain Part Time Employees	1,333,000	1,333,000	0	100.00%
Maintain Temporary Employees	1,333,000	1,333,000	0	100.00%
Maintain Overtime Employees	1,333,000	1,333,000	0	100.00%
Maintain Full Time Workers	1,333,000	1,333,000	0	100.00%
Maintain Part Time Workers	1,333,000	1,333,000	0	100.00%
Maintain Temporary Workers	1,333,000	1,333,000	0	100.00%
Maintain Overtime Workers	1,333,000	1,333,000	0	100.00%

Table 5B. (continued)

Activity	Unit	Revenue	Total Cost		Net Revenue	
			Harvest	Non Harvest	Harvest	Non Harvest
Transfer Corn from Inv.	100 bu.		.20343	.22843	-.20343	-.20343
Transfer Wheat from Inv.	100 bu.		.20343	.22843	-.20343	-.20343
Transfer Soybs from Inv.	100 bu.		.20343	.22843	-.20343	-.20343
Transfer Oats from Inv.	100 bu.		.20343	.22843	-.20343	-.20343
Transfer DRK from Inv.	100 lbs.		.00349	.00380	-.00349	-.00380
Transfer Navies from Inv.	100 lbs.		.00349	.00380	-.00349	-.00380
Loading Out & Selling Corn	100 bu.	2/	.03526	.03626		2/
Loading Out & Selling Wheat	100 bu.		.03526	.03626		
Loading Out & Selling Soys	100 bu.		.03526	.03626		
Loading Out & Selling Oats	100 bu.		.03526	.03626		
Loading Out & Selling DRK	100 lbs.		.00059	.00060		
Loading Out & Selling Navies	100 lbs.		.00059	.00060		
Selling Dairy Supplement	Ton	106.00	91.38	91.38	14.62	14.62
Selling Dairy Complete	Ton	52.00	45.52968	45.59628	6.47032	6.40372
Selling Beef Supplement	Ton	100.00	86.21	86.21	13.79	13.79
Selling Beef Complete	Ton	52.00	45.62968	45.52968	6.47032	6.40372
Selling Poultry Supplement	Ton	120.00	103.45	103.45	16.55	16.55
Selling Poultry Complete	Ton	70.00	60.98768	61.05028	9.01232	8.94972
Selling Hog Supplement	Ton	112.00	96.55	96.55	15.45	15.45
Selling Hog Complete	Ton	62.00	54.09668	54.16028	7.90332	7.83972
Selling Miscellaneous	Ton	120.00	103.45	103.45	16.55	16.55
Selling Potash	Ton	69.00	62.82862	62.82862	6.17138	6.17138
Selling Urea	Ton	43.00	39.18862	39.18862	3.81138	3.81138
Selling Mixed Bulk	Ton	68.24	62.14862	62.14862	6.09138	6.09138
Selling Mixed Bag	Ton	73.24	66.59	66.59	6.65	6.65
Shelling	100 bu.	--	.84400	.86000	-.84400	-.86000
Grinding	100 lbs.	.12	.00623	.00798	.11377	.11202
Selling Building Supplies	$5	5.00	4.348	4.348	.652	.652
Selling Coal	Ton	19.00	13.57	13.57	5.43	5.43
Selling Chemicals	$5	5.00	4.464	4.464	.536	.536
Selling all other Farm Supp.	$5	5.00	4.167	4.167	.833	.833

Table 10. (continued)

Activity	Unit	Budgeted	Actual	Variance	Budgeted	Actual	Variance
			Unit			Total	
Installation of 2" Copper Tube	100 lin. ft.	2.00	1.95	.05	2.00	1.95	.05
Installation of 3" Copper Tube	100 lin. ft.	2.00	1.90	.10	2.00	1.90	.10
Installation of 4" Copper Tube	100 lin. ft.	2.00	1.85	.15	2.00	1.85	.15
Installation of 2" Steel Pipe	100 lin. ft.	10.00	9.80	.20	10.00	9.80	.20
Installation of 3" Steel Pipe	100 lin. ft.	10.00	9.75	.25	10.00	9.75	.25
Installation of 4" Steel Pipe	100 lin. ft.	10.00	9.70	.30	10.00	9.70	.30
Installation of 2" Copper Tube	100 lin. ft.	10.00	9.90	.10	10.00	9.90	.10
Installation of 3" Copper Tube	100 lin. ft.	10.00	9.85	.15	10.00	9.85	.15
Installation of 4" Copper Tube	100 lin. ft.	10.00	9.80	.20	10.00	9.80	.20
Installation of 2" Steel Pipe	100 lin. ft.	10.00	9.70	.30	10.00	9.70	.30
Installation of 3" Steel Pipe	100 lin. ft.	10.00	9.65	.35	10.00	9.65	.35
Installation of 4" Steel Pipe	100 lin. ft.	10.00	9.60	.40	10.00	9.60	.40
Installation of 2" Copper Tube	100 lin. ft.	10.00	9.90	.10	10.00	9.90	.10
Installation of 3" Copper Tube	100 lin. ft.	10.00	9.85	.15	10.00	9.85	.15
Installation of 4" Copper Tube	100 lin. ft.	10.00	9.80	.20	10.00	9.80	.20
Installation of 2" Steel Pipe	100 lin. ft.	10.00	9.70	.30	10.00	9.70	.30
Installation of 3" Steel Pipe	100 lin. ft.	10.00	9.65	.35	10.00	9.65	.35
Installation of 4" Steel Pipe	100 lin. ft.	10.00	9.60	.40	10.00	9.60	.40
Installation of 2" Copper Tube	100 lin. ft.	10.00	9.90	.10	10.00	9.90	.10
Installation of 3" Copper Tube	100 lin. ft.	10.00	9.85	.15	10.00	9.85	.15
Installation of 4" Copper Tube	100 lin. ft.	10.00	9.80	.20	10.00	9.80	.20
Installation of 2" Steel Pipe	100 lin. ft.	10.00	9.70	.30	10.00	9.70	.30
Installation of 3" Steel Pipe	100 lin. ft.	10.00	9.65	.35	10.00	9.65	.35
Installation of 4" Steel Pipe	100 lin. ft.	10.00	9.60	.40	10.00	9.60	.40

Table 5B. (continued)

1/ Revenue figures were calculated from costs by using margins or are given in the questionnaire. See Appendix A.

2/ Revenue and net figures for the loading out and selling activities are shown in Table 6B. The buying costs are not calculated into the net data as they are already in the model.

3/ From Table 4B

4/ Labor cost figures were obtained from the questionnaire. To this was added fringe benefits of 11.72% - FICA (4.40%), Workmans Compensation (5.22%), Unemployment Insurance (2.10%). These percentages were taken from a study by W. Smith Greig, Dept. of Ag. Econ., M.S.U. (Table 20C).

5/ See footnote 4, Table 4B.

Table 22. (continued)

1/ Revenue figures were calculated from data in major markets or are given in the pro forma. See Appendix A.

2/ Revenue and net figures for the leading coal and oil activities are given in Table 23. The lignite coals are not calculated into the net cash as they are already in the model.

3/ From Table 42

4/ Labor cost figures are very crude estimates. To this was added Polish home life of 11.7% - 100% (4.40%), workmans comp. (3.22%), unemployment insurance (2.1%). These percentages were taken from a study by W. Smith Grieg, Secy. of Ag. Econ., U.S.D. (Table 20C).

5/ See footnote 1, Table 42.

Table 6B. Revenue, Cost and Net Revenue for the Loading Out and Selling Activity.

Grain	Periods 1	2	3	4	5	6	7
Corn:							
Revenue ($)	120.00000	120.00000	121.00000	124.00000	126.00000	126.00000	125.00000
Cost ($)	.03526	.03526	.03526	.03526	.03526	.03526	.03626
Net ($)	119.96474	119.96474	120.96474	123.96474	125.96474	125.96474	124.96374
Wheat:							
Revenue ($)	174.00000	173.00000	168.00000	168.00000	165.00000	147.00000	147.00000
Cost ($)	.03526	.03526	.03526	.03526	.03526	.03526	.03626
Net ($)	173.96474	172.96474	167.96474	167.96474	164.96474	146.96474	146.96374
Oats:							
Revenue ($)	76.00000	76.00000	75.00000	72.00000	71.00000	70.00000	67.00000
Cost ($)	.03526	.03526	.03526	.03526	.03526	.03526	.03626
Net ($)	75.96474	75.96474	74.96474	71.96474	70.96474	69.96474	66.96374
Soys:							
Revenue ($)	286.00000	286.00000	283.00000	285.00000	282.00000	288.00000	293.00000
Cost ($)	.03526	.03526	.03526	.03526	.03526	.03526	.03626
Net ($)	285.96474	285.96474	282.96474	284.96474	281.96474	287.96474	292.96374
Navies:							
Revenue ($)	7.51000	7.56000	7.40000	7.30000	7.08000	6.79000	6.98000
Cost ($)	.00059	.00059	.00059	.00059	.00059	.00059	.00060
Net ($)	7.50941	7.55941	7.33941	7.29941	7.07941	6.78941	6.97940
DRK							
Revenue ($)	11.51000	11.56000	11.40000	11.30000	11.08000	10.79000	10.98000
Cost ($)	.00059	.00059	.00059	.00059	.00059	.00059	.00060
Net ($)	11.50941	11.55941	11.39941	11.29941	11.07941	10.78941	10.97940

TABLE 15 - Assumed Cost and Age Profile for Existing Vehicles

Category	1	2	3	4	5
Cars:					
Cost (£)	11,200	11,200	11,200	11,200	11,200
Cost (%)	100.0	100.0	100.0	100.0	100.0
Scrappage (%)	11.2000	11.2000	11.2000	10.1200	10.1200
Survival (%)	100.0000	88.8000	77.6000	66.4000	56.2800
Taxis:					
Cost (£)	7,200	7,200	7,200	7,200	7,200
Cost (%)	100.0	100.0	100.0	100.0	100.0
Scrappage (%)	7.2000	7.2000	7.2000	7.2000	7.2000
Survival (%)	100.0000	92.8000	85.6000	78.4000	71.2000
Vans:					
Cost (£)	12,000	12,000	12,000	12,000	12,000
Cost (%)	100.0	100.0	100.0	100.0	100.0
Scrappage (%)	12.0000	12.0000	12.0000	12.0000	12.0000
Survival (%)	100.0000	88.0000	76.0000	64.0000	52.0000
Coach:					
Cost (£)	11,200	11,200	11,200	11,200	11,200
Cost (%)	100.0	100.0	100.0	100.0	100.0
Scrappage (%)	11.2000	11.2000	11.2000	10.1200	10.1200
Survival (%)	100.0000	88.8000	77.6000	66.4000	56.2800

Table 6B. (continued)

Grain	Periods A	S	O	N	D
Corn:					
Revenue ($)	125.00000	127.00000	118.00000	109.00000	113.00000
Cost ($)	.03626	.03626	.03626	.03626	.03626
Net ($)	124.96374	126.96374	117.96374	108.96374	112.96374
Wheat:					
Revenue ($)	151.00000	151.00000	147.00000	148.00000	153.00000
Cost ($)	.03626	.03626	.03626	.03626	.03626
Net ($)	150.96374	150.96374	146.96374	147.06374	152.96374
Oats:					
Revenue ($)	68.00000	69.00000	69.00000	71.00000	75.00000
Cost ($)	.03626	.03626	.03626	.03626	.03626
Net ($)	67.96374	68.96374	68.96374	70.96374	74.96374
Soys:					
Revenue ($)	290.00000	269.00000	267.00000	267.00000	277.00000
Cost ($)	.03626	.03626	.03626	.03626	.03626
Net ($)	289.96374	268.96374	266.96374	266.96374	276.96374
Navies:					
Revenue ($)	7.08000	7.40000	7.96000	7.92000	8.01000
Cost ($)	.00060	.00060	.00060	.00060	.00060
Net ($)	7.07940	7.39940	7.95940	7.91940	8.00940
DRK					
Revenue ($)	11.08000	11.40000	11.96000	11.92000	12.01000
Cost ($)	.00060	.00060	.00060	.00060	.00060
Net ($)	11.07940	11.39940	11.95940	11.91940	12.00940

Table 6.1 (Continued)

Strata	N	n	$\bar{y}$	s^2
Age (a)	11,422	11,422	11.42240	11.42240
Coef (a)	1.00000	1.00000	.00000	.00000
Income (a)	11,422	11,422	11,422.00	11,422.00
Age:				
Age (b)	1,578	1,578	1.57840	1.57840
Coef (b)	.00000	.00000	.00000	.00000
Income (b)	1,578	1,578	1,578.00	1,578.00
Income:				
Age (c)	549.36214	549.36214	549.36214	549.36214
Coef (c)	.03252	.03252	.03252	.03252
Income (c)	538.00000	538.00000	538.00000	538.00000
Coef:				
Age (d)	60.36214	60.36214	60.36214	60.36214
Coef (d)	.03252	.03252	.03252	.03252
Income (d)	59.00000	59.00000	59.00000	59.00000
Coef:				
Age (e)	12.00214	12.00214	12.00214	12.00214
Coef (e)	.03252	.03252	.03252	.03252
Income (e)	12.00000	12.00000	12.00000	12.00000
Coef:				
Age (f)	154.36214	154.36214	154.36214	154.36214
Coef (f)	.03252	.03252	.03252	.03252
Income (f)	153.00000	153.00000	153.00000	153.00000

Table 7B. Labor Requirements for Grain Elevator and Feed Mill Processes.[1/]

Process No.	Process name	Requirement man-min.	Unit
P-1	Receiving small grain at harvest[2/]	20.63057	1,000 bu.
P-2	Receiving small grain at non-harvest[3/]	12.22650	1,000 bu.
P-3	Receiving ear corn at non-harvest[4/]	1.97120	100 bu.
P-4	Receiving filled bags by truck[5/]	0.69690	100 bu.
P-5	Receiving non-bulky sidelines 6/	0.20000	$2.07226
P-6	Receiving semi-bulky sidelines 7/	0.92920	$14.88846
P-7	Receiving empty 50-lb. bags	0.01916	2 bags
P-8	Receiving empty 100-lb. bags 8/	0.09579	1 bag
P-9	In-elevate and dump small grain at harvest 9/	24.72577	1,000 bu.
P-10	In-elevate and dump small grain at non-harvest 10/	17.64211	1,000 bu.
P-11	In-elevate and dump ear corn at non-harvest 11/	4.66407	100 bu.
P-12	Out-elevate grain to car	7.15500	1,000 bu.
P-13	Elevate in feed mill	0.00886	100 lbs.
P-14	Loading car with grain	28.05000	1,000 lbs.
P-15	Loading truck with ground bulk feed	0.62550	100 lbs.
P-16	Loading filled bags in truck from warehouse 12/	0.91287	100 lbs.
P-17	Loading filled bags in truck from crimper or grinder 13/	1.48005	100 lbs.
P-18	Selling non-bulky sidelines 14/	0.60000	2.07226
P-19	Loading semi-bulky sidelines 15/	2.75889	14.88846
P-20	Long term storage of wheat	11.00000	1,000 bu.
P-21	Grind grain	(0.59900)	(1,000 bu. da.)
		0.14250	100 lbs.
P-22	Rolling grain	0.08393	100 lbs.
P-23	Mixing bulk feed	0.60375	100 lbs.
P-24	Mixing bagged feed	1.19890	100 lbs.
P-25	Packing 50-lb. sacks 16/	1.12656	100 lbs.
P-26	Packing 100-lb. sacks 16/	0.78800	100 lbs.
P-27	Warehousing 17/	1.67935	100 lbs.
P-28	Shelling corn 18/	10.90880	100 bu.
P-29	Delivering bulk feed 19/	11.00000	1,000 lbs.
P-30	Delivering bagged feed 20/	2.60658	100 lbs.

Process name	%	Assembly	Min.	Max.
Process name	%	Assembly	Min.	Max.
Process 1	50.83025	1'000 pm.	1'000 pm.	1'000 pm.
Process 2	15.55820	1'000 pm.	1'000 pm.	1'000 pm.
Process 3	1.24150	1'000 pm.	1'000 pm.	1'000 pm.
Process 4	0.57000	55'015552	55'015552	55'015552
Process 5	0.25250	1'000 pm.	1'000 pm.	1'000 pm.
Process 6	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 7	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 8	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 9	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 10	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 11	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 12	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 13	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 14	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 15	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 16	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 17	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 18	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 19	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 20	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 21	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 22	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 23	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 24	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 25	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 26	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 27	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 28	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 29	0.21125	1'000 pm.	1'000 pm.	1'000 pm.
Process 30	0.21125	1'000 pm.	1'000 pm.	1'000 pm.

Table 1.1. Typical assignment for CPU time in milliseconds.[1]

Table 7B. (continued)

Source: Kansas Study op. cit., p. 12.

1/ Data were developed when possible from secondary sources (see Selected References). Other data were obtained by survey at the sample firm. Allowances have been made for fatigue and personal needs.

2/ Assumed conditions: two-man crew; 31% standard trucks, no hoist; 31% standard trucks with hoist; 7% trailers; load sizes of 200, 200, 60 and 90 bu., respectively; 50% of loads weighed only; 40% of loads weighed and test weight taken; 10% of loads, weighed with moisture test and test weight taken; use of a Steinlite moisture tester.

3/ Assumed conditions: one-man crew; 97% weighed only; 10% weighed and moisture test taken. All other assumptions are the same as for P-1.

4/ Assumptions are the same as for P-2.

5/ Data are for 50-pound bags but the same data are used for other bag sizes. Assumed distance is 30 feet.

6/ No secondary data are available. Similar items were classified and a ratio estimate was made of the labor requirement on the basis of coefficients for similar processes. Process refers to chemicals and dusts sold out of the office such as penicillin, mastitis preparations, fly bait, etc. A product mix was assumed. The weighted average per sale of $2.07226 provides a common denominator.

7/ Explanation is the same as for P-5 with P-6 data substituted.

8/ Purchasing of used 100 pound bags is assumed. Data are ratio estimates.

