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Optimal Organizations for Southeastern South Dakota Livestock Farms: Land Acquisition and Minimum Resource Models

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OPTIMAL ORGANIZATIONS FOR SOUTHEASTERN SOUTH DAKOTA LIVESTOCK FARMS: LAND ACQUISITION AND MINIMUM RESOURCE MODELS

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Adviser Date

Head, Economics Department Date

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This thesis is dedicated to that infinite group of individuals, who during the past two years have repeatedly inquired as to when it would be done.

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Chapter I

INTRODUCTION

Today's farm operators have an ever-increasing number and variety of resources under their control. With this increase in resource use, farm operators need guidelines to use in planning resource use and the possible expansion of their farm enterprises.

Farm operators can use the resources under their control in various ways, but for each set of price relationships a certain resource combination provides maximum net income. Knowledge of alternative enterprise organizations for various farm situations, at different price levels, is useful in providing guidelines to farmers for organizing their farms.

An indication of changing farm size in Southeastern South Dakota can be gained by an examination of the change in the following items from 1959 to 1964:

Item[1]	1959	1964
Total number of farms	7,047	6,302
Average farm size (acres)	242	272
Value of land and buildings		
Per farm	$46,028	$56,032
Per acre	$ 190.20	$ 206.00

[1]United States Census of Agriculture, 1964.

Livestock farmers of Southeastern South Dakota who wish to increase their income have to choose among the alternatives of reorganizing their farms, supplementing their farm income from part-time non-farm employment, or leaving the farm to find non-farm employment which comes closer to providing the income they desire.

For the farm family that wishes to remain in agriculture it is important that they know the kinds and amounts of resources required to earn specified incomes. Often times the specified income is the minimum income that is needed to keep the farmer in agriculture.

Hypotheses

Below are the hypotheses that directed this study. The first two deal with a profit maximizing model used in finding optimum plans for mixed livestock farms with specified quantities of available resources. The remainder deal with a model used to find minimum resources needed to earn specified labor-management returns.

(1) It is profitable, at least at certain price levels, for mixed livestock farms in Southeastern South Dakota to expand extensively when land is available.

(2) Land acquired can be used most profitably to produce corn and reduce the amount of corn purchased. Therefore, land acquisition will increase as the price of corn rises.

(3) Intensive hog production is an important means of achieving specified labor-management returns with the least amount of land,

and when hogs are excluded from the model land requirements will increase considerably.

(4) If livestock feeding activities are excluded from the model, the land requirement in the optimal solution will be greater than when the feeding activities are included.

(5) When corn buying is allowed, the optimal plan will require less land than when all corn used is grown on the representative farm.

(6) If the operator is willing to take less than a 5.5 percent return to land, resources required to earn specified labor-management returns will be reduced.

Objectives

The following are the specific objectives of this study:

(1) To determine optimal organizations of representative mixed livestock farms in Southeastern South Dakota when land acquisition is considered as an alternative.

(2) If expansion is profitable, to evaluate the types of land acquisition, the size and extent of expansion, and the types and amounts of credit needed for the adjustments.

(3) To determine combinations of farm enterprises consistent with minimum resource estimates for specified levels of income and environmental conditions for Southeastern South Dakota.

Area Studied

The area considered in this study consists of Moody, Lincoln, Minnehaha, Clay and Union counties.[2] These five counties contain some of the best farmland in South Dakota. In South Dakota, the lines of equal precipitation and equal temperature cross roughly at right angles. Relatively speaking, this makes the southeast warm-moist.[3] Favorable temperature and moisture conditions have helped maintain the soil's organic matter and nitrogen content. The annual temperature for this region ranges from 45° to 48° F. The average number of days without killing frost is about 160 days.[4] For the thirty years 1931-1960 the average precipitation during the normal growing season (April through September) has slightly exceeded 17.5 inches.[5]

This area's soils lie on a moderately undulating glacial plain. The area is contained within the Chernozem soil region of South Dakota. Soil associations of the Chernozem soil region are mainly the silt loams and silty clay loams of the Moody-Croften series.

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[2]See Figure 1.