9/ Crew size and load sizes and types are assumed to be the same as for P-1.

10/ A one-man crew is assumed. Load sizes and types are assumed to be the same as for P-1.

11/ Crew size and load types are assumed to be the same as for P-10, but load sizes are smaller. Weighted average load size is 148.9 bu.

12/ Data are for 50-pound bags moved 30 feet; however, we assume the same coefficient for other bag sizes, except we take into account the effect on the labor coefficient of varying quantities loaded on the hand truck for movement to the truck. Consequently, the size of the coefficient for a specific activity will depend upon sale size. For the coefficients presented, we have assumed a sale

Table 23. (continued)

Source: Kansas Study op. cit., p. 12.

1/ Data were developed when possible from secondary sources (see Selected References). Other data were obtained by survey at the single firm. Allowances have been made for fatigue and personal needs.

2/ Assumed conditions: two-man crew; 21% standard trucks, no hoist; 31% standard trucks with hoist; 7% trailers; load sizes of 200, 200, 80 and 90 lbs., respectively; 50% of loads weighed only; 40% of loads weighed and tare weight taken; 10% of loads, weighed with moisture test and test weight taken; use of a Tichnitz moisture tester.

3/ Assumed conditions: one-man crew; 97% weighed only; 10% weighed and moisture test taken. All other assumptions are the same as for P-1.

4/ Assumptions are the same as for P-2.

5/ Data are for 50-pound bags but the same data are used for other bag sizes. Assumed distance is 30 feet.

6/ No secondary data are available. Similar items were classified and a ratio estimate was made of the labor requirement on the basis of coefficients for similar processes. Process refers to chemicals and dusts sold out of the office such as penicillin, mastitis preparations, fly bait, etc. A product mix was assumed. The weighted average per sale of $2.0/22% provides a common denominator.

7/ Explanation is the same as for P-5 with P-6 data substituted.

8/ Purchasing of unit 100 pound bags is assumed. Data are ratio estimates.

9/ Crew size and load sizes and types are assumed to be the same as for P-1.

10/ A one-man crew is assumed. Load sizes and types are assumed to be the same as for P-1.

11/ Crew size and load types are assumed to be the same as for P-10, but load sizes are smaller. Weighted average load size is 148.9 lb.

12/ Data are for 50-pound bags moved 30 feet; however, we assume the same coefficient for other bag sizes, except we take into account the effect on the labor coefficient of varying quantities loaded on the hand truck for movement to the truck. Consequently, the size of the coefficient for a specific activity will depend upon sale size. For the coefficients presented, we have assumed a sale

Table 7B. (continued)

size of 500 pounds. A schedule was worked out for other sale sizes. An analysis of sales tickets revealed the average size of sales for specific activities.

13/ A fully loaded hand truck for transporting bags from the machine to the truck was assumed.

14/ The relevant unit is the weighted average dollar value of sale per year derived from sample data. The requirement is a ratio estimate derived in a manner similar to P-5. Items sold are assumed to be carried out by customer.

15/ Footnote 13 applies except loading is by elevator personnel.

16/ Batches of 500 pounds per cart load moved 60 feet are assumed.

17/ The coefficient shown is for sale size of 500 pounds. Assumed distance from packing to warehouse is 60 feet. Assumed distance from warehouse to dock is 30 feet.

18/ One person's time is assumed to be fully occupied in operating sheller.

19/ The average distance traveled is assumed to be 10 miles one way carrying 3.25 tons of feed.

20/ Data are adjustments of coefficient requirements of P-29.

Table 73. (continued)

size of 500 pounds. A subsidy was worked out for each sale sizes. An analysis of sales tickets revealed the average size of sales for ex-cilli activities.

13\ A fully loaded 1 ½ ton truck for transporting hay from the machine to the barn was assumed.

14\ The relevant unit is the weighted average dollar value of sale per year derived from farm to farm. The coefficient is a ratio estimate derived in a manner similar to F-5. Items sold are assumed to be carried out by customer.

15\ Footnote 13 applies except loading is by elevator personnel.

16\ Batches of 500 pounds per cart load moved 60 feet are assumed.

17\ The coefficient given is for sale size of 500 pounds. Assumed distance from parking to warehouse is 67 feet. Assumed distance from warehouse to door is 30 feet.

18\ One person's time is assumed to be fully occupied in operating sheller.

19\ The average distance traveled is assumed to be 10 miles one way carrying 2.25 tons of feed.

20\ Data are adjusted to coefficient requirements of F-29.

Table 8B. Labor Requirements by Processes Defined in Kansas Study.

Process in Kansas Study	Units in this Study	Labor Requirements Man-Hours	Process in Kansas Study	Units in this Study	Labor Requirements Man-Hours
1	100 bu.	.034384 1/	16	Ton	.304290
2	100 bu.	.020378	17	Ton	.493350
3	100 bu. (shelled)	.032853	18	$5	.025000
4	Ton	.232300	19	$5	.015327
5	$5	.008333	20	100 bu.	.018333
6	$5	.005162	21	100 lbs.	.002375
7	1 bag	.000159	22	100 lbs.	.001398
8	1 bag	.001597	23	100 lbs.	.010063
9	100 bu.	.041210	24	100 lbs.	.019982
10	100 bu.	.029404	25	Ton	.375520
11	100 bu. (shelled)	.077735	26	Ton	.262666
12	100 bu.	.001193	27	Ton	.559783
13	Ton	.002953	28	100 bu.	.181813
14	100 bu.	.046750	29	Ton	.366667
15	Ton	.208517	30	Ton	.868860

1/ Sometimes it will be helpful to have the following processes defined in other units.

Process	Unit	Lbr. Requirements
1	100 lbs.	.000576
2	100 lbs.	.000340
9	100 lbs.	.000687
10	100 lbs.	.000490
12	100 lbs.	.000020
16	100 lbs.	.015215
20	100 lbs.	.000306
23	Ton	.201250
26	100 lbs.	.013133

Table 1. Sample Problem Illustrating Dominance Relations in Manpower Planning.

Process	Process in Year 1	Process in Year 2	Process in Year 3	Manpower Requirements
1	Do Nothing	Do Nothing	Do Nothing	0
2	Do Nothing	Do Nothing	Do Part Time	10
3	Do Nothing	Do Part Time	Do Full Time	30
4	Do Part Time	Do Full Time	Do Nothing	30
5	Do Part Time	Do Full Time	Do Part Time	40
6	Do Full Time	Do Nothing	Do Nothing	20
7	Do Full Time	Do Nothing	Do Part Time	30
8	Do Full Time	Do Part Time	Do Nothing	40
9	Do Full Time	Do Part Time	Do Part Time	50

Table 2. Coefficients of Variables in Linear Programming Formulation of Manpower Planning Problem.

Process	Do Nothing in Year 1	Do Part Time in Year 1	Do Full Time in Year 1	Do Nothing in Year 2	Do Part Time in Year 2	Do Full Time in Year 2	Do Nothing in Year 3	Do Part Time in Year 3	Do Full Time in Year 3	Manpower Requirements
1	1	0	0	1	0	0	1	0	0	0
2	1	0	0	1	0	0	0	1	0	10
3	1	0	0	0	1	0	0	0	1	30
4	0	1	0	0	0	1	1	0	0	30
5	0	1	0	0	0	1	0	1	0	40
6	0	0	1	1	0	0	1	0	0	20
7	0	0	1	1	0	0	0	1	0	30
8	0	0	1	0	1	0	1	0	0	40
9	0	0	1	0	1	0	0	1	0	50
Manpower Requirements	0	10	30	30	40	20	30	40	50	

Table 9B. Labor Requirements by Activity.

Activity	Units	Processes included from Table 8B Non-Harvest	Labor-Requirement Non-Harvest Man-Hrs.	Processes Inc. from Table 8B Harvest	Labor Req. Harvest Man-Hrs.
Receiving & Storing Shd. Corn	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Ear Corn	100 bu.	3,28,11	.292403	3,28,11	.292403
Receiving & Storing Wheat	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Soys	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Oats	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing DRK	100 lbs.	2,10	.000830	1,9	.001263
Receiving & Storing Navies	100 lbs.	2,10	.000830	1,9	.001263
Receiving Wet Corn	100 bu.	2,10 1/	.057182	1,9 1/	.097794
Receiving Wet Wheat	100 bu.	2,10 1/	.057182	1,9 1/	.097794
Receiving Wet Soys	100 bu.	2,10 1/	.057182	1,9 1/	.097794
Receiving Wet Oats	100 bu.	2,10 1/	.057182	1 1/	.097794
Receiving Wet Navies	100 lbs.	-- 1/	--	--	--
Buying Shelled Corn	100 bu.	--	--	--	--
Buying Ear Corn	100 bu.	--	--	--	--
Buying Wheat	100 bu.	--	--	--	--
Buying Soys	100 bu.	--	--	--	--
Buying Oats	100 bu.	--	--	--	--
Buying DRK	100 lbs.	--	--	--	--
Buying Navies	100 lbs.	--	--	--	--
Store Corn	100 bu.	20	.018333	20	.018333
Store Wheat	100 bu.	20	.018333	20	.018333
Store Soys	100 bu.	20	.018333	20	.018333
Store Oats	100 bu.	20	.018333	20	.018333
Store DRK	100 lbs.	20	.000306	20	.018333
Store Navies	100 lbs.	20	.000306	20	.000306
Transfer Corn fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Wheat fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Soys fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Oats fr. Inv.	100 bu.	20	.018333	20	.018333

Table 9-. Labor Requirements by Activity.

Activity	Units	Processes Included from Table 8B Non-Harvest	Labor-Requirement Non-Harvest Mn-Hrs.	Processes Inc. from Req. Table 8B Harvest	Labor Harvest Mn-Hrs.
Receiving & Storing Shl. Corn	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Ear Corn	100 bu.	3,28,11	.292403	3,28,11	.292403
Receiving & Storing Wheat	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Soys	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing Oats	100 bu.	2,10	.049782	1,9	.075594
Receiving & Storing DRK	100 lbs.	2,10	.000630	1,9	[illegible]
Receiving & Storing Navies	100 lbs.	2,10	.000830	1,9	[illegible]
Receiving Wet Corn	100 bu.	2,10 1/	.057182	1,9 1/	[illegible]
Receiving Wet Wheat	100 bu.	2,10 1/	.057182	1,9 1/	[illegible]
Receiving Wet Soys	100 bu.	2,10 1/	.057182	1,9 1/	[illegible]
Receiving Wet Oats	100 bu.	2,10 1/	.057182	1 1/	[illegible]
Receiving Wet Navies	100 lbs.	-- 1/	--	--	--
Buying Shelled Corn	100 bu.	--	--	--	--
Buying Ear Corn	100 bu.	--	--	--	--
Buying Wheat	100 bu.	--	--	--	--
Buying Soys	100 bu.	--	--	--	--
Buying Oats	100 bu.	--	--	--	--
Buying DRK	100 lbs.	--	--	--	--
Buying Navies	100 lbs.	--	--	--	--
Store Corn	100 bu.	20	.018333	20	.018333
Store Wheat	100 bu.	20	.018333	20	.018333
Store Soys	100 bu.	20	.018333	20	.018333
Store Oats	100 bu.	20	.018333	20	.018333
Store DRK	100 lbs.	20	.000306	20	[illegible]
Store Navies	100 lbs.	20	.000306	20	[illegible]
Transfer Corn fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Wheat fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Soys fr. Inv.	100 bu.	20	.018333	20	.018333
Transfer Oats fr. Inv.	100 bu.	20	.018333	20	.018333

Table 9B. (continued)

Activity	Units	Processes included from Table 8B Non-Harvest	Labor-Requirement Non-Harvest Man-Hrs.	Processes Inc. from Table 8B Harvest	Labor Req. Harvest Man-Hrs.
Loading Out & Selling Corn	100 bu.	12,14	.047943	12,14	.047943
Loading Out & Selling Wheat	100 bu.	12,14	.047943	12,14	.047943
Loading Out & Selling Soys	100 bu.	12,14	.047943	12,14	.047943
Loading Out & Selling Oats	100 bu.	12,14	.047943	12,14	.047943
Loading Out & Selling DRK	100 bu.	8,12,16,26	.029965	8,12,16,26	.029965
Loading Out & Selling Navies	100 bu.	8,12,16,26	.029965	8,12,16,26	.029965
Selling Dairy Supplement	Ton	4,16	.536590	4,16	.536590
Selling Dairy Complete	Ton	8,12,13,17, 21,23,26,29, 30 2/	1.007566	8,12,13, 17,21,23, 26,29,30 2/	1.007470
Selling Beef Supplement	Ton	4,16	.536590	4,16	.536590
Selling Beef Complete	Ton	8,12,13,17, 21,23,26, 29,30 2/	1.007470	8,12,13, 17,21,23, 26,29,30 2/	1.007470
Selling Poultry Supplement	Ton	4,16	.536590	4,16	.536590
Selling Poultry Complete	Ton	8,12,13,17 21,23,26,29 30 2/	1.000281	8,12,13, 17,21,23, 26,29,30 2/	1.000281
Selling Hog Supplement	Ton	4,16	.536590	4,16	.536590
Selling Hog Complete	Ton	8,12,13,17 21,23,26, 29,30 2/	1.002677	8,12,13, 17,21,23, 26,29,30 2/	1.002677
Selling Miscellaneous	Ton	4,16	.536590	4,16	.536590
Selling Potash	Ton	15,29 3/	.299184	15,29 3/	.299184
Selling Urea	Ton	15,29 3/	.299184	15,29 3/	.299184
Selling Mixed Bulk	Ton	15,29 3/	.299184	15,29 3/	.299184
Selling Mixed Bag	Ton	4,16,30 3/	.753805	4,16,30 3/	.753805
Shelling	100 bu.	28	.181813	28	.181813
Grinding	100 lbs.	21	.002375	21	.002375

Table 4b. (continued)

Activity	Units	Processes Included from Table 6B Non-Harvest	Labor Requirement Non-Harvest Lab-Hrs.	Processes Inc. from Table 7B Harvest	Labor Req. Harvest Man-Hrs.
Loading Cut & Selling Corn	100 bu.	12,14	.047043	12,14	[illegible]
Loading Cut & Selling Wheat	100 bu.	12,14	[illegible]	12,14	[illegible]
Loading Cut & Selling Soys	100 bu.	12,14	.047443	12,14	[illegible]
Loading Cut & Selling Oats	100 bu.	12,14	.047843	12,14	[illegible]
Loading Cut & Selling [illegible]	100 bu.	8,12,16,26	[illegible]	9,12,16,26	[illegible]
Loading Cut & Selling Navies	100 bu.	8,12,16,26	[illegible]	9,12,16,26	[illegible]
Selling Dairy Supplement	Ton	4,16	[illegible]	4,16	[illegible]
Selling Dairy Complete	Ton	8,12,13,17, 21,23,26,29, 30 2/	[illegible]	8,12,13, 17,21,23, 26,29,30 2/	[illegible]
Selling Beef Supplement	Ton	4,16	[illegible]	4,16	[illegible]
Selling Beef Complete	Ton	8,12,13,17, 21,23,26, 29,30 2/	1.007470	8,12,13, 17,21,23, 26,29,30 2/	[illegible]
Selling Poultry Supplement	Ton	4,16	.539590	4,16	[illegible]
Selling Poultry Complete	Ton	8,12,13,17 21,23,26,29 30 2/	1.000281	8,12,13, 17,21,23, 26,29,30 2/	1.000281
Selling Hog Supplement	Ton	4,15	[illegible]	4,16	[illegible]
Selling Hog Complete	Ton	8,12,13,17 21,23,26, 29,30 2/	1.002877	8,12,13, 17,21,23, 26,29,30 2/	1.002877
Selling Miscellaneous	Ton	4,16	[illegible]	4,16	[illegible]
Selling Potash	Ton	15,29 3/	[illegible]	15,29 3/	[illegible]
Selling Urea	Ton	15,29 3/	[illegible]	15,29 3/	[illegible]
Selling Mixed Bulk	Ton	15,29 3/	[illegible]	15,29 3/	[illegible]
Selling Mixed Bag	Ton	4,16,30 2/	[illegible]	4,16,30 2/	[illegible]
Shelling	100 bu.	28	[illegible]	[illegible]	[illegible]
Grinding	100 lbs.	21	[illegible]	21	[illegible]

Table 9B. (continued)

Activity	Units	Processes included from Table 8B Non-Harvest	Labor-Requirement Non-Harvest Man-Hrs.	Processes Inc. from Table 8B Harvest	Labor Req. Harvest Man-Hrs.
Selling Building Supplies	$5	5,18	.033333	5,18	.033333
Selling Coal	Ton	15,29 4/	.538517	15,29 4/	.538517
Selling Chemicals	$5	5,18	.033333	5,18	.033333
Selling all other Farm Supplies	$5	6,19	.020489	6,19	.020489

1/ Dry requirements were not given in the Kansas Study. In this study it was assumed that it takes .0222 man-hrs, during harvest to dry 100 bushels of grain and 1/3 of this amount for non-harvest (.0074 man-hrs). This figure, .0222, was arrived at by assuming that it takes 8 man hours of labor to dry grains during harvest running the drier 24 hours per day. The drier capacity is 1500 bu./hr. From this we can calculate the man-hours per 100 bushels of grain. It was assumed for this that the drier capacity is constant for all grains. Dark red kidney beans and navy beans are not dried -- these drying requirements were added to the previous two processes (2,10 or 1,9).

2/ In processes 12 and 21 the ingredients of the feeds must be known -- Hog (1600# Corn/Ton), Dairy (1200# Corn/Ton and 600# Oats/Ton), Beef (1800# Corn/Ton) and Poultry (1500# Corn/Ton). Weights were also used to get the proper proportions of labor used to bag and deliver feed; bagged (85%) delivered (40%).

3/ 25% of the fertilizer is delivered. We assumed that no labor was used in receiving the fertilizers.

4/ 90% of the coal is delivered.

Table 8A. (continued)

Activity	Units	Processes Included from Table 8B Non-Harvest	Labor Requirement Non-Harvest Man-Hrs.	Processes Inc. from Table 8B Harvest	Labor Req. Harvest Man-Hrs.
Hauling Building Supplies	$5	5,18	.083333	5,18	.083333
Hauling Coal	Ton	15,29 4/	.388117	15,29 4/	.388117
Hauling Chemicals	$5	5,18	.083333	5,18	.083333
Hauling all other Farm Supplies	$5	6,19	.020409	6,19	.020409

1/ Dry requirements were not given in the Kansas Study. In this study it was assumed that it takes .0222 man-hrs, during harvest to dry 100 bushels of grain and 1/3 of this amount for non-harvest (.0074 man-hrs). This figure, .0222, was arrived at by assuming that it takes 8 man hours of labor to dry grains during harvest running the drier 24 hours per day. The drier capacity is 1500 bu./hr. From this we can calculate the man-hours per 100 bushels of grain. It was assumed for this that the drier capacity is constant for all grains. Dark red kidney beans and navy beans are not dried -- these drying requirements were added to the previous two processes (2,10 or 1,9).

2/ In processes 12 and 21 the ingredients of the feeds must be known -- Hog (1200# Corn/Ton), Dairy (1200# Corn/Ton and 600# Oats/Ton), Beef (1500# Corn/Ton) and Poultry (1500# Corn/Ton). Weights were also used to get the proper proportions of labor used to bag and deliver feed; bagged (85%) delivered (40%).

3/ 25% of the fertilizer is delivered. We assumed that no labor was used in receiving the fertilizers.

4/ 50% of the coal is delivered.

Table 10B. Labor Available 1/

Type of Labor	Man Hours Available for Cash Period 2/											
	1	2	3	4	5	6	7	A	S	Ø	N	D
Full Time Regular 3/	1920	1920	1920	1920	1920	1920	1920	1920	1920	1920	1920	1920
Full Time Overtime 4/	336	336	336	336	336	1320	1320	1320	1320	1320	1320	1320
Part Time Regular 5/	0	0	0	0	0	320	320	320	320	160	160	320
Part Time Overtime 6/	0	0	0	0	0	160	160	160	160	80	80	160

1/ Assumptions are given in the text.

2/ Harvest months are 7-D - July through December.

3/ 12 men x 40 hours/week x 4 weeks/month = 1920.

4/ a) 12 men x 7 hours/week overtime x 4 weeks/month = 336.
b) 6 men x 41 hours overtime x 4 weeks/month + 336 (a) = 1320.

During harvest:

4 more hours per day are assumed for Mon.-Fri. + 8 extra hours for Sat. and Sun. = 41.

5/ 2 men x 40 hours/week x 4 weeks/month = 320 (Divide by 2 for Ø for N, since half as many men are available.

6/ 2 men x 20 hours overtime x 4 weeks/month = 160 (divide by 2 for Ø for N). This assumes 2 hours overtime for Mon.-Fri. + 10 hours on Saturday.

Table 108. Labor Availability [1]

Type of Labor	1	2	3	4	5	6	7	8	9	10
	Man Hours Available for Each Period [2]									
Entry Level Production [3]	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
Entry Level Overtime [4]	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
Part Time Regular [5]	0	0	0	0	350	350	350	350	350	350
Part Time Overtime [6]	0	0	0	0	350	350	350	350	350	350

Notes:

[1] Assumptions are given in the text.

[2] Each period is one week.

[3] Entry level regular time labor is available at a rate of 8 hours per day, 5 days per week, 4 weeks per month, 12 months per year. Thus, the number of hours available per period is assumed to be $8 \times 5 \times 4 \times 12 / 12 = 160$ hours per period.

[4] Entry level overtime labor is available at a rate of 10 hours per day, 5 days per week, 4 weeks per month, 12 months per year. Thus, the number of hours available per period is assumed to be $10 \times 5 \times 4 \times 12 / 12 = 200$ hours per period.

[5] Part time regular labor is available at a rate of 7 hours per day, 5 days per week, 4 weeks per month, 12 months per year. Thus, the number of hours available per period is assumed to be $7 \times 5 \times 4 \times 12 / 12 = 140$ hours per period.

[6] Part time overtime labor is available at a rate of 10 hours per day, 5 days per week, 4 weeks per month, 12 months per year. Thus, the number of hours available per period is assumed to be $10 \times 5 \times 4 \times 12 / 12 = 200$ hours per period.

Table 11B. Receiving and Storing Capacities 1/

Period	Capacity (bu./hr.)	Hours	Capacity/Period (bu.)
1	10,000	188	1,880,000
2	10,000	188	1,880,000
3	10,000	188	1,880,000
4	10,000	188	1,880,000
5	10,000	188	1,880,000
6	10,000	188	1,880,000
7	31,000	352	10,912,000
A	28,000	352	9,856,000
S	9,000	352	3,168,000
Ø	10,000	352	3,520,000
N	10,000	352	3,520,000
D	8,000	352	2,816,000

1/ Assumptions are listed in the text under "Receiving and Storing Capacity."

Table IIB. Receiving and Storing Co modities 1/

Period	Capacity (Sq.Ft.)	Rate	Capacity Period (Sq.)
J	10,000	152	1,520,000
S	10,000	148	1,480,000
O	10,000	148	1,480,000
N	10,000	148	1,480,000
D	10,000	148	1,480,000
J	10,000	148	1,480,000
F	10,000	148	1,480,000
M	21,000	152	10,012,000
A	28,000	152	9,456,000
M	9,000	152	3,108,000
J	10,000	152	3,520,000
J	10,000	152	3,520,000
A	8,000	152	2,816,000

1/ Assumptions are listed in the text under "Receiving and Storing Capacity."

Table 12B. Grains Available to Purchase 1/

Period	Grains to Purchase						
	Corn (bu.)	Ear Corn (bu.)	Wheat (bu.)	Soys (bu.)	Oats (bu.)	DRK (lbs.)	Navies (lbs.)
1	14,919	1,194	9,026	2,132	3,648	0	2,951
2	11,695	936	11,840	3,451	2,177	0	5,353
3	9,933	795	10,502	3,482	2,333	0	6,028
4	4,472	358	6,288	3,651	3,430	0	6,758
5	4,460	357	3,689	2,559	2,576	0	20,876
6	10,561	845	454,668	4,347	1,850	0	60,825
7	12,842	1,027	100,437	1,872	3,320	0	20,907
A	9,207	737	10,480	371	16,155	0	74,962
S	7,796	624	4,080	965	1,513	27,740	657,008
Ø	31,290	0	4,607	36,490	253	157,854	616,843
N	62,593	0	1,962	10,504	457	48,071	47,953
D	16,196	0	4,443	3,699	2,078	7,612	1,653

1/ The grains available to purchase are the amount received minus the amount stored. The receipt data are given in Appendix C. See Table 13B for storage data.

Table 128. Chains variable to Durham II

Region	Com (mm)	Tot Com (mm)	Com ... (mm)	Cpa ... (mm)	Cpa (mm)	Ind (mm)	Ind (mm)
I	14,816	1,014	9,150	3,158	3,648	0	1,322
1	15,845	1,055	10,007	4,247	3,350	0	1,220
2	10,884	1,055	4,247	3,350	1,820	0	1,220
3	9,283	782	4,247	3,350	1,820	0	1,220
4	9,447	328	9,288	3,221	3,430	0	1,220
5	7,220	321	3,488	9,288	5,228	0	1,220
A	7,220	254	4,000	3,488	1,820	0	1,220
B	7,220	321	10,007	4,247	3,350	0	1,220
C	15,845	1,055	10,007	4,247	3,350	0	1,220
D	14,816	1,014	9,150	3,158	3,648	0	1,322
E	15,845	1,055	10,007	4,247	3,350	0	1,220
F	15,845	1,055	10,007	4,247	3,350	0	1,220
G	14,816	1,014	9,150	3,158	3,648	0	1,322
H	15,845	1,055	10,007	4,247	3,350	0	1,220
I	15,845	1,055	10,007	4,247	3,350	0	1,220

Table 129. Chains variable to Durham II

Region	Com (mm)	Tot Com (mm)	Com ... (mm)	Cpa ... (mm)	Cpa (mm)	Ind (mm)	Ind (mm)
I	14,816	1,014	9,150	3,158	3,648	0	1,322
1	15,845	1,055	10,007	4,247	3,350	0	1,220
2	10,884	1,055	4,247	3,350	1,820	0	1,220
3	9,283	782	4,247	3,350	1,820	0	1,220
4	9,447	328	9,288	3,221	3,430	0	1,220
5	7,220	321	3,488	9,288	5,228	0	1,220
A	7,220	254	4,000	3,488	1,820	0	1,220
B	7,220	321	10,007	4,247	3,350	0	1,220
C	15,845	1,055	10,007	4,247	3,350	0	1,220
D	14,816	1,014	9,150	3,158	3,648	0	1,322
E	15,845	1,055	10,007	4,247	3,350	0	1,220
F	15,845	1,055	10,007	4,247	3,350	0	1,220
G	14,816	1,014	9,150	3,158	3,648	0	1,322
H	15,845	1,055	10,007	4,247	3,350	0	1,220
I	15,845	1,055	10,007	4,247	3,350	0	1,220

Table 13B. Grains Available for Storage 1/

Period	Grains to Store					
	Corn (bu.)	Wheat (bu.)	Soys (bu.)	Oats (bu.)	DRK (lbs.)	Navies (lbs.)
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	64,221	0	0	0	0
A	0	6,701	0	10,328	0	0
S	0	0	0	0	17,735	420,693
Ø	20,005	0	23,329	0	100,923	394,375
N	40,018	0	6,716	0	0	0
D	10,355	0	0	0	0	0

1/ Grains available to store are 39 percent of the grains received. Thirty-nine percent is the figure found through the questionnaire. Grains are stored only during harvest months.

Table IOB. Cross Variable Int Factor 1/

Factor	Corn (bu.)	Wheat (bu.)	Oats (bu.)	Barley (bu.)	Soybeans (bu.)	Hay (T.)
			Crop Code			
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	50,000	0	53,350	0	0	0
12	50,000	0	53,350	0	0	0

1/ Assets assigned to state are 30 percent of the Grains region.

Table 14B. Sales Outlet for Fertilizer 1/

Period	%	Potash	Urea	17-17-17 2/		8-32-16		6-24-24		0-25-25		Spec. Corn Starter		Spec. Bean Starter		Spec. Beet Starter	
				Bag	Bulk	Bag	Bulk	Bag	Bulk	Bag	Bulk	Bag	Bulk	Bag	Bulk	Bag	Bulk
1	3.38	13.52	16.90	.68	2.72	3.04	12.16	3.04	12.16	.68	2.72	1.36	5.44	.34	1.36	.41	1.64
2	3.92	15.68	19.60	.78	3.12	3.53	14.12	3.53	14.12	.78	3.12	1.56	6.24	.39	1.56	.47	1.88
3	1.79	7.16	8.95	.36	1.44	1.31	5.24	1.31	5.24	.36	1.44	.72	2.88	.18	.72	.20	.80
4	5.17	20.68	25.85	1.03	4.12	4.65	18.60	4.65	18.60	1.03	4.12	2.06	8.24	.52	1.08	.62	2.48
5	35.39	141.56	176.95	7.08	28.32	31.85	127.40	31.85	127.40	7.08	28.32	14.16	56.64	3.54	14.16	4.25	17.00
6	9.85	39.40	39.25	1.97	7.88	8.87	35.48	8.87	35.48	1.97	7.88	3.94	15.76	.99	3.96	1.09	4.36
7	.89	3.56	4.45	.18	.72	.80	3.20	.80	3.20	.18	.72	.36	1.44	.09	.36	.11	.44
A	3.79	15.16	18.95	.76	3.04	3.41	13.64	3.41	13.64	.76	3.04	1.52	6.08	.38	1.72	.45	1.80
S	28.67	114.68	143.35	5.73	22.92	25.80	103.20	25.80	103.20	5.73	22.92	11.46	45.84	2.87	11.28	3.44	13.76
Ø	5.77	23.08	28.85	1.15	4.60	5.19	20.76	5.19	20.76	1.15	4.60	2.30	9.20	.58	2.32	.69	2.76
N	.34	1.36	1.70	.07	.28	.31	1.24	.31	1.24	.07	.28	.14	.56	.04	.16	.04	.16
D	1.03	4.12	5.15	.21	.84	.93	3.72	.93	3.72	.21	.84	.42	1.68	.11	.44	.12	.48
Total		400	500	20	80	90	360	90	360	20	80	40	160	10	40	12	48

1/ Given in ton units

2/ Eighty percent of mixed fertilizer is bulk (from questionnaire).

٤٦ جدول رقم ٤٠ توزيع العائلات حسب فئات الدخل الشهري

فئات الدخل الشهري	عدد العائلات	النسبة المئوية	المتوسط الحسابي	الوسيط	المنوال	الانحراف المعياري	التباين	الالتواء	التفرطح
٥٠٠ - ٩٩٩	٤٢	١٤٫٠	٨٤٥٫٠	٨٤٠٫٠	٨٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
١٠٠٠ - ١٤٩٩	٦٠	٢٠٫٠	١٢٤٥٫٠	١٢٥٠٫٠	١٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
١٥٠٠ - ١٩٩٩	٥٤	١٨٫٠	١٧٤٥٫٠	١٧٥٠٫٠	١٨٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٢٠٠٠ - ٢٤٩٩	٤٨	١٦٫٠	٢٢٤٥٫٠	٢٢٥٠٫٠	٢٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٢٥٠٠ - ٢٩٩٩	٣٠	١٠٫٠	٢٧٤٥٫٠	٢٧٥٠٫٠	٢٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٣٠٠٠ - ٣٤٩٩	١٨	٦٫٠	٣٢٤٥٫٠	٣٢٥٠٫٠	٣٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٣٥٠٠ - ٣٩٩٩	١٢	٤٫٠	٣٧٤٥٫٠	٣٧٥٠٫٠	٣٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٤٠٠٠ - ٤٤٩٩	٦	٢٫٠	٤٢٤٥٫٠	٤٢٥٠٫٠	٤٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٤٥٠٠ - ٤٩٩٩	٦	٢٫٠	٤٧٤٥٫٠	٤٧٥٠٫٠	٤٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٥٠٠٠ - ٥٤٩٩	٦	٢٫٠	٥٢٤٥٫٠	٥٢٥٠٫٠	٥٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٥٥٠٠ - ٥٩٩٩	٦	٢٫٠	٥٧٤٥٫٠	٥٧٥٠٫٠	٥٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٦٠٠٠ - ٦٤٩٩	٦	٢٫٠	٦٢٤٥٫٠	٦٢٥٠٫٠	٦٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٦٥٠٠ - ٦٩٩٩	٦	٢٫٠	٦٧٤٥٫٠	٦٧٥٠٫٠	٦٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٧٠٠٠ - ٧٤٩٩	٦	٢٫٠	٧٢٤٥٫٠	٧٢٥٠٫٠	٧٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٧٥٠٠ - ٧٩٩٩	٦	٢٫٠	٧٧٤٥٫٠	٧٧٥٠٫٠	٧٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٨٠٠٠ - ٨٤٩٩	٦	٢٫٠	٨٢٤٥٫٠	٨٢٥٠٫٠	٨٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٨٥٠٠ - ٨٩٩٩	٦	٢٫٠	٨٧٤٥٫٠	٨٧٥٠٫٠	٨٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٩٠٠٠ - ٩٤٩٩	٦	٢٫٠	٩٢٤٥٫٠	٩٢٥٠٫٠	٩٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
٩٥٠٠ - ٩٩٩٩	٦	٢٫٠	٩٧٤٥٫٠	٩٧٥٠٫٠	٩٧٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
١٠٠٠٠ فأكثر	٦	٢٫٠	١٠٢٤٥٫٠	١٠٢٥٠٫٠	١٠٢٠٠٫٠	١٤٥٫٠	٢١٠٢٥٫٠	٠٫٢٥	-٠٫٨٠
المجموع	٣٠٠	١٠٠٫٠							

جدول رقم ٤٦: توزيع العائلات حسب فئات الدخل الشهري (من الدراسة الميدانية).

٤٦ توزيع العائلات حسب فئات الدخل الشهري

٤٧ توزيع العائلات حسب فئات الدخل الشهري (من الدراسة الميدانية).

APPENDIX C

PRICES, SALES AND RECEIPT DATA

APPENDIX C

TESTING, CALIBRATION AND RECEIVED DATA

APPENDIX C

Table 1C. Prices Received by Michigan Farmers (Corn).

	1964	1965	1966	1967	Average	Price to Elevator 1/
January	$1.08	$1.06	$1.12	$1.25	$1.13	$1.20
February	1.05	1.11	1.12	1.22	1.13	1.20
March	1.06	1.14	1.11	1.26	1.14	1.21
April	1.10	1.17	1.12	1.25	1.16	1.24
May	1.14	1.21	1.13	1.23	1.18	1.26
June	1.13	1.22	1.14	1.22	1.18	1.26
July	1.11	1.20	1.20	1.17	1.17	1.25
August	1.12	1.18	1.29	1.10	1.17	1.25
September	1.19	1.20	1.30	1.08	1.19	1.27
October	1.13	1.10	1.22	1.00	1.11	1.18
November	.96	.99	1.22	.92	1.02	1.09
December	1.04	.99	1.25	.97	1.06	1.13

Source: Michigan Agricultural Statistics, July 1965, p. 41; June 1966, p. 30; September 1967, p. 55; July 1968, p. 35.

1/ Using 6.5% margin

1\ Using p.25 method

Source: Michigan Agricultural Statistics, July 1988, p. 32.
September 1987, p. 22: July 1988, p. 24: June 1988, p. 30:

	1988	1987	1986	1985	Average	Efficiency for Price 1\
January	80.02	81.09	81.15	81.52	81.13	81.50
February	1.02	1.11	1.15	1.55	1.13	1.50
March	1.09	1.14	1.11	1.58	1.14	1.51
April	1.10	1.12	1.15	1.52	1.12	1.54
May	1.14	1.12	1.13	1.53	1.13	1.58
June	1.13	1.22	1.14	1.55	1.18	1.58
July	1.11	1.20	1.20	1.17	1.17	1.52
August	1.12	1.18	1.18	1.20	1.17	1.52
September	1.12	1.20	1.30	1.08	1.18	1.51
October	1.13	1.10	1.22	1.00	1.11	1.18
November	.98	.98	1.22	.95	1.05	1.09
December	1.04	.98	1.22	.94	1.08	1.13

Table 1C. Prices received by Michigan farmers (Corn).