[3]Fred C. Westin, Leo F. Puhr, and George J. Buntley, Soils of South Dakota, Soil Survey Series Pamphlet No. 3, Agronomy Department, Agricultural Experiment Station, South Dakota State University, Brookings, South Dakota, July, 1967, p. 2.

[4]Ibid., p. 5.

[5]South Dakota Crop and Livestock Reporting Service, South Dakota Agriculture, 1966.

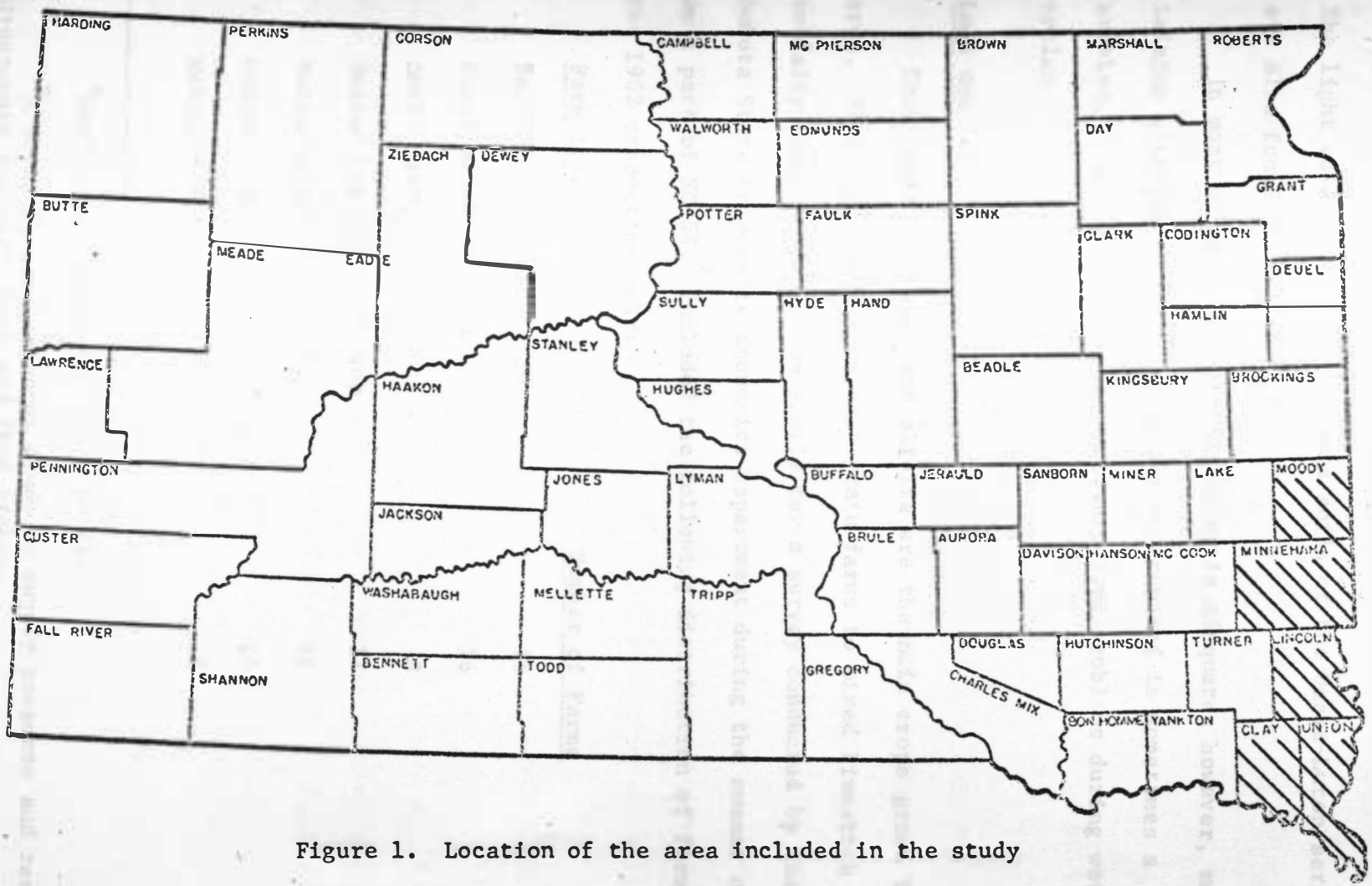

Figure 1. Location of the area included in the study

The light colored silty clay loams soils of the Onawa-Luton series are also found in this area.[6]

In most of the area soil fertility is adequate; however, maintaining nitrogen and organic matter on cropland is sometimes a problem. Drainage and water also cause some problems during wet cycles.