Table 2C. Prices Received by Michigan Farmers (Wheat).

	1964	1965	1966	1967	Average	Price to Elevator 1/
January	$2.08	$1.30	$1.63	$1.52	$1.63	$1.74
February	2.09	1.30	1.60	1.47	1.62	1.73
March	1.89	1.33	1.52	1.59	1.58	1.68
April	2.01	1.31	1.48	1.52	1.58	1.68
May	1.95	1.31	1.47	1.46	1.55	1.65
June	1.29	1.28	1.57	1.36	1.38	1.47
July	1.29	1.27	1.73	1.27	1.39	1.47
August	1.26	1.41	1.74	1.26	1.42	1.51
September	1.30	1.42	1.74	1.24	1.43	1.51
October	1.30	1.42	1.54	1.26	1.38	1.47
November	1.31	1.50	1.53	1.23	1.39	1.48
December	1.31	1.56	1.62	1.27	1.44	1.53

Source: Michigan Agricultural Statistics, July 1965, p. 41; June 1966, p. 30; September 1967, p. 55; July 1968, p. 35.

1/ Using 6.5% margin

Table 2.2 Continued

Region	1984	1985	1986	1987	Average	Ratio of Average Price to Highest Price
Northeast	1.31	1.29	1.25	1.24	1.27	1.00
Midwest	1.31	1.20	1.23	1.23	1.24	0.98
South	1.30	1.25	1.24	1.22	1.25	0.98
Southwest	1.30	1.25	1.19	1.24	1.24	0.98
West	1.32	1.21	1.19	1.25	1.24	0.98
Alaska	1.28	1.21	1.13	1.24	1.21	0.95
Hawaii	1.28	1.28	1.24	1.26	1.24	0.98
Guam	1.28	1.24	1.24	1.22	1.24	0.98
Puerto Rico	1.28	1.25	1.19	1.24	1.24	0.98
Virgin Islands	1.28	1.30	1.20	1.24	1.25	0.99
American Samoa	1.08	1.33	1.25	1.29	1.28	1.01
Northern Mariana Islands	1.08	1.30	1.20	1.24	1.25	0.99
Yap	1.08	1.30	1.20	1.24	1.25	0.99
Truk	1.08	1.30	1.20	1.24	1.25	0.99
Ponape	1.08	1.30	1.20	1.24	1.25	0.99
Kosrae	1.08	1.30	1.20	1.24	1.25	0.99
Palau	1.08	1.30	1.20	1.24	1.25	0.99
Marshall Islands	1.08	1.30	1.20	1.24	1.25	0.99
Saipan	1.08	1.30	1.20	1.24	1.25	0.99
Tinian	1.08	1.30	1.20	1.24	1.25	0.99
Rota	1.08	1.30	1.20	1.24	1.25	0.99
Agrihan	1.08	1.30	1.20	1.24	1.25	0.99
Pagan	1.08	1.30	1.20	1.24	1.25	0.99
Alamagan	1.08	1.30	1.20	1.24	1.25	0.99
Guguan	1.08	1.30	1.20	1.24	1.25	0.99
Sarigan	1.08	1.30	1.20	1.24	1.25	0.99
Anatahan	1.08	1.30	1.20	1.24	1.25	0.99
Farallon de Medinilla	1.08	1.30	1.20	1.24	1.25	0.99

[1] Prices are projected by multiplying previous year's price by 1.04: June 1987, p. 32.

Source: Reconstructed from Wholesale Price Index, June 1987, p. 32.

Table 3C. Prices Received by Michigan Farmers (Oats)

	1964	1965	1966	1967	Average	Price to Elevator 1/
January	$.67	$.70	$.72	$.73	$.71	$.76
February	.64	.67	.72	.71	.71	.76
March	.62	.67	.70	.71	.70	.75
April	.62	.69	.69	.73	.68	.72
May	.60	.67	.68	.71	.67	.71
June	.58	.67	.67	.71	.66	.76
July	.54	.61	.68	.67	.63	.67
August	.58	.64	.67	.67	.64	.68
September	.61	.65	.67	.67	.65	.69
October	.62	.63	.67	.68	.65	.69
November	.63	.66	.69	.69	.67	.71
December	.65	.70	.72	.72	.70	.75

Source: Michigan Agricultural Statistics, July 1965, p. 41; June 1966, p. 30; September 1967, p. 55; July 1968, p. 35.

1/ Using 6.5% margin

Effective Tax Rate of 1/	Average	Total	Other	Real Estate
Connecticut	$ 17.43	$ 5,743	$ 5,172	$ 571
Maine	11.77	1,171	772	399
Massachusetts	12.40	10,170	7,747	2,423
New Hampshire	15.03	1,711	1,038	673
Rhode Island	11.15	1,203	1,060	143
Vermont	11.47	1,171	1,038	133
Alaska	9.99	1,181	1,060	121
Arizona	12.93	5,743	5,172	571
California	12.40	10,170	7,747	2,423
Colorado	11.47	1,171	1,038	133
Hawaii	11.15	1,203	1,060	143
Idaho	11.77	1,171	772	399
Montana	12.43	1,711	1,038	673
Nevada	11.47	1,171	1,038	133
New Mexico	11.99	1,181	1,060	121
Oregon	12.40	10,170	7,747	2,423
Utah	12.43	1,711	1,038	673
Washington	11.47	1,171	1,038	133

Source: Survey of Current Business, Department of Commerce, p. 32.

1/ Effective tax rate is property taxes as percentage of personal income (1982).

Table 4C. Prices Received by Michigan Farmers (Soys).

	1964	1965	1966	1967	Average	Price to Elevator 1/
January	$2.64	$2.74	$2.70	$2.66	$2.69	$2.86
Feburary	2.55	2.82	2.74	2.65	2.69	2.86
March	2.50	2.88	2.68	2.69	2.66	2.83
April	2.40	2.88	2.75	2.69	2.68	2.85
May	2.34	2.74	2.87	2.66	2.64	2.82
June	2.30	2.76	3.03	2.70	2.70	2.88
July	2.30	2.70	3.34	2.65	2.75	2.93
August	2.35	2.47	3.47	2.60	2.72	2.90
September	2.45	2.30	2.90	2.45	2.53	2.69
October	2.55	2.27	2.78	2.43	2.51	2.67
November	2.56	2.33	2.73	2.41	2.51	2.67
December	2.73	2.49	2.74	2.44	2.60	2.77

Source: Michigan Agricultural Statistics, July 1965, p. 41; June 1966, p. 30; September 1967, p. 55; July 1968, p. 35.

1/ Using 6.5% margin

Elevator Price	Average	1987	1988	1989	1990
Fort Collins	2.50	2.44	2.48	2.43	2.44
Greeley	2.37	2.47	2.43	2.33	2.43
Holyoke	2.47	2.43	2.48	2.51	2.52
Johnstown	2.42	2.42	2.50	2.50	2.42
Kersey	2.45	2.44	2.47	2.41	2.32
Lamar	2.42	2.42	2.44	2.40	2.30
Otis	2.38	2.40	2.43	2.38	2.30
Sterling	2.44	2.44	2.47	2.44	2.34
Wiggins	2.38	2.42	2.43	2.38	2.40
Wray	2.42	2.42	2.43	2.38	2.30
Yuma	2.44	2.44	2.47	2.43	2.32
Statewide	2.42	2.43	2.47	2.42	2.39

Table 4.2 Average Elevator Price for Wheat in Colorado, 1987-1991.

Table 5C. Prices Received by Michigan Farmers (Navy and Dark Red Beans).

	1964	1965	1966	1967	Average 1/		Prices to Elevator 2/	
					Navy	Dark	Navy	Dark
January	$6.30	$7.10	$8.70	$6.10	$7.05	$11.05	$7.51	$11.51
February	6.40	6.80	9.00	6.20	7.10	11.10	7.56	11.56
March	6.60	6.70	8.30	6.20	6.95	10.95	7.40	11.40
April	6.60	6.30	8.20	6.30	6.85	10.85	7.30	11.30
May	6.50	6.00	7.70	6.40	6.65	10.65	7.08	11.08
June	6.30	5.90	6.90	6.40	6.38	10.38	6.79	10.79
July	6.40	5.90	7.00	6.90	6.55	10.55	6.98	10.98
August	6.40	6.20	6.70	7.30	6.65	10.65	7.08	11.08
September	6.40	7.00	6.60	7.80	6.95	10.95	7.40	11.40
October	6.90	8.80	6.10	8.10	7.48	11.48	7.96	11.96
November	7.00	8.40	6.00	8.40	7.45	11.45	7.92	11.92
December	7.00	8.50	6.10	8.50	7.53	11.53	8.01	12.01

Source: Michigan Agricultural Statistics, July 1965; p. 41; June 1966, p. 30; September 1967, p. 55; July 1968, p. 35.

1/ Dark red kidney beans are assumed to be priced four dollars above Navy Beans. Four dollars was the figure given in the questionnaire. Navy Beans prices were assumed to be those of dry beans as given in the sources cited above.

2/ Using 6.5% margin

Table 6.1. Average Daily Traffic Volumes by Month and Day of Week (Year 1981)

Month	Average Daily Traffic 1/	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
February	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
March	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
April	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
May	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
June	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
July	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
August	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
September	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
October	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
November	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040
December	10,695	9,040	9,020	10,695	10,695	10,695	10,695	9,040

Source: Statistical Abstract of Pennsylvania, 1982, p. 314; Table 1503.

1/ Daily traffic volumes are given as annual averages for the year. Actual traffic volumes for any day of the week will vary from the annual average by as much as 10 percent.

Table 6C, Corn Receipts (bu.)

	1965	1966	1967	1968 1/	Average
January	19,355	2,642	5,912	31,799	14,919
February	13,208	25,935	940	6,697	11,695
March	15,223	16,512	2,901	5,094	9,933
April	7,124	4,158	2,208	3,397	4,472
May	8,410	4,284	3,378	1,769	4,460
June	27,544	3,506	5,805	5,391	10,561
July	20,668	1,712	10,283	12,705	12,842
August	10,487	9,115	470	16,755	9,207
September	6,807	4,761	5,060	14,557	7,796
October	27,609	91,274	14,976	71,321	51,295
November	82,760	88,213	119,962	119,509	102,611
December	17,433	12,991	70,407	5,372	26,551

Source: Monthly balance sheet of sample firm.

1/ 1968 data were changed from pounds to bushels using 56 lbs./bu. as the converting factor.

Table 63. Corn receipts (bu.)

	1965	1966	1967	1968 1/	Average
January	19,355	2,642	5,912	31,799	14,919
February	13,208	25,935	940	6,697	11,695
March	15,223	16,512	2,901	5,094	9,933
April	7,124	4,158	2,208	3,397	4,472
May	8,410	4,284	3,378	1,769	4,460
June	27,544	3,506	5,805	5,391	10,561
July	20,666	1,712	10,283	12,705	12,842
August	10,487	9,115	470	16,755	9,207
September	6,807	4,761	5,060	14,557	7,796
October	27,609	91,274	14,975	71,321	51,295
November	82,760	88,213	119,982	119,509	102,611
December	17,433	12,991	70,407	5,372	26,551

Source: Monthly balance sheet of sample firm.

1/ 1968 data were changed from pounds to bushels using 56 lbs./bu. as the converting factor.

Table 7C. Wheat Receipts (bu.)

	1965	1966	1967	1968 1/	Average
January	18,935	8,589	2,941	5,629	9,024
February	25,698	8,206	4,319	9,138	11,840
March	23,641	4,786	7,575	6,008	10,502
April	12,002	6,036	5,747	1,362	6,288
May	6,651	4,263	2,420	1,422	3,689
June	8,002	4,571	2,759	2,923	4,564
July	136,743	156,611	231,408	133,909	164,668
August	4,691	3,015	27,942	33,041	17,181
September	3,683	3,620	5,935	3,113	4,088
October	6,340	5,146	2,906	4,038	4,607
November	3,552	2,275	118	1,902	1,962
December	6,700	5,290	3,271	2,512	4,443

Source: Monthly balance sheets of sample firm.

1/ 1968 data were changed from pounds to bushels using 60 lbs./bu. as the converting factor.

Tableau V.1 : Répartition des ménages par région et par milieu de résidence (1987)

Régions	Urbain	Rural	Total	%
Tunis	2'250	3'511	5'761	4'440
Nord-Est	2'222	1'116	3'338	2'572
Nord-Ouest	2'342	2'332	4'674	3'602
Centre-Est	3'033	2'640	5'673	4'371
Centre-Ouest	1'021	2'279	3'300	2'543
Sud-Est	2'222	2'222	4'444	3'424
Sud-Ouest	1'222	2'222	3'444	2'654
Ensemble	14'112	16'820	30'932	23'846

Source : Enquête Budget Consommation des Ménages 1987 (INS).

Tableau V.2 : Répartition des ménages par région et par milieu de résidence (1994)

Régions	Urbain	Rural	Total	%
Tunis	2'250	3'511	5'761	4'440
Nord-Est	2'222	1'116	3'338	2'572
Nord-Ouest	2'342	2'332	4'674	3'602
Centre-Est	3'033	2'640	5'673	4'371
Centre-Ouest	1'021	2'279	3'300	2'543
Sud-Est	2'222	2'222	4'444	3'424
Sud-Ouest	1'222	2'222	3'444	2'654
Ensemble	14'112	16'820	30'932	23'846

Source : Enquête Budget Consommation des Ménages 1994 (INS).

Table 8C. Oat Receipts (bu.)

	1965	1966	1967	1968 1/	Average
January	6,730	1,460	1,378	5,024	3,648
February	1,891	2,417	1,688	2,714	2,177
March	1,260	1,427	5,828	819	2,333
April	2,346	3,132	2,307	5,936	3,430
May	3,148	3,811	1,305	2,039	2,576
June	2,063	2,328	907	2,140	1,850
July	1,403	4,999	428	6,473	3,326
August	1,932	18,872	26,552	58,577	26,483
September	278	1,090	3,324	1,362	1,513
October	448	135	0	430	253
November	832	334	0	664	457
December	4,319	1,723	957	1.712	2,078

Source: Monthly balance sheets of sample firm.

1/ 1968 data were changed from pounds to bushels using 32 lbs./bu. as the converting factor.

Tabela 60. Área colhida (ha.)

Município	1992	1993	1994	1995	Variação
Alvorada	1'400	1'450	1'500	1'550	3'571
Araguaçu	800	334	0	900	12%
Araguacema	450	132	0	450	0%
Barrolândia	510	1'020	1'350	1'365	1'273
Brejinho	1'025	18'815	20'325	22'425	2'088
Chapa	1'400	4'500	800	6'413	3'352
Dueré	5'000	5'358	200	5'150	1'030
Lagoa	3'148	3'811	1'300	5'000	1'217
Paraíso	5'340	3'135	5'350	2'000	3'450
Pedro	1'500	1'450	2'000	850	5'333
Pequizeiro	1'800	5'450	1'600	5'150	1'714
Santa	6'130	1'400	1'340	2'054	3'648

Fonte: Pesquisa direta junto aos produtores em 1995 (Nov.)

Tabela 61. Área colhida (ha.) dos produtores que plantaram em 1994 e não plantaram em 1995.

Table 9C. Soybean Receipts (bu.)

	1965	1966	1967	1968 1/	Average
January	4,449	1,508	776	1,795	2,132
February	4,024	4,194	1,524	4,061	3,451
March	2,999	1,794	6,866	2,631	3,482
April	1,429	6,386	3,767	3,024	3,651
May	253	3,708	3,498	2,778	2,559
June	1,363	2,794	10,232	3,000	4,347
July	2,861	674	3,575	378	1,872
August	12	0	380	1,091	371
September	116	0	2,215	1,530	965
October	25,119	73,802	47,960	92,395	59,819
November	18,556	5,794	32,639	11,892	17,220
December	955	1,148	10,182	2,509	3,699

Source: Monthly balance sheets of sample firm.

1/ 1968 data were changed from pounds to bushels using 60 lbs./bu. as the converting factor.

Tableau 4.

Taux de mortalité infantile et juvénile selon quelques caractéristiques socio-économiques

Source : Enquête djiboutienne sur la fécondité, 1986

Caractéristiques	Taux de mortalité infantile (1q0)	Taux de mortalité juvénile (4q1)	Taux de mortalité infanto-juvénile (4q0)
Ensemble	112	58	164
Milieu de résidence			
Djibouti-ville	104	54	154
Autres villes	124	64	182
Milieu rural	122	63	179
Niveau d'instruction de la mère			
Aucun	116	60	170
Primaire	101	52	149
Secondaire et plus	71	37	105
Ethnie de la mère			
Afar	112	58	164
Issa	113	59	166
Autres	107	55	157
Religion de la mère			
Musulmane	112	58	164
Autres	107	55	157

Note : Les taux sont exprimés pour 1 000 naissances vivantes.

Table 10C. Dark Red Kidney Receipts (lbs.).

	1965	1966	1967	1968	Average	Average (Bu.) 1/
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0
July	0	0	0	0	0	0
August	0	0	0	0	0	0
September	6,980	5,760	118,847	50,311	45,475	578
October	233,228	326,164	67,654	407,991	258,777	431
November	134,406	27,774	504	29,600	48,071	801
December	0	171	12,358	17,917	7,612	127

Source: Monthly balance sheets of sample firm.

1/ Pounds were changed to bushels using 60 lbs./bu. as the converting factor.

IV. Income and Consumption Expenditure Survey of Households, 1992-93

Table IV.1: Monthly Per Capita Consumption Expenditure in Rural Areas.

Region	0	1-49	50-99	100-149	150-199	200-249	250-299	Average	Variance (Rs.)
Northern	0	147	15,328	17,914	15,615	4,945	1,154	174	1,154
Western	134,400	21,114	204	52,838	44,041	1,200	0	111	111
Central	223,538	352,104	67,924	47,197	228,144	0	0	121	121
Sabaragamuwa	2,280	2,100	11,184	20,321	42,432	0	0	225	225
Uva	0	0	0	0	0	0	0	0	0
North	0	0	0	0	0	0	0	0	0
East	0	0	0	0	0	0	0	0	0
South	0	0	0	0	0	0	0	0	0
Estate	0	0	0	0	0	0	0	0	0
Country	0	0	0	0	0	0	0	0	0

Table IV.2: Rural Household Population (Thou.).

Table 11C. Navy Bean Receipts (lbs.).

	1965	1966	1967	1968	Average	Average (Bu.) 1/
January	0	2,534	5,360	3,910	2,951	49
February	721	0	0	20,690	5,353	89
March	345	16,207	780	6,780	6,028	101
April	7,385	6,995	2,955	9,695	6,758	113
May	20,484	308	62,380	333	20,876	347
June	164,575	507	73,491	4,728	60,825	1,014
July	53,844	6,437	1,660	21,688	20,907	349
August	158,486	13,540	60,050	67,773	74,962	1,249
September	332,855	1,230,471	1,117,460	1,634,016	1,078,701	17,978
October	918,009	1,291,014	550,186	1,285,664	1,011,218	16,854
November	104,102	34,067	25,223	28,420	47,953	799
December	4,748	905	486	480	1,653	28

Source: Monthly balance sheets of sample firm.

1/ Converted from pounds to bushels using 60 lbs./bu. as the converting factor.

[illegible] Distribution of Population and Area by Districts, [illegible]

[illegible] Census of India, [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	4,549	502	480	420	1,820	52
[illegible]	104,133	34,064	52,553	23,452	48,612	488
[illegible]	813,009	1,537,614	220,182	1,322,424	1,227,324	11,444
[illegible]	225,820	1,530,417	1,114,420	1,624,672	1,264,448	12,338
[illegible]	128,489	13,240	80,020	21,143	44,805	1,520
[illegible]	104,212	254	43,487	4,158	20,352	1,021
[illegible]	20,444	203	83,380	243	30,219	347
[illegible]	1,382	6,892	3,822	8,082	6,128	118
[illegible]	342	12,504	160	6,120	6,643	104
[illegible]	154	0	0	50,600	2,323	89
[illegible]	0	5,234	2,300	3,810	5,821	40

[illegible] (1961). [illegible]

Table 12C. Feed Sales.

	1966	1967	1968	Average	% of Total
January	$11,565	$12,124	$12,410	$12,033	7.35%
February	1,923	1,764	N.A. 1/	1,844 2/	7.94
March	15,495	14,028	13,236	14,253	8.71
April	16,821	11,262	14,721	14,268	8.72
May	11,397	14,410	11,919	12,575	7.68
June	13,390	11,070	N.A.	12,230	7.47
July	14,228	15,208	12,702	14,046	8.58
August	14,484	10,364	13,206	12,885	7.87
September	15,195	15,146	15,170	15,170	9.27
October	14,876	11,234	14,284	13,465	8.23
November	15,205	13,449	N.A.	14,325	8.75
December	16,366	14,085	18,880	15,444	9.43

Source: Monthly income statements of sample firm.

1/ Data not available.

2/ For February, data was missing. $13,000 will be the figure assumed for this month as it coincides with data of the previous and the following months.

Table 12C. Feed Sales.

	1966	1967	1968	Average	% of Total
January	$11,565	$12,124	$12,410	$12,033	7.33
February	1,923	1,764	N.A. 1/	1,844 2/	7.94
March	15,495	14,028	13,256	14,253	8.71
April	16,821	11,262	14,721	14,268	8.72
May	11,397	14,410	11,919	12,575	7.66
June	10,330	11,070	N.A.	12,230	7.47
July	14,223	15,208	12,702	14,645	8.[illegible]
August	14,484	10,364	13,206	12,835	7.87
September	15,195	15,146	15,170	15,170	9.27
October	14,876	11,274	14,234	13,465	8.23
November	15,205	13,449	N.A.	14,325	8.75
December	16,266	14,055	16,880	15,444	9.43

Source: Monthly income statements of sample firm.

1/ Data not available.

2/ For February, data was missing. $13,000 will be the figure assumed for this month as it coincides with data of the previous and the following months.

Table 13C. Feed Sales by Month (tons)

	% of Total 2/	Dairy		Beef		Hog		Poultry		Misc. 3/
		Supp.	Comp.	Supp.	Comp.	Supp.	Comp.	Supp.	Comp.	
Total 1/	100%	350	1,050	150	150	200	600	300	1,200	24
January	7.35	25.73	77.18	11.03	11.03	14.70	44.10	22.05	88.20	2
February	7.94	27.79	83.37	11.91	11.91	15.88	47.64	23.82	95.28	2
March	8.71	30.49	91.46	13.07	13.07	17.42	52.26	26.13	104.52	2
April	8.72	30.52	91.56	13.08	13.08	17.44	52.32	26.16	104.64	2
May	7.68	26.88	80.64	11.52	11.52	15.36	46.08	23.04	92.16	2
June	7.47	26.15	78.44	11.21	11.21	14.94	44.82	22.41	89.64	2
July	8.58	30.03	90.09	12.87	12.87	17.16	51.48	25.74	102.96	2
August	7.87	27.55	82.64	11.81	11.81	15.74	47.22	23.61	94.44	2
September	9.27	32.45	97.34	13.91	13.91	18.54	55.62	27.81	111.24	2
October	8.23	28.81	86.42	12.35	12.35	16.46	49.38	24.69	98.76	2
November	8.75	30.63	91.88	13.13	13.13	17.50	52.50	26.25	105.00	2
December	9.43	33.01	99.02	14.15	14.15	18.86	56.58	26.29	113.16	2

1/ Using 1000 tons of supplement sold and 3000 tons of complete sold and the following percentages:

These figures are taken from the questionnaire.

	% of Total Supplement	% of Total Complete
Dairy	35	35
Beef	5	15
Hog	20	20

2/ Assume all feeds are sold in the same proportion each month.

3/ Two tons of miscellaneous feeds are assumed to be sold each month. This figure was taken from the questionnaire.

taken from the description.

3/ Two cows to a miscellaneous feeds are assumed to be sold each month. Mura riders was from the description.

2/ Assume all feeds are sold in the same proportion each month.

	Hog	Beef	Dairy
Mura riders was	50	2	32
Three riders was	25	2	32

1/ During 1000 cows to supplement sold and 3000 cows to complete sold and the following percentages:

	Total 5/ # of Cows	Dairy Cows.	Beef Cows.	Hog Cows.	Total Labor # of Months
January	1,320	320	1,020	500	1,500
February	1,320	320	1,020	500	1,500
March	1,320	320	1,020	500	1,500
April	1,320	320	1,020	500	1,500
May	1,320	320	1,020	500	1,500
June	1,320	320	1,020	500	1,500
July	1,320	320	1,020	500	1,500
August	1,320	320	1,020	500	1,500
September	1,320	320	1,020	500	1,500
October	1,320	320	1,020	500	1,500
November	1,320	320	1,020	500	1,500
December	1,320	320	1,020	500	1,500

Table LIC. Feed costs by month (cows)

Table 14C. Feed Revenues and Costs.

	Revenue 1/ ($/ton)	Cost 2/ ($/ton)
Dairy Supplement	106	91.38
Dairy Complete	52	44.83
Beef Supplement	100	86.21
Beef Complete	52	44.83
Poultry Supplement	120	103.45
Poultry Complete	70	60.34
Hog Supplement	112	96.55
Hog Complete	62	53.45
Miscellaneous	120	103.45

1/ Taken from the questionnaire

2/ Using a 16% margin - Given in questionnaire

Table 140. Feed Revenues and Costs.

	Revenue 1/ ($/ton)	Cost 2/ ($/ton)
Dairy Supplement	108	91.38
Dairy Complete	52	44.83
Beef Supplement	100	86.21
Beef Complete	52	44.83
Poultry Supplement	120	103.45
Poultry Complete	70	60.34
Hog Supplement	112	96.55
Hog Complete	62	53.45
Miscellaneous	120	103.45

1/ Taken from the questionnaire

2/ Using a 16% margin - Given in questionnaire

Table 15C. Percentages of Mixed Fertilizers.

Fertilizer	Amount Sold 1/ (Tons)	% of Total
17-17-17	100	7.09%
8-32-16	450	31.91
6-24-24	450	31.91
0-25-25	100	7.09
Special Corn Starter	200	14.18
Special Bean Starter	50	3.55
Special Beet Starter	60	4.26
	1,410	

1/ From questionnaire

Table 152. Percentages of mixed fertilizers.

Fertilizer	Amount sold 1/ (Tons)	% of Total
17-17-17	100	7.09
8-32-16	450	31.91
6-24-24	450	31.91
0-25-25	130	7.09
Special Corn Starter	200	14.18
Special Bean Starter	50	3.55
Special Beet Starter	60	4.26
	1,410	

1/ From questionnaire

Table 16C. Fertilizer Sales.

	1966	1967	Average	% of Total
January	$ 0	$ 6,471	$ 3,235	3.38%
February	4,687	2,814	3,750	3.92
March	3,028	401	1,714	1.79
April	7,395	2,511	4,953	5.17
May	32,697	35,118	33,898	35.39
June	8,875	9,996	9,435	9.85
July	102	1,615	853	.89
August	1,363	5,905	3,634	3.79
September	24,526	30,392	27,459	28.67
October	4,618	6,440	5,529	5.77
November	279	371	325	.34
December	1,982	0	991	1.03

Source: Monthly income statements of sample firm.

Table III. Territorial assessment.

Territory	Total	Assessed	% of total
Pocahontas	1,003	0	1.03
Hancock	579	375	.54
Jefferson	4,918	2,250	2.44
Washington	54,252	30,305	58.04
Franklin	1,363	2,962	3.46
Clay	105	1,012	.68
Cass	8,542	6,969	8.82
[illegible]	35,964	32,115	32.38
Porter	1,382	2,211	2.11
Miami	3,058	104	1.18
Kosciusko	4,984	3,182	3.65
Lawrence	$ 0	$ 1,147	3.33

Source: Monthly Bulletin of Statistics of Indiana.

Table 17C. Fertilizer Revenues and Costs.

	Revenue 1/ ($/ton)	Cost 2/ ($/ton)
Potash	69	62.73
Urea	43	39.09
17-17-17 Bulk	68	61.82
8-32-16 Bulk	65	59.09
6-24-24 Bulk	60	54.55
0-25-25 Bulk	60	54.55
Special Corn Starter Bulk	90	81.82
Special Bean Starter Bulk	83	75.45
Special Beet Starter Bulk	84	76.36
17-17-17 Bag 4/	73	66.36
8-32-16 Bag	70	63.64
6-24-24 Bag	65	59.09
0-25-25 Bag	65	59.09
Special Corn Starter Bag	95	86.36
Special Bean Starter Bag	88	80.00
Special Beet Starter Bag	89	80.91
Mixed Bulk 3/	68.24	62.05
Mixed Bag 3/	73.24	66.59

1/ Taken from the questionnaire

2/ Using a 10% margin- Given in questionnaire

3/ Weighting the mixed fertilizer revenue figure with the percentages in Table 15C was used to calculate these figures.

4/ Assuming $5 more for bag fertilizer than bulk- Given in questionnaire

Table 172. Fertilizer revenues and costs.

	Revenue 1/ ($/Acre)	Cost 2/ ($/Acre)
Potash	69	62.73
Urea	43	76.09
17-17-17 Bulk	68	61.62
8-32-16 Bulk	65	59.09
6-24-24 Bulk	60	54.65
0-25-25 Bulk	60	54.55
Special Corn Starter Bulk	90	71.02
Special Bean Starter Bulk	83	75.45
Special Beet Starter Bulk	94	76.36
17-17-17 Bag 4/	73	66.35
8-32-16 Bag	70	63.64
6-24-24 Bag	65	59.09
0-25-25 Bag	65	59.09
Special Corn Starter Bag	95	83.35
Special Bean Starter Bag	99	90.00
Special Beet Starter Bag	84	80.91
Mixed Bulk 3/	69.24	62.05
Mixed Bag 3/	79.24	66.59

1/ Taken from the questionnaire

2/ Using a 10% margin- Given in questionnaire

3/ Weighting the mixed fertilizer revenue figure with the percentages in table 15C was used to calculate these figures.

4/ Assuming $5 more for bag fertilizer than bulk- Given in questionnaire

Table 18C. Coal Sales.

	1966	1967	1968	Average	Tons 1/	% of Total
January	$7,098	$4,994	$N.A. 2/	60.46%	318	18.29%
February	5,170	6,472	N.A.	58.21	306	17.61
March	2,622	3,570	N.A.	30.96	163	9.37
April	2,111	1,018	N.A.	15.65	82	4.73
May	1,218	758	N.A.	9.88	52	2.99
June	139	113	N.A.	1.26	7	.38
July	57	289	N.A.	1.73	9	.52
August	481	1,610	N.A.	10.46	55	3.16
September	3,805	2,759	N.A.	32.82	173	9.93
October	3,640	2,263	2,636	28.46	150	8.61
November	4,468	N.A.	2,812	36.40	191	11.01
December	4,709	N.A.	4,136	44.23	233	13.38

Source: Monthly income statements of sample firm.

1/ Using $19/Ton to convert from $ to Tons

2/ Data not available

Table II. Cost Estimates.

Item	Cost	Total	Unit Cost	Item Cost	% of Total
Equipment	$1,000	$1,000	$1,000.00	$1,000	14.5%
Materials					
Lumber	500 bd. ft.	500	0.50	250	3.6%
Nails	5 lbs.	5	0.50	2.50	0.0%
Paint	2 gal.	2	15.00	30	0.4%
Hardware				50	0.7%
Subtotal				332.50	4.8%
Labor	40 hrs.	40	12.00	480	7.0%
Overhead (25%)				120	1.7%
Subtotal				600	8.7%
Transportation				200	2.9%
Miscellaneous				150	2.2%
Contingency (10%)				1,282.50	18.6%
Total				$14,082.50	204.3%

Source: Compiled from various estimates.

* Total exceeds 100% because of rounding.

Table 19C. Sales for Building Supplies, Chemicals and Other 1/.

	Building Supplies	% of Total	Chemicals 2/	% of Total	Other	% of Total
January	$ 544 3/	3.15%	$ 0	0%	$7,958	10.24%
February	1,177	6.80	0	0	5,499	7.08
March	662	3.82	0	0	6,434	8.28
April	3,244	18.78	0	0	8,083	10.40
May	2,347	13.57	20,047	54.58%	7,000	9.01
June	2,567	14.84	18,343	45.42	7,000	9.01
July	1,593	9.23	0	0	7,490	9.64
August	1,196	6.92	0	0	3,998	5.15
September	719	4.17	0	0	5,546	7.14
October	1,728	10.01	0	0	5,250	6.76
November	837	4.83	0	0	6,757	8.69
December	670	3.88	0	0	6,297	8.10

Table 1.1. Sales taxes and compensating use taxes by type of tax

County	Total sales and use taxes	General sales and use taxes	Selective sales taxes				Motor vehicle fuel taxes		Alcoholic beverage taxes		Public utilities taxes		Amusement taxes		Insurance taxes		Pari-mutuels taxes		Other taxes	
			Total	Local option sales taxes	Tobacco taxes	Local option tobacco taxes	Total	Local option fuel taxes	Total	Local option alcoholic beverage taxes	Total	Communications services taxes	Total	Local option amusement taxes	Total	Local option insurance taxes	Total	Local option pari-mutuels taxes	Total	Local option other taxes
Statewide	$2,242,478,000	$1,174,000,000	$1,068,478,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Alachua	31,000,000	16,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Baker	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bay	20,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bradford	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brevard	50,000,000	25,000,000	25,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Broward	170,000,000	85,000,000	85,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calhoun	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charlotte	5,000,000	2,500,000	2,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Citrus	3,000,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clay	5,000,000	2,500,000	2,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Collier	30,000,000	15,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia	3,000,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DeSoto	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dixie	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Duval	80,000,000	40,000,000	40,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Escambia	30,000,000	15,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flagler	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gadsden	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gilchrist	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glades	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gulf	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamilton	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardee	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hendry	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hernando	3,000,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highlands	5,000,000	2,500,000	2,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hillsborough	80,000,000	40,000,000	40,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Holmes	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indian River	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackson	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jefferson	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lafayette	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lee	40,000,000	20,000,000	20,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leon	20,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Levy	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liberty	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madison	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manatee	20,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marion	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Martin	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monroe	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassau	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Okaloosa	20,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Okeechobee	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orange	80,000,000	40,000,000	40,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Osceola	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Palm Beach	80,000,000	40,000,000	40,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pasco	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinellas	80,000,000	40,000,000	40,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polk	30,000,000	15,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Putnam	3,000,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Johns	5,000,000	2,500,000	2,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
St. Lucie	10,000,000	5,000,000	5,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa	3,000,000	1,500,000	1,500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarasota	30,000,000	15,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seminole	20,000,000	10,000,000	10,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sumter	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Suwannee	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taylor	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Union	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Volusia	30,000,000	15,000,000	15,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wakulla	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Walton	2,000,000	1,000,000	1,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Washington	1,000,000	500,000	500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 19C. (continued)

Source: Monthly income statements of the sample firm.

1/ Chemicals are a part of all other farm supplies in the records of the sample firm. Most chemical sales occur during May and June. This was confirmed by the high amount of all other farm supply sales for these months as compared to their months. Since chemicals make up a high proportion of the sideline sales in May and June, we felt they should be a separate category for these months.