Land Use

Corn, oats, soybeans and alfalfa are the main crops grown in this area. Farm types vary from cash grain farms to mixed livestock farms to dairy farms. The random sample for a survey conducted by the South Dakota State University Economics Department during the summer of 1963, as a part of NC-54,[7] included the following distribution of farms for the 1962 production year:

Farm type	Number of Farms
Small hog and cash crop	15
Small mixed livestock	16
Small dairy	8
Medium hog and cash crop	11
Medium mixed livestock	14
Medium beef	10
Medium dairy	8

[6]Westin and others op. cit., p. 21.

[7]A North Central regional study of supply response and response adjustments for beef, pork and feed grains.

Large hog and cash crop	12
Large mixed livestock	11
Large beef	15

Procedures

The analytical technique employed in an effort to accomplish the objectives of this study was linear programming. From the farm survey conducted by the Economics Department, representative farm situations have been defined, and optimal organizations have been determined.

In the first part of this study a linear programming model is constructed that allows three representative mixed livestock farms to acquire additional land by purchase and/or rental. Three price levels each were allowed for corn, beef and hogs. All combinations of these prices result in 27 optimal organizations for each representative farm situation.

In the second part of this study a linear programming model is used to determine minimum resources needed to obtain specified levels of labor-management returns. Income levels of 3,000 dollars, 5,000 dollars, and 10,000 dollars are used. Only one price level for corn, beef and hogs was used. Alternative models were constructed to study the effect of different enterprises on the resources needed to produce specified labor-management returns.

Chapter II

DEVELOPMENT OF THE CONCEPT

The effects of land acquisition alternatives on the organizational structure of optimal farm plans have been studied in several North Central states. Most of these studies have been an extension of the models used in NC-54.

Nohre and Jensen studied profitable farm adjustments for eleven counties in South Central Minnesota.[1] After finding optimal farm plans with land regarded as a fixed input, the model was expanded to permit the purchase of up to 160 acres of additional land.

With prices projected at the medium level, profits were not maximized on any of the farms by buying the maximum acreage permitted. However, all farms except the large cash grain and large general farm increased profits by adding more land. These are the only two farms on which there were corn sales. The other farms bought land to augment the home raised supply of corn.

The earning power of additional land was the greatest for small farms, but capital shortage prevented them from expanding as much as the larger farms did. For example, the small, medium and large mixed livestock farms expanded 89, 94 and 134 acres respectively. Because of the shortage of capital, land buying on all farms except the large

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[1] C. D. Nohre and H. R. Jensen, Profitable Farm Adjustments in South Central Minnesota, Station Bulletin 471, University of Minnesota Agricultural Experiment Station, 1964.

mixed livestock was on land contract rather than land mortgage. Labor also proved to be a limiting factor for some of the farms.

In the optimal plans in which land was purchased, the purchase of land was strongly competitive with hogs for resources. The purchase of land drew capital and labor resources away from hogs so that the level of hog production was significantly lower in the land acquisition model. In the land acquisition model, however, existing beef housing and feeding facilities were either used up to the limit or were expanded beyond these levels. For the representative farms on which facilities were available, high mechanization beef feeding entered into the optimal plan.

Cooper and Colyer studied the effects of land acquisition for Northern Missouri.[2] Working with three price levels each for corn, hogs and beef, they found optimal farm organizations for 27 price combinations for each representative farm. Their model allowed for the purchase of additional land. Land could also be added by renting.

On all types of farms, at all price combinations, some land was added. When land was available, limited capital was more profitably employed to purchase land and grow grain to expand livestock output rather than using the capital to purchase grain.