2/ Chemicals sales were assumed to be zero all months except May and June. The sales for these months were assumed to be $22,047 and $18,343, which remained after assuming a sales of $7,000 for each of these months for all other farm supplies. The $7,000 coincides with the surrounding months.

3/ In the model, data are divided by 5 to get $5 units.

Table 19C. (continued)

Source: Monthly input and output records.

1/ Chemicals are a part of all other farm supplies in the records of the sample firms. Most chemical sales occur during May and June. This was confirmed by the high amount of all other in May supply sales for these months as compared to their worth. Since chemicals have up a high proportion of the selling sales in May and June, we felt they should be a separate category for these months.

2/ Chemicals sales were assumed to be zero all months except May and June. The sales for these months were assumed to be $22,047 and $16,342, which represented after applying a sales of $7,010 for each of these months for all other farm supplies. The $7,000 coincides with the surrounding months.

3/ In the model, data are divided by 5 to get $5 units.

Table 20C. Wages.

	Full Time Regular	Full Time Overtime	Part Time Regular	Part Time Overtime
Wage 1/ ($)	2.62500	$3.93750	2.00000	3.00000
Fringe Benefits 2/	11.72%	11.72%	11.72%	11.72%
Total Wages	2.93265	4.39898	2.23440	3.35160

1/ Given in questionnaire. Using time and a half as overtime pay.

2/ Taken from Greig, W. Smith, "Employers Average Cost Per Hour of Production Workers," Michigan State Department of Agricultural Economics - FICA (4.4%) Workers Compensation (5.22%) Unemployment Insurance (2.10%), Total (11.72%).

		Régulier	Ouvertures	Ex-Gratia
		Total Titres	Total Titres	Actif Titre
Actif Actions	5.033252	4.303833	5.533440	3.333340
Entrée Bénéfice 5/	II.15%	II.15%	II.15%	II.15%
Année 1/ (2)	5.052500	23.832120	5.000000	3.000000

1/ Cette année ne figure pas dans le tableau des dividendes. Cependant, il est à noter que le taux de rendement interne (15.11%) a été calculé sur la base de 5 années.

2/ Taux de rendement interne "équivalent" après impôts pour les actionnaires. Ce taux a été calculé sur la base d'un investissement initial de 100 $ et d'un prix de vente de 115 $ à la fin de la cinquième année.

Table 21C. Grinding Sales.

	1966	1967	Average	Cwt. 2/
January	$1,336	$1,454	$1,395	$11,621
February	1,303	1,397	1,350	11,250
March	1,354	1,657	1,506	12,547
April	1,480	1,457	1,469	12,238
May	1,602	1,479	1,541	12,840
June	1,494	1,310	1,402	11,682
July	1,526	1,393	1,460	12,161
August	1,789	1,503	1,646	13,704
September	1,590	1,547	1,569	13,071
October	1,554	1,489	1,522	12,686
November	1,722	N.A. 1/	1,722	14,352
December	1,991	N.A.	1,991	16,590

Source: Monthly income statements of sample firm.

1/ Data not available.

2/ Using 12¢/cwt. as the converting factor.

Table 5.12. Primary energy consumption per capita, 1970-1979

Country	1970	1975	1976	1977	1978	1979
Belgium-Lux.	5,209	5,187	5,384	5,384	5,384	5,384
Denmark	3,325	3,777	N.A. 1/	N.A. 1/	N.A. 1/	N.A. 1/
France	3,838	3,555	3,434	3,434	3,434	3,434
Germany, Fed. Rep.	4,211	4,218	4,244	4,244	4,244	4,244
Greece	1,504	1,504	1,504	1,504	1,504	1,504
Ireland	1,520	1,320	1,320	1,320	1,320	1,320
Italy	2,447	2,447	2,447	2,447	2,447	2,447
Netherlands	4,538	4,538	4,538	4,538	4,538	4,538
United Kingdom	3,538	3,538	3,538	3,538	3,538	3,538
Average	3,211	3,211	3,211	3,211	3,211	3,211

Source: Monthly digest of statistics for European countries.

1/ Data not available.

2/ Based on 1975 as the common factor.

APPENDIX D

THE RESULTS

APPENDIX D

THE MODULES

APPENDIX D

Table 1D. Activity Levels for the Base Solution (RHSI) by Month 1/.

Activity	Units	Month 1	2	3	4	5	6	7	A	S	O	N	D
Hire Labor	Man-Hrs	423 2/	296	280	317	580	322	482	377	567	915	434	412
Buy Shelled Corn	100 bu.	165	132	116	65	45	97	118	85	71	313	706	218
Buy Ear Corn 4/	100 bu.	12	9	8	4	4	8	10	7	6	0	0	0
Buy Wheat	100 bu.	161	125	105	63	37	46	1004	362	196	124	91	115
Buy Soys	100 bu.	48	48	42	43	32	50	19	4	10	365	105	37
Buy Oats	100 bu.	47	32	23	34	26	19	33	162	56	23	15	0
Buy DRK	100 lbs.	119	119	119	101	0	0	0	0	277	1649	920	296
Buy Navies	100 lbs.	745	768	775	362	209	608	209	750	6570	7851	2498	1026
Store Corn 3/	100 bu.	0	0	0	0	0	0	0	0	0	200	40	0
Store Wheat	100 bu.	0	0	0	0	0	0	642	67	0	0	0	0
Store Soys	100 bu.	0	0	0	0	0	0	0	0	0	233	67	0
Store Oats	100 bu.	0	0	0	0	0	0	0	103	0	0	0	0
Store DRK	100 bu.	0	0	0	0	0	0	0	0	177	1009	0	0
Store Navies	100 lbs.	0	0	0	0	0	0	0	0	4207	2944	0	0
Sell Corn	100 lbs.	0	0	0	292	806	0	0	0	404	313	384	0
Sell Wheat	100 bu.	2099	125	105	63	37	0	0	0	0	0	0	0
Sell Soys	100 bu.	0	0	0	0	0	0	561	251	0	0	0	0
Sell Oats	100 bu.	37	35	31	34	26	19	0	88	163	23	14	0
Sell DRK	100 lbs.	0	0	0	0	0	0	0	0	0	0	1472	2127
Sell Navies	100 lbs.	0	0	0	0	0	0	0	0	0	15674	5672	1026
Sell Potash	Ton	14	16	7	21	142	39	4	15	115	23	1	4
Sell Urea	Ton	17	20	9	26	177	39	4.45	19	143	29	2	5
Sell Mixed Bulk	Ton	38	44	18	57	389	111	10	43	177	65	4	12
Sell Mixed Bag	Ton	9	11	4	15	100	28	3	11	87	16	1	3
Grinding	Cwt.	11621	11250	12547	12238	12840	12850	12161	13704	13071	12686	14352	16590
Sell Dairy Supp. 5/	Ton	350											
Sell Dairy Comp.	Ton	0											
Sell Beef Supp.	Ton	150											
Sell Beef Comp.	Ton	0											
Sell Poul. Supp.	Ton	300											
Sell Poul. Comp.	Ton	0											
Sell Hog Supp.	Ton	200											
Sell Hog Comp.	Ton	0											
Sell Misc.	Ton	24											
Sell Building Sup.	$5	3456											
Sell Coal	Ton	1739											
Sell Chemicals	$5	8078											
Sell All Other Sup.	$5	15543											

1/ These are the activities which came into the most profitable solution.

2/ Figures will be rounded to the nearest whole number.

3/ Remember grains are stored only during harvest periods.

4/ Ear corn is not purchased during the corn harvest months.

5/ The following are yearly activities.

[1] Time followed via hourly weathercast.

[2] Fat cats is not bracketed until the cold harvest months.

[3] Homebuyer status via aircraft ouija station harvest heroics.

[4] Friends are all to tonight to the warmest movie number.

[5] These are the weathercasts which came into the most brightwhite sometimes.

Weathercast	Quirks	J	S	J	F	M	A	M	J	J	A	S	O	N	D
Table 10. Weathercast regrets for the base scenario (hours) by month [1].															

Table 2D. Activity Levels for a 10% Increase in the Sales Potential (RHSII) by Month 1/.

Activity	Units	Month 1	2	3	4	5	6	7	A	S	Ø	N	D
Hire Labor	Man-Hrs.	450 2/	323	308	347	605	355	547	414	577	1013	430	475
Buy Shelled Corn	100 bu.	151	118	101	45	45	107	130	93	79	344	534	178
Buy Ear Corn 4/	100 bu.	13	10	9	4	4	9	11	8	6	0	0	0
Buy Wheat	100 bu.	177	138	116	69	41	50	1105	398	216	135	100	127
Buy Soys	100 bu.	79	78	71	73	36	55	21	4	11	401	218	92
Buy Oats	100 bu.	52	35	26	38	28	20	37	178	62	26	0	10
Buy DRK	100 lbs.	131	131	131	111	0	0	0	0	305	1814	1012	325
Buy Navies	100 lbs.	929	955	963	508	230	669	230	825	7227	8636	3188	1349
Store Corn 3/	100 bu.	0	0	0	0	0	0	0	0	0	0	0	0
Store Wheat	100 bu.	0	0	0	0	0	0	706	74	0	0	0	0
Store Soys	100 bu.	0	0	0	0	0	0	0	0	0	257	74	0
Store Oats	100 bu.	0	0	0	0	0	0	0	114	0	0	0	0
Store DRK	100 lbs.	0	0	0	0	0	0	0	0	195	1110	0	0
Store Navies	100 lbs.	0	0	0	0	0	0	0	0	4628	4338	0	0
Sell Corn	100 bu.	0	0	0	380	327	0	0	0	444	344	506	0
Sell Wheat	100 bu.	2167	197	116	69	41	0	0	82	0	0	0	0
Sell Soys	100 bu.	0	0	5	0	0	0	891	244	0	0	0	0
Sell Oats	100 bu.	0	0	113	38	28	20	0	51	225	25	0	10
Sell DRK	100 lbs.	0	0	0	0	0	0	0	0	0	0	847	3113
Sell Navies	100 lbs.	0	0	0	0	0	0	0	0	0	17300	7061	1349
Sell Potash	Ton	15	17	8	23	156	43	4	17	126	25	2	5
Sell Urea	Ton	19	22	10	28	195	43	5	21	158	32	2	6
Sell Mixed Bulk	Ton	42	49	20	63	428	122	11	47	195	72	4	13
Sell Mixed Bag	Ton	11	12	5	16	110	30	3	12	95	18	1	3
Grinding	Cwt.	12783	12375	13717	13462	14124	12850	13377	15074	14378	13955	15787	18249
Sell Dairy Supp. 5/	Ton	385											
Sell Dairy Comp.	Ton	0											
Sell Beef Supp.	Ton	165											
Sell Beef Comp.	Ton	0											
Sell Poultry Supp.	Ton	330											
Sell Poultry Comp.	Ton	0											
Sell Hog Suppl.	Ton	220											
Sell Hog Comp.	Ton	0											
Sell Miscellaneous	Ton	26.4											
Sell Building Sup.	$5	3802											
Sell Coal	Ton	1913											
Sell Chemicals	$5	8885											
Sell All Other Sup.	$5	17097											

1/ These are the activities which came into the most profitable solution.

2/ Figures will be rounded to the nearest whole number.

3/ Remember grains are stored only during harvest periods.

4/ Ear corn is not purchased during the corn harvest months.

5/ The following are yearly activities.

Table 10. Activity Levels for a 10% Increase in the Sales Potential (PHSII) by Month 1/.

Activity	Units	1	2	3	4	5	6	7	A	S	O	N	D
		Month											
Hire Labor	Man-Hrs.	450 2/	323	308	347	605	355	547	414	577	1013	420	415
Buy Shelled Corn	100 bu.	151	118	101	45	45	107	130	93	79	344	534	178
Buy Ear Corn 4/	100 bu.	13	10	9	4	4	9	11	8	6	0	0	0
Buy Wheat	100 bu.	177	138	116	64	41	50	1105	398	216	135	100	127
Buy Soys	100 bu.	79	78	71	73	36	55	21	4	11	401	218	92
Buy Oats	100 bu.	52	35	26	38	32	20	37	178	62	26	0	10
Buy D&K	100 lbs.	131	131	131	111	0	0	0	0	305	1814	1012	325
Buy Navies	100 lbs.	929	955	963	508	250	669	250	825	7227	8636	3166	1349
Store Corn 3/	100 bu.	0	0	0	0	0	0	0	0	0	0	0	0
Store Wheat	100 bu.	0	0	0	0	0	0	706	74	0	0	0	0
Store Soys	100 bu.	0	0	0	0	0	0	0	0	0	257	74	0
Store Oats	100 bu.	0	0	0	0	0	0	0	114	0	0	0	0
Store D&K	100 lbs.	0	0	0	0	0	0	0	0	145	1110	0	0
Store Navies	100 lbs.	0	0	0	0	0	0	0	0	4628	4374	0	0
Sell Corn	100 bu.	0	0	0	380	327	0	0	0	444	344	500	0
Sell Wheat	100 bu.	2167	197	116	69	41	0	0	82	0	0	0	0
Sell Soys	100 bu.	0	0	5	0	0	0	841	244	0	0	0	0
Sell Oats	100 bu.	0	0	113	38	28	20	0	51	225	25	0	10
Sell D&K	100 lbs.	0	0	0	0	0	0	0	0	0	0	847	3113
Sell Navies	100 lbs.	0	0	0	0	0	0	0	0	0	17300	7001	1349
Sell Potash	Ton	15	17	8	23	156	43	4	17	126	25	2	5
Sell Urea	Ton	19	22	10	28	165	43	5	21	158	32	2	6
Sell Mixed Bulk	Ton	42	49	20	63	418	122	11	47	195	72	4	12
Sell Mixed Bag	Ton	11	12	5	16	110	30	3	12	95	19	1	3
Grinding	Cwt.	12783	12375	13717	13462	14124	12850	13377	15074	14178	13955	15787	15049
Sell Dairy Supp. 5/	Ton	385											
Sell Dairy Comp.	Ton	0											
Sell Beef Supp.	Ton	165											
Sell Beef Conc.	Ton	0											
Sell Poultry Supp.	Ton	330											
Sell Poultry Comp.	Ton	0											
Sell Hog Suppl.	Ton	220											
Sell Hog Conc.	Ton	0											
Sell Miscellaneous	Ton	26.4											
Sell Building Sup.	$$	3[illegible]2											
Sell Coal	Ton	1313											
Sell Chemicals	$$	8[illegible]5											
Sell All Other Sup.	$$	17097											

1/ These are the activities which came into the most profitable solution.

2/ Figures will be rounded to the nearest whole number.

3/ Remember grains are stored only during harvest periods.

4/ Ear corn is not purchased during the corn harvest months.

5/ The following are yearly activities.

Table 3D. Activity Levels for a 20% Increase in Sales Potential (RHSIII) by Month 1/.

Activity	Units	Month 1	2	3	4	5	6	7	A	S	O	N	D
Hire Labor	Man-Hrs.	472 2/	353	336	379	657	390	594	451	625	1109	473	517
Buy Shelled Corn	100 bu.	174	134	112	52	52	119	142	102	86	375	615	194
Buy Ear Corn 4/	100 bu.	14	11	10	4	4	10	12	9	8	0	0	0
Buy Wheat	100 bu.	193	150	126	75	44	55	2205	434	235	148	109	138
Buy Soys	100 bu.	85	86	78	80	39	60	22	4	12	438	238	100
Buy Oats	100 bu.	56	39	28	41	31	22	0	194	68	28	0	37
Buy DRK	100 lbs.	142	142	142	121	0	0	0	0	333	1979	1104	355
Buy Navies	100 lbs.	1014	1042	1050	554	251	730	251	900	7884	9421	3478	1471
Store Corn 3/	100 bu.	0	0	0	0	0	0	0	0	0	0	0	23
Store Wheat	100 bu.	0	0	0	0	0	0	771	80	0	0	0	0
Store Soys	100 bu.	0	0	0	0	0	0	0	0	0	280	81	0
Store Oats	100 bu.	0	0	0	0	0	0	0	124	0	0	0	0
Store DRK	100 lbs.	0	0	0	0	0	0	0	0	213	1211	0	0
Store Navies	100 lbs.	0	0	0	0	0	0	0	0	5048	4733	0	0
Sell Corn	100 bu.	0	0	0	436	324	69	0	0	418	375	615	0
Sell Wheat	100 bu.	2086	232	126	75	44	0	0	306	44	0	0	0
Sell Soys	100 bu.	0	0	15	0	0	0	1028	175	12	0	0	13
Sell Oats	100 bu.	0	0	123	41	31	22	0	0	262	28	0	37
Sell DRK	100 lbs.	0	0	0	0	0	0	0	0	0	0	1038	3282
Sell Navies	100 lbs.	0	0	0	0	0	0	0	0	0	19181	7395	1471
Sell Potash	Ton	16	19	9	25	170	47	4	18	138	28	2	5
Sell Urea	Ton	20	24	11	31	212	47	5	23	172	35	2	6
Sell Mixed Bulk	Ton	46	53	21	69	467	133	12	52	213	78	5	14
Sell Mixed Bag	Ton	11	13	5	17	120	33	3	13	104	20	1	4
Grinding	Cwt.	13945	13500	15056	14686	15408	14018	14593	16445	15685	15223	17222	19908
Sell Dairy Supp. 5/	Ton	420											
Sell Dairy Comp.	Ton	0											
Sell Beef Supp.	Ton	180											
Sell Beef Comp.	Ton	0											
Sell Poultry Supp.	Ton	360											
Sell Poultry Comp.	Ton	0											
Sell Hog Supp.	Ton	240											
Sell Hog Comp.	Ton	0											
Sell Miscellaneous	Ton	28.8											
Sell Building Sup.	$5	4148											
Sell Coal	Ton	2087											
Sell Chem.	$5	9694											
Sell All Other Sup.	$5	18652											

1/ These are the activities which came into the most profitable solution.

2/ Figures will be rounded to the nearest whole number.

3/ Remember grains are stored only during harvest periods.

4/ Ear corn is not purchased during the corn harvest months.

5/ The following are yearly activities.

Table 3D. Activity Levels for a 20% Increase in Sales Potential (BHSIII) by Month 1/.