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[2]Sam T. Cooper and Dale K. Colyer, Effects of Land Acquisition Alternatives on Optimal Farm Plans for North Missouri, Research Bulletin 877, University of Missouri Agricultural Experiment Station, November, 1965.

The mixed livestock farms were limited to 34 acres to rent and 75 acres to buy. All three sizes of farms added the limit of land. The small and medium mixed livestock farms purchased all land on contract. Because of a larger capital supply the large mixed livestock farm bought some land through mortgage.

The levels of hog and beef activities varied with changes in price combinations. With more favorable hog prices as compared to beef prices, hogs were favored over beef and vice versa. When hog and beef prices were at the same price level, both activities entered into the optimal plan. When hog and beef prices were both changed in the same direction, they remained at about the same level, with the main change being in gross income.

Livestock production per farm tended to remain at about the same level for the expanded farms. However, because the farm size was increased, livestock production per acre was reduced.

Lard worked with a land acquisition model in the Thumb and South Central Michigan.[3] Part of Northeast Indiana was also included in the study. Lard provided for land buying, land selling and land renting. Two types of land could be acquired, one priced 20 percent above the other. Farms in the Thumb area were limited to 40 acres of

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[3]Curtis F. Lard, Profitable Reorganization of Representative Farms in Lower Michigan and Northeastern Indiana with Special Emphasis on Feed Grains and Livestock, (unpublished Ph.D. thesis) Michigan State University, 1963.

each type to rent or buy. In the South Central area, 120 acres could be bought and 80 acres could be rented.

In the Thumb area there was considerable land buying and renting. This was particularly true at the high price levels. At high corn prices, beef was favored over hogs, and at lower prices hogs became more favorable.

In the South Central region, there was considerable land selling, particularly at the low corn price. The capital obtained from land sales was used to expand livestock enterprises. In cases of labor shortage, beef enterprises switched from low to high mechanization beef feeding. With the exception of two of the larger farms, land purchase was on contract. In both areas, when land was added it was rented land that was added first. This was mainly because rented land was all cropland.

Use of Representative Farm Situations

The idea of a "typical" or "representative" firm has a historical basis starting with Alfred Marshall. Marshall refers to the study of the expenses of a representative producer in order to determine the causes governing the supply price of a commodity.[4]

In the early 1920's agricultural economists started to augment the largely geographic "type of farming" studies by including budgets of typical farms. They felt that blanket recommendations applying to

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[4]Alfred Marshall, Principles of Economics, Eighth Edition, Macmillan and Company, p. 317.

all farms of a region could not be made sufficiently specific, and may be misleading, whereas if farms are segregated into groups by type, size or area, more specific recommendations can be applied by the farmers in the group.[5] The development of linear programming and high speed computing facilities have renewed interest in the use of representative situations.

If applicable results are to be generated by the use of representative farms, careful consideration must be used in selecting the representative farm. Refinements could be made in the actual selection of representative farms if it were possible to isolate the primary characteristics of farms and farmers that tend to dominate or strongly influence the particular decision under study. It seems reasonable to expect, also, that the principal influences or characteristics that affect one decision may differ with respect to another decision. Accordingly, any empirical use of the representative farm must be tied closely to a stated problem or purpose.[6]

Each farm is unique in its particular combination of resources, but the representative farm can be a very useful educational tool for

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[5]Harold O. Carter, "Representative Farms - Guides for Decision Making?", Journal of Farm Economics, Vol. 45, No. 5, December, 1963, p. 1456.

[6]Ibid., p. 1454.

many kinds of management problems, particularly on low income farms.[7] Individual managers can appraise their own resource use in the light of these results.

The representative farm concept has drawbacks in that it becomes impossible to group farms such that no important factors vary significantly within the class. The representative farm studies are static in nature, whereas the farm firm is in a dynamic framework.[8]

From a practical standpoint, funds, time and data available as well as the complexity of the problem dictate in large part the particular techniques used in a research study. Before we can commit the representative farm type analysis to the scrap pile we must consider available analytical techniques that might be used to replace it.

Studies that consider income levels as a goal of the farm firm are more recent than those that assume profit maximization with available resources. Much of the initial work in the field was done by Brewster. In a paper presented to the Southern Farm Management Research Committee, Brewster considered four general topics important in a study of this type.[9]

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[7]Manning H. Becker, Discussion: "Representative Farms - Guides for Decision Making?", Journal of Farm Economics, Vol. 45, No. 5, December, 1963, p. 1456.

[8]Harold O. Carter, op. cit., p. 1452.

[9]John M. Brewster, "Analyzing Minimum Resource Requirements for Specified Income Levels," Farm Size and Output Research, Cooperative Series Bulletin No. 56, Oklahoma Agricultural Experiment Station: Stillwater 1958, pp. 95-104.

1. The attributes of the income requirement.

2. The values to be minimized.

3. The construction of resource situations to be considered.

4. An empirical example.

In a later minimum resource study, Varley and Tolley argue that the approach known as "resources needed for specific income levels" aims for farm organizations giving a return to operators labor and management similar to what could be earned in non-farm employment.[10] Their recommended procedure for an analytical study was "... to assume a specified level of return to the operator's labor, capital and management with a residual return imputed to land.[11] The income levels suggested by Varley and Tolley were used in the minimum resource section of this study.

Connor did a minimum resource study in order to develop and study potential long-run adjustments for farm operators in the Panhandle region of Oklahoma. He found that minimum resource requirements for 3,000 dollar and 5,000 dollar return to operator labor and

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[10] A. P. Varley and G. S. Tolley, "Simultaneous Target Planning for Farms and the Area," Journal of Farm Economics, Vol. 44, No. 4, November, 1962, pp. 979-991.

[11] Ibid., p. 991.

management were high or unobtainable at the current land prices. When no return to land was required, land requirement was substantially reduced.[12]

Connors found that of the adjustment hypotheses considered, the hypothesis that farmers acquire some minimum amounts of resources sufficient to obtain an acceptable return to labor and management does not appear to be an adequate explanation of the trend in farm size itself. Existing farm sizes were most closely approximated when no return to land and/or ten percent higher yields were assumed.[13] In general, declines in numbers of farms and farmers, increased farm size and rather stable acreages of major products were common projections for each hypothesis in Connor's study.

Umberger found minimum resource requirements needed to earn specified levels of income in Faulk County, South Dakota.[14] Programming results indicated that the level of resources needed to earn specific levels of operator income varied with enterprise combinations. If greater emphasis were placed on livestock feeding activities, the increase in land requirements would be relatively smaller than under continued enlargement of present farm organizations.

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[12]Larry Jean Connor, Long-Run Adjustments for Farm Operators in a Sparsely Populated, High-Risk Area of the Great Plains, (unpublished Ph.D. thesis) Oklahoma State University: Stillwater, 1964, pp. 117-119.

[13]Ibid., p. 120.

[14]Dwaine E. Umberger, Minimum Resource Requirements for Specified Levels of Income in Faulk County, South Dakota, (unpublished M.S. thesis) South Dakota State University: Brookings, 1967.

An indication that owner-operators may not require full opportunity returns to their own land, labor and management was shown by programming results that approached present farm sizes only as land prices were decreased below assumed current levels.[15]

Maher did a minimum resource study for the South James Area of South Dakota.[16] Maher considered two management levels, one having average levels of mechanization and efficiency, while the other had a high level of both. He found that at both management levels, enterprise combinations allowing dairy and swine as a livestock enterprise required the smallest amounts of resources in terms of land and capital as compared to other livestock enterprise situations. The study indicated that for farm operators with limited land and capital, swine and dairy provide the greatest opportunity of maximizing profits. However, it was found that if the farm operators are not limited by land or capital, but rather by labor, then the most profitable livestock enterprise is a beef cow-calf operation.

The study indicated that farm operators should consider swine, dairy and livestock feeding enterprises as a lower cost method of obtaining desired income levels than acquiring additional land and other resources required with other enterprise combinations.

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[15] Ibid., p. 68.