Activity	Units	1	2	3	4	5	6	7	A	S	O	N	D
Hire Labor	Man-Hrs.	472 2/	353	336	379	657	390	594	451	625	1109	413	517
Buy Shelled Corn	100 bu.	174	134	112	52	52	119	142	102	86	375	615	194
Buy Ear Corn 4/	100 bu.	14	11	10	4	4	10	12	9	8	0	0	0
Buy Wheat	100 bu.	193	170	126	75	44	55	1215	434	235	148	109	139
Buy Soys	100 bu.	85	96	78	90	29	60	22	4	12	408	238	100
Buy Oats	100 bu.	56	39	28	41	31	22	0	194	68	28	0	37
Buy DMK	100 lbs.	142	142	142	131	0	0	0	0	513	1979	1104	355
Buy Navies	100 lbs.	1014	1042	1050	594	251	730	261	960	7684	9421	3476	1471
Store Corn 3/	100 bu.	0	0	0	0	0	0	0	0	0	0	0	23
Store Wheat	100 bu.	0	0	0	0	0	0	771	80	0	0	0	0
Store Soys	100 bu.	0	0	0	0	0	0	0	0	0	240	81	0
Store Oats	100 bu.	0	0	0	0	0	0	0	124	0	0	0	0
Store DMK	100 lbs.	0	0	0	0	0	0	0	0	273	1211	0	0
Store Navies	100 lbs.	0	0	0	0	0	0	0	0	5078	4703	0	0
Sell Corn	100 bu.	0	0	0	476	324	69	0	0	418	315	615	0
Sell Wheat	100 bu.	2086	232	126	75	44	0	0	306	44	0	0	0
Sell Soys	100 bu.	0	0	15	0	0	0	1028	175	12	0	0	13
Sell Oats	100 bu.	0	0	123	41	31	22	0	0	262	28	0	37
Sell DMK	100 lbs.	0	0	0	0	0	0	0	0	0	0	1048	3242
Sell Navies	100 lbs.	0	0	0	0	0	0	0	0	0	19181	7335	1471
Sell Potash	Ton	16	19	9	25	170	47	4	19	133	28	2	5
Sell Urea	Ton	20	24	11	31	232	47	5	23	172	35	2	6
Sell Mixed Bulk	Ton	46	53	21	69	467	113	12	52	213	78	5	14
Sell Mixed Bag	Ton	11	13	5	17	170	33	3	13	104	20	1	4
Grinding	Cwt.	13945	13500	15056	14686	15408	14218	11593	16445	15685	15223	17222	19903
Sell Dairy Supp. 5/	Ton	420											
Sell Dairy Comp.	Ton	0											
Sell Beef Supp.	Ton	190											
Sell Beef Comp.	Ton	0											
Sell Poultry Supp.	Ton	360											
Sell Poultry Comp.	Ton	0											
Sell Hog Supp.	Ton	240											
Sell Hog Comp.	Ton	0											
Sell Miscellaneous	Ton	28.8											
Sell Building Sup.	$$	4148											
Sell Coal	Ton	2097											
Sell Chem.	$$	9444											
Sell All Other Sup.	$$	18652											

1/ These are the activities which came into the most profitable solution.

2/ Figures will be rounded to the nearest whole number.

3/ Remember grains are stored only during harvest periods.

4/ Ear corn is not purchased during the corn harvest months.

5/ The following are yearly activities.

Table 4D. Profit Reduction Per Unit of Forced Activity 1/.

Activity	Unit	$ Red. Profit RHSI	$ Red. Profit RHSII	$ Red Profit RHSIII
Selling Dairy Complete	Ton	36.19	36.24	36.37
Selling Beef Complete	Ton	35.91	35.94	36.09
Selling Poultry Complete	Ton	26.70	26.72	26.83
Selling Hog Complete	Ton	30.03	30.05	30.18
Store Corn November	100 bu.	2.63	1.78	1.90
Store Corn October	100 bu.		.33	.12
Store Corn December	100 bu.		.47	

1/ These are the reduced profits for each unit that comes into the optimal solution.

IV. Effect of the Irrigation Practices for each Date of Sowing and Time of Cutting on Fodder Quality.

Treatments	Mean	Mean	Mean	Mean
	% Ash	% Prot. Protein	% Fat	% Fib Fibre
Time of Irrigation				
Time of Cutting				
Before Noon Irrigation	5.63	30.03	32.04	32.83
After Noon Irrigation	5.63	30.03	32.04	32.83
Before Noon Irrigation	5.63	30.03	32.04	32.83
After Noon Irrigation	5.63	30.03	32.04	32.83
Interaction				
Before Noon Irrigation	5.63	30.03	32.04	32.83
After Noon Irrigation	5.63	30.03	32.04	32.83
Before Noon Irrigation	5.63	30.03	32.04	32.83
After Noon Irrigation	5.63	30.03	32.04	32.83

Table 44. Effect of Irrigation Practices on Fodder Quality.

Table 5D. Excess Resources for the Three Business Potentials.

Resource	Unit	Amount in Excess (RHSI)	Amount in Excess (RHSII)	Amount in Excess (RHSIII)
Capital (1) 1/	$	326,678	324,805	302,621
Capital (5)	$	112,074	50,726	48,504
Capital (6)	$	45,398	46,994	57,200
Capital (7)	$	41,765	123,359	151,149
Capital (Ø)	$	1,430		
Labor (1) 2/	Man-Hrs.	1,497	1,470	1,448
Labor (2)	Man-Hrs.	1,624	1,596	1,567
Labor (3)	Man-Hrs.	1,640	1,611	1,583
Labor (4)	Man-Hrs.	1,602	1,573	1,541
Labor (5)	Man-Hrs.	1,340	1,314	1,262
Labor (6)	Man-Hrs.	1,598	1,564	1,529
Labor (7)	Man-Hrs.	1,438	1,373	1,325
Labor (A)	Man-Hrs.	1,543	1,506	1,469
Labor (S)	Man-Hrs.	1,353	1,343	1,295
Labor (Ø)	Man-Hrs.	1,004	906	810
Labor (N)	Man-Hrs.	1,486	1,490	1,446
Labor (D)	Man-Hrs.	1,509	1,445	1,402
Shelled Corn to Purchase (N)	100 bu.		155	136
Oats to Purchase (A)	100 bu.			40
Oats to Purchase (N)	100 bu.		16	18
Oats to Purchase (D)	100 bu.	31	24	
Corn Available for Storage (Ø)	100 bu.		220	240
Corn Available for Storage (N)	100 bu.	361	440	480
Corn Available for Storage (D)	100 bu.	104	114	101
Total Storage Capacity (1)	100 bu.	646	636	588
Total Storage Capacity (2)	100 bu.	1,432	1,420	1,308
Total Storage Capacity (3)	100 bu.	1,272	1,295	1,138
Total Storage Capacity (4)	100 bu.	1,318	1,415	1,327

Resource	Unit	Mean Number	(Wrong) Excess	(Wrong) Excess	Mean Number
Staff Affairs Officer (4)	100 pm.	1'318			1'334
Staff Affairs Officer (3)	100 pm.	1'512			1'532
Staff Affairs Officer (2)	100 pm.	1'422			1'442
Staff Affairs Officer (1)	100 pm.	1'420			1'440
Staff Affairs Officer (5)	100 pm.	1'422			1'442
Staff Affairs Officer (6)	100 pm.	1'420			1'440
Staff Affairs Officer (7)	100 pm.	1'420			1'440
Staff Affairs Officer (8)	100 pm.	1'420			1'440
Staff Affairs Officer (9)	100 pm.	1'420			1'440
Staff Affairs Officer (10)	100 pm.	1'420			1'440
Staff Affairs Officer (11)	100 pm.	1'420			1'440
Staff Affairs Officer (12)	100 pm.	1'420			1'440
Staff Affairs Officer (13)	100 pm.	1'420			1'440
Staff Affairs Officer (14)	100 pm.	1'420			1'440
Staff Affairs Officer (15)	100 pm.	1'420			1'440
Staff Affairs Officer (16)	100 pm.	1'420			1'440
Staff Affairs Officer (17)	100 pm.	1'420			1'440
Staff Affairs Officer (18)	100 pm.	1'420			1'440
Staff Affairs Officer (19)	100 pm.	1'420			1'440
Staff Affairs Officer (20)	100 pm.	1'420			1'440
Staff Affairs Officer (21)	100 pm.	1'420			1'440
Staff Affairs Officer (22)	100 pm.	1'420			1'440
Staff Affairs Officer (23)	100 pm.	1'420			1'440
Staff Affairs Officer (24)	100 pm.	1'420			1'440
Staff Affairs Officer (25)	100 pm.	1'420			1'440
Staff Affairs Officer (26)	100 pm.	1'420			1'440
Staff Affairs Officer (27)	100 pm.	1'420			1'440
Staff Affairs Officer (28)	100 pm.	1'420			1'440
Staff Affairs Officer (29)	100 pm.	1'420			1'440
Staff Affairs Officer (30)	100 pm.	1'420			1'440
Staff Affairs Officer (31)	100 pm.	1'420			1'440
Staff Affairs Officer (32)	100 pm.	1'420			1'440
Staff Affairs Officer (33)	100 pm.	1'420			1'440
Staff Affairs Officer (34)	100 pm.	1'420			1'440
Staff Affairs Officer (35)	100 pm.	1'420			1'440
Staff Affairs Officer (36)	100 pm.	1'420			1'440
Staff Affairs Officer (37)	100 pm.	1'420			1'440
Staff Affairs Officer (38)	100 pm.	1'420			1'440
Staff Affairs Officer (39)	100 pm.	1'420			1'440
Staff Affairs Officer (40)	100 pm.	1'420			1'440
Staff Affairs Officer (41)	100 pm.	1'420			1'440
Staff Affairs Officer (42)	100 pm.	1'420			1'440
Staff Affairs Officer (43)	100 pm.	1'420			1'440
Staff Affairs Officer (44)	100 pm.	1'420			1'440
Staff Affairs Officer (45)	100 pm.	1'420			1'440
Staff Affairs Officer (46)	100 pm.	1'420			1'440
Staff Affairs Officer (47)	100 pm.	1'420			1'440
Staff Affairs Officer (48)	100 pm.	1'420			1'440
Staff Affairs Officer (49)	100 pm.	1'420			1'440
Staff Affairs Officer (50)	100 pm.	1'420			1'440
Staff Affairs Officer (51)	100 pm.	1'420			1'440
Staff Affairs Officer (52)	100 pm.	1'420			1'440
Staff Affairs Officer (53)	100 pm.	1'420			1'440
Staff Affairs Officer (54)	100 pm.	1'420			1'440
Staff Affairs Officer (55)	100 pm.	1'420			1'440
Staff Affairs Officer (56)	100 pm.	1'420			1'440
Staff Affairs Officer (57)	100 pm.	1'420			1'440
Staff Affairs Officer (58)	100 pm.	1'420			1'440
Staff Affairs Officer (59)	100 pm.	1'420			1'440
Staff Affairs Officer (60)	100 pm.	1'420			1'440

Table 5D. (continued)

Resource	Unit	Amount in Excess (RHSI)	Amount in Excess (RHSII)	Amount in Excess (RHSIII)
Total Storage Capacity (5)	100 bu.	1,800	1,699	1,630
Total Storage Capacity (6)	100 bu.	2,014	1,654	1,597
Total Storage Capacity (7)	100 bu.	473	96	.
Total Storage Capacity (A)	100 bu.	758	554	562
Total Storage Capacity (S)	100 bu.	617	684	741
Total Storage Capacity (Ø)	100 bu.	256	.	.
Outlet for Dairy Complete (Y)	Ton	1,050	1,155	1,260
Outlet for Beef Complete (Y)	Ton	150	165	180
Outlet for Poultry Complete (Y)	Ton	1,200	1,320	1,440
Outlet for Hog Complete (Y)	Ton	600	660	720

1/ Indicates month, i.e., (1) = January.

2/ This is regular labor. The program used no overtime or part time labor.

Account	Unit	Amount in Budget (Thousands)	Amount in Revised (Thousands)	Amount in Variance (Thousands)
Accounts Payable	Dollars	1,500	1,650	150
Accounts Receivable	Dollars	2,000	2,200	200
Advertising Expense	Dollars	500	450	-50
Bad Debt Expense	Dollars	100	120	20
Cash	Dollars	1,000	1,100	100
Common Stock	Shares	10,000	10,000	0
Cost of Goods Sold	Dollars	5,000	5,500	500
Depreciation Expense	Dollars	1,000	1,000	0
Dividends Paid	Dollars	200	220	20
Equipment	Dollars	3,000	3,300	300
Income Tax Expense	Dollars	800	880	80
Interest Expense	Dollars	400	440	40
Inventory	Units	1,000	1,100	100
Land	Dollars	2,000	2,000	0
Long-Term Debt	Dollars	4,000	4,000	0
Net Income	Dollars	1,200	1,320	120
Office Supplies Expense	Dollars	150	165	15
Prepaid Insurance	Dollars	300	330	30
Retained Earnings	Dollars	3,000	3,300	300
Salaries Expense	Dollars	2,500	2,750	250
Sales Revenue	Dollars	10,000	11,000	1,000
Supplies	Units	500	550	50
Utilities Expense	Dollars	600	660	60
Wages Payable	Dollars	1,000	1,100	100

Table 87. Miscellaneous.

Table 6D. Marginal Value Products for the Three Business Potentials 1/.

Resource	Unit	MVP (RHSI) $	MVP (RHSII) $	MVP (RHSIII) $
Capital (2) 2/	$	.01	.01	.01
Capital (3)	$	.02	.03	.03
Capital (4)	$	.01	.01	.01
Capital (A)	$	.01	.01	.02
Capital (S)	$	.01	.01	.02
Capital (Ø)	$	0	.01	.01
Capital (N)	$	.01	.02	.03
Capital (D)	$	.02	.03	.03
Ear Corn to Purchase (1)	100 bu.	9.72	9.72	9.72
Ear Corn to Purchase (2)	100 bu.	9.57	9.15	9.15
Ear Corn to Purchase (3)	100 bu.	6.86	5.64	6.13
Ear Corn to Purchase (4)	100 bu.	5.94	5.94	5.94
Ear Corn to Purchase (5)	100 bu.	5.85	5.85	5.85
Ear Corn to Purchase (6)	100 bu.	6.13	6.13	5.85
Ear Corn to Purchase (7)	100 bu.	7.41	7.41	7.13
Ear Corn to Purchase (A)	100 bu.	6.33	6.33	7.96
Ear Corn to Purchase (S)	100 bu.	5.89	5.80	5.99
Shelled Corn to Purchase (1)	100 bu.	11.29	11.29	11.29
Shelled Corn to Purchase (2)	100 bu.	11.15	10.72	10.73
Shelled Corn to Purchase (3)	100 bu.	8.46	7.26	7.75
Shelled Corn to Purchase (4)	100 bu.	7.53	7.53	7.53
Shelled Corn to Purchase (5)	100 bu.	7.43	7.43	7.43
Shelled Corn to Purchase (6)	100 bu.	7.70	7.70	7.43
Shelled Corn to Purchase (7)	100 bu.	8.89	8.89	8.62
Shelled Corn to Purchase (A)	100 bu.	7.82	7.82	9.47
Shelled Corn to Purchase (S)	100 bu.	7.37	7.37	7.49
Shelled Corn to Purchase (Ø)	100 bu.	3.64	1.90	2.04
Sheleed Corn to Purchase (N)	100 bu.	.96	0	0
Shelled Corn to Purchase (D)	100 bu.	2.13	3.17	2.90
Wheat to Purchase (1)	100 bu.	10.43	10.43	10.43
Wheat to Purchase (2)	100 bu.	10.47	10.50	10.50

Table 69. Marginal Value Products for the Three Business Potentials 1/.