[16] John N. Maher, Guidelines for Estimating Resources Needed To Earn a Specified Level of Income, South James Area, South Dakota, (unpublished M.S. thesis) South Dakota State University: Brookings, 1968.

Income Levels

For the purpose of this study the meaning of income levels is return to operator's labor and management. This implies that all other resources are paid their market price. The number and range of income levels that conceptually can be selected is a continuum, but from a practical standpoint only a few income levels could be selected. From a comparative welfare standpoint, farm people need to know the types and quanities of agricultural resources needed to enable the average farm operator to have earning levels equal to that of semi-skilled workers in non-farm employment.

In actuality only rough comparisons can be made, identical money income comparisons between farm and non-farm workers are not real income comparisons. Estimates of the money income per capita needed in agriculture to provide a welfare standard comparable to that of non-farm families vary. In 1958 Johnson estimated that labor earnings in agriculture would represent equal returns for comparable non-farm labor if per capita incomes in agriculture were 65-70 percent of non-farm income.[17] A more recent study says average per capita income in agriculture would have to be 92 percent of the non-farm income.[18]

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[17] D. Gale Johnson, "Labor Mobility and Agricultural Adjustment," Agricultural Adjustments in a Growing Economy, Iowa State College Press, Ames, Iowa, 1958, pp. 163-172.

[18] D. E. Hathaway, Government and Agriculture: Economic Policy in a Democratic Society, New York: Macmillan and Company, 1963.

Chapter III

ASSUMPTIONS AND METHODS OF ANALYSIS

Method of Analysis

The first part of this study uses linear programming to determine optimal organizations for representative mixed livestock farms. Linear programming is also employed in the second part to determine minimum resources needed to earn specified returns to operator labor and management.

Linear programming is a method of determining an optimum program of interdependent activities in view of available resources.[1] Any problem containing the following three components may be expressed as a linear programming problem:[2] (1). an objective, (2). alternative methods or processes for achieving the objective, and (3). resource or other restrictions. However, unless the following assumptions apply to the problem under consideration, linear programming may not provide a sufficiently precise solution:[3]

1. Linearity - this restricts variables to the first power, and means that only straight line relationships exist in linear programming. This means that prices paid for resources or received for

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[1] N. Paul Loomba, Linear Programming, McGraw-Hill Book Company, New York, 1964, p. 1.

[2] Earl O. Heady and Wilfred Candler, Linear Programming Methods, Iowa State University Press, Ames, Iowa, 1958, pp. 2-4.

[3] Ibid., pp. 17-18.

products, remain constant for all volumes of output. Similarly, increasing returns to scale for single processes are not allowed.

2. Additivity - this means that the total amount of resources used by several enterprises must be equal to the sum of the resources used by each individual enterprise.

3. Divisibility - this means that factors can be used and commodities can be produced in quantities which are fractional units. Resources and products are assumed to be continuous and infinitely divisible.

The complete mathematical statement of the problem includes a set of simultaneous linear equations which represents the conditions of the problem and a linear function which expresses the objectives of the problem.[4]

In order to illustrate the mathematical model for determining optimal organizations of the representative mixed livestock farms, the resource restrictions, and admissible enterprises must be given. Assuming profit maximization as a goal, the optimization problem can be stated as follows:[5]

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[4]Saul I. Glass, Linear Programming Methods and Applications, 2nd ed., McGraw-Hill Book Company, New York, 1964, p. 3.

[5]This model was suggested by Earl R. Swanson in "Application of Programming Analysis to Corn Belt Farms," Journal of Farm Economics, Vol. 38, No. 2, May 1956, pp. 412-413.

Maximize net return:

$$(1). \quad I = \sum_{j=1}^{n} X_j C_j \qquad j = 1, 2, 2, \ldots n$$

where C_j denotes the net return of a unit level of each of the activities. X_j denotes the quantity of the j^{th} product produced. The letter n represents the number of admissable activities. The linear statement of the objective is subject to the following resource restrictions.

$$(2) \sum a_{ij} x_j \leq b_i, \qquad i=1, \ldots, m,$$

where a_{ij} is the quantity of the i^{th} input required per unit of the j^{th} produce produced. The letter b_i is the amount of the i^{th} restricted, and m is the number of restricted inputs. In illustrating the mathematical model for determining the minimum resource requirements needed for specific levels, the income level of the operator, the resource restrictions, and the admissable enterprises must be given.[6]

The minimum resource problem may be summarized as follows when the objective is to minimize the amount of land.

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[6]This model was first used by Varley and Tolley in "Simultaneous Target Planning for Farms and the Area," Journal of Farm Economics, Vol. 44, No. 4, November, 1962, pp. 979-991.

$$(3) \qquad F = \sum_{j=1}^{n} C_j X_j \quad \text{with} \quad X_j \quad 0,$$

where C_j is the quantity of land required per unit of the j^{th} product and X_j is the quantity of the j^{th} product produced.

The linear statement of the objective is subject to the following resource restrictions.

$$(4) \sum a_{ij} x_j \leq b_i \qquad i=1, \ldots, m,$$

which is the same as number two in the profit maximization problem.

The income requirement is:

$$(5) \sum_{j=1}^{n} r_j x_j = B,$$

where r_j is the net revenue from the production of one unit of the j^{th} product, and B is the specified level of income.

Assumptions of the Models

When using linear programming it is important that the assumptions be stated explicitly. In the remainder of the chapter the assumptions of the two models are discussed and compared.

Profit Maximization Model

The representative farm situations defined in this section of the study are small, medium and large mixed livestock farms. The farms were classified by size and type. Data from farms making up the mixed livestock class were used to determine the initial resource

restrictions which define the representative farm situations. Thus, the representative farms are defined by size and type, while the resource restrictions are the statistical averages of the resources used by the farms included in the size type classification. Another defining characteristic used was the enterprises found on these farms in 1962. The enterprise levels for the representative mixed livestock farms for the production year 1962 are given in Table 3-1.

Table 3-1. Enterprise Levels for Representative Mixed Livestock Farms in Southeastern South Dakota in 1962.

Product	Unit	Farm Size Group		
		Small	Medium	Large
Crops				
Corn, grain	Acre	50	92	136
Corn, silage	Acre	2	2	9
Soybeans	Acre	6	8	18
Oats	Acre	18	61	73
Legume hay	Acre	9	20	19
Livestock				
Sows	Head	3	10	15
Feeder cattle	Head	11	18	45
Beef cows	Head	4	9	2
Land				
Owned	Acre	97	86	99
Rented	Acre	68	191	281

Because the farms were all classified as mixed livestock farms, the only major difference among them was size. In 1962 corn was the main crop grown on the three representative farms. Livestock production was divided between pork and beef.

Resource Restrictions

Table 3-2 gives the initial level of resources for the mixed livestock farms. The level of resources are based on farm averages. The annual cash restriciton is the net amount initially available for farm operations. Three thousand dollars have been deducted to provide for the living expenses of the operator. The initial resource restrictions for cash and different sources of credit were estimated as follows. The initial cash available was assumed to be the non real estate assets less machinery and equipment. Operator living expense was also subtracted from this value. The initial real estate mortgage limit was 50 percent of the gross real estate value less all outstanding debts against real estate. Initial chattel mortgage was limited to 50 percent of the total non real estate assets. When the various livestock, feeding and housing activities entered into the solutions, they added part or full purchase value to the initial mortgage limits.

Both the quantity of a resource and when it is available are important. Thus labor is broken down into five periods, with the percentage distribution as follows:

TABLE 3-2. RESOURCE RESTRICTIONS FOR REPRESENTATIVE MIXED LIVESTOCK FARMS IN SOUTHEASTERN SOUTH DAKOTA.