Resource	Unit	MVP (BRSI) $	MVP (BRSII) $	MVP (BRSIII) $
Capital (2) 2/	$	.01	.01	.01
Capital (3)	$	.02	.03	.03
Capital (4)	$	.01	.01	.01
Capital (5)	$	.01	.01	.02
Capital (6)	$	.01	.01	.02
Capital (7)	$	0	.01	.01
Capital (8)	$	.01	.02	.03
Capital (9)	$	.02	.03	.03
Ear Corn to Purchase (1)	100 bu.	9.72	9.72	9.72
Ear Corn to Purchase (2)	100 bu.	9.57	9.15	9.15
Ear Corn to Purchase (3)	100 bu.	6.86	5.64	6.13
Ear Corn to Purchase (4)	100 bu.	5.94	5.94	5.94
Ear Corn to Purchase (5)	100 bu.	5.85	5.85	5.85
Ear Corn to Purchase (6)	100 bu.	6.13	6.13	5.85
Ear Corn to Purchase (7)	100 bu.	7.41	7.41	7.13
Ear Corn to Purchase (8)	100 bu.	6.33	6.23	7.96
Ear Corn to Purchase (9)	100 bu.	5.99	5.80	5.39
Shelled Corn to Purchase (1)	100 bu.	11.29	11.29	11.29
Shelled Corn to Purchase (2)	100 bu.	11.15	10.72	10.73
Shelled Corn to Purchase (3)	100 bu.	8.46	7.26	7.75
Shelled Corn to Purchase (4)	100 bu.	7.53	7.53	7.53
Shelled Corn to Purchase (5)	100 bu.	7.43	7.43	7.43
Shelled Corn to Purchase (6)	100 bu.	7.70	7.70	7.43
Shelled Corn to Purchase (7)	100 bu.	8.89	8.59	8.02
Shelled Corn to Purchase (8)	100 bu.	7.82	7.92	9.47
Shelled Corn to Purchase (9)	100 bu.	7.37	7.77	7.49
Shelled Corn to Purchase [illegible]	100 bu.	3.64	1.59	2.04
Shelled Corn to Purchase [illegible]	100 bu.	.96	0	0
Shelled Corn to Purchase [illegible]	100 bu.	2.13	3.17	2.90
Wheat to Purchase (1)	100 bu.	10.43	10.43	10.43
Wheat to Purchase (2)	100 bu.	10.47	10.50	10.50

Table 6D. (continued)

Resource	Unit	MVP(RHSI) $	MVP(RHSII) $	MVP(RHSIII) $
Wheat to Purchase (3)	100 bu.	9.62	9.72	9.68
Wheat to Purchase (4)	100 bu.	9.56	9.56	9.56
Wheat to Purchase (5)	100 bu.	9.43	9.43	9.43
Wheat to Purchase (6)	100 bu.	16.79	13.61	11.84
Wheat to Purchase (7)	100 bu.	15.87	12.70	10.92
Wheat to Purchase (A)	100 bu.	11.53	8.35	8.39
Wheat to Purchase (s)	100 bu.	12.45	9.28	7.49
Wheat to Purchase (Ø)	100 bu.	17.75	13.66	13.30
Wheat to Purchase (N)	100 bu.	15.44	14.05	13.47
Wheat to Purchase (D)	100 bu.	15.44	16.05	15.54
Soys to Purchase (1)	100 bu.	21.75	21.75	20.55
Soys to Purchase (2)	100 bu.	21.03	20.03	18.84
Soys to Purchase (3)	100 bu.	19.73	16.94	16.88
Soys to Purchase (4)	100 bu.	19.89	19.89	18.69
Soys to Purchase (5)	100 bu.	26.89	26.89	25.69
Soys to Purchase (6)	100 bu.	22.18	22.18	20.98
Soys to Purchase (7)	100 bu.	17.36	17.36	16.16
Soys to Purchase (A)	100 bu.	17.56	17.56	17.63
Soys to Purchase (S)	100 bu.	19.74	16.57	15.63
Soys to Purchase (Ø)	100 bu.	22.08	17.24	14.87
Soys to Purchase (N)	100 bu.	19.51	16.71	14.15
Soys to Purchase (D)	100 bu.	14.94	14.13	11.64
Oats to Purchase (1)	100 bu.	4.43	5.21	4.89
Oats to Purchase (2)	100 bu.	4.45	4.96	4.64
Oats to Purchase (3)	100 bu.	4.52	4.57	4.55
Oats to Purchase (4)	100 bu.	3.48	3.48	3.48
Oats to Purchase (5)	100 bu.	3.43	3.43	3.43
Oats to Purchase (6)	100 bu.	3.43	3.43	3.43
Oats to Purchase (7)	100 bu.	.87	.87	0
Oats to Purchase (A)	100 bu.	3.37	3.37	4.24
Oats to Purchase (S)	100 bu.	3.37	3.37	3.42
Oats to Purchase (Ø)	100 bu.	3.37	1.62	1.76

Table 6b. (continued)

Purchase	Unit	NLP(RF-I) $	NLP(RF-II) $	NLP(RF-III) $
Wheat to Purchase (3)	100 bu.	9.62	9.72	9.68
Wheat to Purchase (4)	100 bu.	9.56	9.55	9.56
Wheat to Purchase (5)	100 bu.	9.43	9.43	9.43
Wheat to Purchase (6)	100 bu.	16.79	12.61	11.84
Wheat to Purchase (7)	100 bu.	15.87	12.70	10.92
Wheat to Purchase ( )	100 bu.	11.53	8.35	8.39
Wheat to Purchase ( )	100 bu.	12.45	9.28	7.49
Wheat to Purchase ( )	100 bu.	17.75	13.66	13.[illegible]
Wheat to Purchase ( )	100 bu.	15.44	14.65	12.47
Wheat to Purchase ( )	100 bu.	15.44	16.05	15.34
Soys to Purchase (1)	100 bu.	21.75	21.75	20.55
Soys to Purchase (2)	100 bu.	21.03	22.03	18.84
Soys to Purchase (3)	100 bu.	19.73	16.94	14.88
Soys to Purchase (4)	100 bu.	19.69	16.[illegible]	18.[illegible]
Soys to Purchase (5)	100 bu.	26.89	24.69	[illegible]
Soys to Purchase (6)	100 bu.	22.18	22.18	20.[illegible]
Soys to Purchase (7)	100 bu.	17.[illegible]	17.38	16.16
Soys to Purchase ( )	100 bu.	17.[illegible]	17.76	17.[illegible]
Soys to Purchase ( )	100 bu.	15.74	16.27	15.[illegible]
Soys to Purchase ( )	100 bu.	12.03	17.24	14.07
Soys to Purchase ( )	100 bu.	19.51	16.71	14.[illegible]
Soys to Purchase ( )	100 bu.	14.94	14.15	11.[illegible]
Oats to Purchase (1)	100 bu.	4.69	[illegible]	4.[illegible]
Oats to Purchase (2)	100 bu.	4.65	4.[illegible]	4.84
Oats to Purchase (3)	100 bu.	4.52	4.57	4.[illegible]
Oats to Purchase (4)	100 bu.	3.49	3.4[illegible]	3.4[illegible]
Oats to Purchase (5)	100 bu.	3.43	3.43	3.4[illegible]
Oats to Purchase ( )	100 bu.	3.43	3.42	3.43
Oats to Purchase (7)	100 bu.	.87	.87	0
Oats to Purchase ( )	100 bu.	3.37	3.07	4.14
Oats to Purchase ( )	100 bu.	3.77	3.07	3.42
Oats to Purchase ( )	100 bu.	2.37	1.02	1.76

Table 6D. (continued)

Resource	Unit	MVP(RHSI) $	MVP(RHSII) $	MVP(RHSIII) $
Oats to Purchase (N)	100 bu.	.68	0	0
Oats to Purchase (D)	100 bu.	0	0	0
DRK to Purchase (1)	100 lbs.	.82	.89	.94
DRK to Purchase (2)	100 lbs.	.73	.76	.81
DRK to Purchase (3)	100 lbs.	.70	.65	.75
DRK to Purchase (4)	100 lbs.	.88	.95	1.00
DRK to Purchase (5)	100 lbs.	1.24	1.31	1.35
DRK to Purchase (6)	100 lbs.	1.51	1.58	1.63
DRK to Purchase (7)	100 lbs.	1.35	1.42	1.46
DRK to Purchase (A)	100 lbs.	1.13	1.20	1.24
DRK to Purchase (S)	100 lbs.	.95	1.02	.92
DRK to Purchase (Ø)	100 lbs.	.43	.43	.43
DRK to Purchase (N)	100 lbs.	.33	.32	.32
DRK to Purchase (D)	100 lbs.	.29	.32	.32
Navies to Purchase (1)	100 lbs.	.78	.79	.81
Navies to Purchase (2)	100 lbs.	.70	.70	.71
Navies to Purchase (3)	100 lbs.	.74	.69	.74
Navies to Purchase (4)	100 lbs.	.90	.91	.93
Navies to Purchase (5)	100 lbs.	1.20	1.22	1.23
Navies to Purchase (6)	100 lbs.	1.47	1.49	1.51
Navies to Purchase (7)	100 lbs.	1.30	1.32	1.34
Navies to Purchase (A)	100 lbs.	1.13	1.15	1.18
Navies to Purchase (S)	100 lbs.	.90	.93	.87
Navies to Purchase (Ø)	100 lbs.	.38	.36	.36
Navies to Purchase (N)	100 lbs.	.33	.32	.32
Navies to Purchase (D)	100 lbs.	.29	.31	.32
Corn Available for Storage (Ø)	100 bu.	3.54	0	0
Corn Available for Storage (N)	100 bu.	0	0	0
Corn Available for Storage (D)	100 bu.	0	0	0
Wheat Available for Storage (7)	100 bu.	14.51	12.12	9.23
Wheat Available for Storage (A)	100 bu.	15.23	13.07	12.18

| | | |

Table 6D. (continued)

Resource	Unit	MVP(RHSI) $	MVP(RHSII) $	MVP(RHSIII) $
Soys Available for Storage (A)	100 bu.	20.64	13.46	13.81
Soys Available for Storage (N)	100 bu.	17.96	15.49	14.36
Oats Available for Storage (A)	100 bu.	4.61	4.31	4.33
DRK Available for Storage (S)	100 lbs.	.52	.52	.54
DRK Available for Storage (Ø)	100 lbs.	.53	.49	.51
Navies Available for Storage (S)	100 lbs.	.49	.49	.49
Navies Available for Storage (Ø)	100 lbs.	.53	.47	.48
Outlet for Dairy Supp. (Y)	Ton	13.12	13.18	13.21
Outlet for Beef Supp. (Y)	Ton	12.30	12.35	12.39
Outlet for Poultry Supp. (Y)	Ton	15.07	15.13	15.17
Outlet for Hog Supp. (Y)	Ton	13.96	14.01	14.05
Outlet for Miscellaneous (Y)	Ton	14.99	15.05	15.10
Total Storage Capacity (7)	100 bu.	0	0	2.39
Total Storage Capacity (Ø)	100 bu.	0	3.53	3.30
Total Storage Capacity (N)	100 bu.	5.44	7.46	7.51
Total Storage Capacity (D)	100 bu.	11.36	8.98	8.52
Outlet for Potash (1)	Ton	4.54	4.01	3.58
Outlet for Potash (2)	Ton	6.73	7.45	7.16
Outlet for Potash (3)	Ton	6.00	5.76	5.76
Outlet for Potash (4)	Ton	3.95	3.28	3.55
Outlet for Potash (5)	Ton	4.40	4.40	4.40
Outlet for Potash (6)	Ton	5.28	5.28	5.28
Outlet for Potash (7)	Ton	6.07	6.07	6.35
Outlet for Potash (A)	Ton	5.31	5.31	6.47
Outlet for Potash (S)	Ton	4.58	5.03	5.26
Outlet for Potash (Ø)	Ton	6.05	6.91	6.33
Outlet for Potash (N)	Ton	6.38	6.80	6.81
Outlet for Potash (D)	Ton	4.58	3.77	3.33
Outlet for Urea (1)	Ton	2.46	2.13	1.86
Outlet for Urea (2)	Ton	3.83	4.28	4.10
Outlet for Urea (3)	Ton	3.38	3.23	3.23
Outlet for Urea (4)	Ton	2.09	1.67	1.84

Table 6.[illegible]. (Continued)

Resource	Unit	[illegible](…I) $	[illegible](…II) $	[illegible](…III) $
Soys Available for Storage (N)	100 bu.	20.64	13.46	12.51
Soys Available for Storage (M)	100 bu.	17.96	15.49	14.36
Oats Available for Storage (A)	100 bu.	4.61	4.31	4.33
[illegible] Available for Storage (S)	100 lbs.	.52	.52	.34
[illegible] Available for Storage (Q)	100 lbs.	.53	.49	.71
Navies Available for Storage (S)	100 lbs.	.40	.49	.49
Navies Available for Storage (Q)	100 lbs.	.53	.47	.4[illegible]
Outlet for Dairy Supp. (Y)	Ton	13.12	13.18	12.21
Outlet for Beef Supp. (Y)	Ton	12.30	12.35	12.29
Outlet for Poultry Supp. (Y)	Ton	15.07	15.13	15.17
Outlet for Hog Supp. (Y)	Ton	13.96	14.01	14.05
Outlet for Miscellaneous (Y)	Ton	14.99	15.05	15.10
Total Storage Capacity (7)	100 bu.	0	0	2.[illegible]
Total Storage Capacity (8)	100 bu.	0	3.54	3.80
Total Storage Capacity (9)	100 bu.	5.44	7.45	7.71
Total Storage Capacity (0)	100 bu.	11.25	[illegible]	8.[illegible]
Outlet for Potash (1)	Ton	4.74	4.[illegible]	3.5[illegible]
Outlet for Potash (2)	Ton	5.73	7.45	7.16
Outlet for Potash (3)	Ton	6.60	5.74	5.76
Outlet for Potash (4)	Ton	3.35	3.28	3.[illegible]
Outlet for Potash (5)	Ton	4.47	4.46	[illegible]
Outlet for Potash (6)	Ton	5.28	5.20	[illegible]
Outlet for Potash (7)	Ton	6.77	6.[illegible]	[illegible]
Outlet for Potash (8)	Ton	5.31	[illegible]	6.[illegible]
Outlet for Potash (9)	Ton	[illegible]	5.[illegible]	[illegible]
Outlet for Potash (0)	Ton	6.05	6.91	6.03
Outlet for Potash ([illegible])	Ton	6.33	6.[illegible]	6.[illegible]
Outlet for Potash ([illegible])	Ton	4.08	3.77	3.33
Outlet for Urea (1)	Ton	2.46	1.13	1.85
Outlet for Urea (2)	Ton	2.83	4.29	4.10
Outlet for Urea (3)	Ton	3.28	3.23	[illegible]
Outlet for Urea (4)	Ton	2.09	1.07	1.84

Table 6D. (continued)

Resource	Unit	MVP(RHSI) $	MVP(RHSII) $	MVP(RHSIII) $
Outlet for Urea (5)	Ton	2.38	2.38	2.38
Outlet for Urea (6)	Ton	2.93	2.93	2.93
Outlet for Urea (7)	Ton	3.41	3.41	3.59
Outlet for Urea (A)	Ton	2.94	2.94	3.67
Outlet for Urea (S)	Ton	2.48	2.76	2.91
Outlet for Urea (Ø)	Ton	3.40	3.95	3.57
Outlet for Urea (n)	Ton	3.61	3.87	3.87
Outlet for Urea (D)	Ton	2.48	1.98	1.69
Outlet for Mixed Bulk (1)	Ton	4.49	3.97	3.54
Outlet for Mixed Bulk (2)	Ton	6.66	7.37	7.08
Outlet for Mixed Bulk (3)	Ton	5.94	5.70	5.70
Outlet for Mixed Bulk (4)	Ton	3.90	3.24	3.51
Outlet for Mixed Bulk (5)	Ton	4.35	4.35	4.35
Outlet for Mixed Bulk (6)	Ton	5.22	5.22	5.22
Outlet for Mixed Bulk (7)	Ton	6.00	6.01	6.29
Outlet for Mixed Bulk (A)	Ton	5.26	5.26	6.40
Outlet for Mixed Bulk (D)	Ton	4.53	4.98	5.21
Outlet for Mixed Bulk (Ø)	Ton	5.99	6.84	6.26
Outlet for Mixed Bulk (N)	Ton	6.33	6.74	6.75
Outlet for Mixed Bulk (D)	Ton	4.53	3.74	3.30
Outlet for Mixed Bag (1)	Ton	3.64	3.07	2.60
Outlet for Mixed Bag (2)	Ton	5.98	6.75	6.44
Outlet for Mixed Bag (3)	Ton	5.20	4.94	4.94
Outlet for Mixed Bag (4)	Ton	3.00	2.29	2.57
Outlet for Mixed Bag (5)	Ton	3.50	3.49	3.49
Outlet for Mixed Bag (6)	Ton	4.45	4.45	4.45
Outlet for Mixed Bag (7)	Ton	5.27	5.27	5.57
Outlet for Mixed Bag (A)	Ton	4.47	4.47	5.70
Outlet for Mixed Bag (S)	Ton	3.87	4.15	4.39
Outlet for Mixed Bag (Ø)	Ton	5.25	6.17	5.53
Outlet for Mixed Bag (N)	Ton	5.60	6.04	6.04
Outlet for Mixed Bag (D)	Ton	3.67	2.81	2.32

(continued)

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Table 6D. (continued)

Resource	Unit	MVP(RHSI) $	MVP(RHSII) $	MVP(RHSIII) $
Outlet for Grinding (1)	Cwt.	.11	.11	.11
Outlet for Grinding (2)	Cwt.	.11	.11	.11
Outlet for Grinding (3)	Cwt.	.11	.11	.11
Outlet for Grinding (4)	Cwt.	.11	.11	.11
Outlet for Grinding (5)	Cwt.	.11	.11	.11
Outlet for Grinding (6)	Cwt.	.11	.11	.11
Outlet for Grinding (7)	Cwt.	.11	.11	.11
Outlet for Grinding (A)	Cwt.	.11	.11	.11
Outlet for Grinding (S)	Cwt.	.11	.11	.11
Outlet for Grinding (Ø)	Cwt.	.11	.11	.11
Outlet for Grinding (N)	Cwt.	.11	.11	.11
Outlet for Grinding (D)	Cwt.	.11	.11	.11
Outlet for Building Supp. (Y)	$5	.56	.56	.56
Outlet for Coal (Y)	Ton	3.88	3.89	3.90
Outlet for Chemicals (Y)	$5	.45	.45	.45
Outlet for All Other Supp. (Y)	$5	.78	.78	.78

1/ These are the MVP's for each unit of resource.

2/ Indicates month, i.e., (1) = January.

Table [illegible] (continued)

Resource	Unit	MVP(1981) $	MVP(1982) $	MVP(1983) $
Outlet for [illegible] (1) [b]	Cwt.	.11	.11	.11
Outlet for [illegible] (2)	Cwt.	.11	.11	.11
Outlet for [illegible] (3)	Cwt.	.11	.11	.11
Outlet for [illegible] (4)	Cwt.	.11	.11	.11
Outlet for [illegible] (5)	Cwt.	.11	.11	.11
Outlet for [illegible] (6)	Cwt.	.11	.11	.11
Outlet for [illegible] (7)	Cwt.	.11	.11	.11
Outlet for [illegible] (8)	Cwt.	.11	.11	.11
Outlet for [illegible] (9)	Cwt.	.11	.11	.11
Outlet for [illegible] (10)	Cwt.	.11	.11	.11
Outlet for [illegible] (11)	Cwt.	.11	.11	.11
Outlet for [illegible] (12)	Cwt.	.11	.11	.11
Outlet for [illegible] (Y)	$$	[illegible]	[illegible]	[illegible]
Outlet for coal (Y)	Ton	3.36	[illegible]	[illegible]
Outlet for [illegible] (Y)	$$	[illegible]	[illegible]	[illegible]
Outlet for all [illegible] (Y)	$$	[illegible]	[illegible]	[illegible]

a/ These are the MVP's for each unit of resource.

b/ Indicates month, i.e., (1) = January.

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