Resource	Unit	Farm Size Group		
		Small	Medium	Large
Group I cropland	Acre	61	110	157
Group II cropland	Acre	48	88	127
Group III cropland	Acre	0	3	15
Group IV cropland	Acre	0	5	7
Pasture grazing limit	Ton H.E.	26	30	28
Corn acreage limit	Acre	82	106	118
Hay to harvest	Tons	7	9	14
Central farrow Q_1	Sow	8	14	15
Central farrow Q_2	Sow	8	14	15
Central farrow Q_3	Sow	8	14	15
Central farrow Q_4	Sow	8	14	15
Confinement feed Q_1	Head	0	112	120
Confinement feed Q_2	Head	0	112	120
Confinement feed Q_3	Head	0	112	120
Confinement feed Q_4	Head	0	112	120
Portable feed Q_1	Head	64	0	0
Portable feed Q_2	Head	64	0	0
Portable feed Q_3	Head	64	0	0
Portable feed Q_4	Head	64	0	0
Beef housing Pd. 1	Head	29	29	34
Beef housing Pd. 2	Head	29	29	34
Low mech. feed. Pd. 1	Head	2	2	10
Low mech. feed. Pd. 2	Head	2	2	10
Annual labor	Man Hr.	2,597	3,752	4,257
Period 1 labor	Man Hr.	892	1,175	1,209
Period 2 labor	Man Hr.	337	444	445
Period 3 labor	Man Hr.	534	831	1,010
Period 4 labor	Man Hr.	514	803	977
Period 5 labor	Man Hr.	320	499	606
Annual cash, Pd. 1	$10.00	3,946	9,649	17,568
Annual cash, Pd. 2	$10.00	3,946	9,649	17,568
Real estate mortgage	$10.00	13,179	17,721	17,571
Chattel mortgage, Pd. 1	$10.00	4,135	4,071	9,345
Chattel mortgage, Pd. 2	$10.00	0	0	0
Silo capacity	Tons	63	57	131
Seasonal labor limit	Man Hr.	50	40	300
Buy land limit	Acre	105	46	73
Rent land limit	Acre	15	11	15

Period one - November 16 to March 15	24.19 percent
Period two - March 16 to April 30	10.00 percent
Period three - May 1 to July 15	23.48 percent
Period four - July 16 to September 30	27.78 percent
Period five - October 1 to November 15	14.55 percent

An attempt was made to group the labor such that crucial and slack periods in crop production were more distinct. The labor restrictions were reduced by the estimated amounts of overhead labor required on the farms.

The quantity of land available for purchase or rental was determined from the questionnaire response. Each farm operator was asked to list how much land was available for purchase or rent in his immediate area.

Activities Considered

Land

The percentage composition of an acre added reflected the original composition of an acre on the particular representative farm. The percentage composition of an acre of land for the three representative farms is given in Table 3-3.

Cropland was divided into four groups. The division was influenced mainly by the percent of slope and the susceptibility of the land to erosion. Group I cropland had the least slope, 0-3 percent. This was the only group of cropland on which continuous grain crop sequences were allowed. On the other groups of cropland various

Table 3-3: Assumed Percentage Composition of an Acre of Farmland for Representative Mixed Livestock Farms in Southeastern South Dakota.

Item	Farm Size Group		
	Small	Medium	Large
		Percent	
Cropland composition			
Group 1	39.0	41.7	43.3
Group 2	31.1	38.8	36.4
Group 3		1.9	4.2
Group 4		2.0	2.0
Total cropland	70.1	79.4	85.9
Native hay or pasture	22.9	12.2	8.4
Farmstead and other	7.0	8.4	5.7
Total	100.0	100.0	100.0

rotations were used. When a cropping system including a high proportion of row crops was used on those groups of cropland, terracing was necessary. Admissible crop enterprises included corn grain, corn silage, oats, soybeans, alfalfa hay and native hay. Assumed land price was $200.11.

Representative farms were allowed to add land either by purchase and/or rental. Purchase could be either by mortgage or contract. Purchase for mortgage required a 50 percent downpayment, and carried a 5.5 percent interest charge. Purchase on contract required a 20 percent downpayment and carried a six percent interest charge. Rented land was charged a value estimated to be one-third of gross income from an acre of cropland.

The land acquisition activities for the large mixed livestock farm are shown in Table 3-4 as an example of the model used.

Table 3-4. Land Acquisition Activities used with Representative Large Mixed Livestock Farm in Profit Maximization Model.

Equation No.	Description	Unit	Buy Land Mortgage	Buy Land Contract	Rent Land in
			Acre	Acre	Acre
1	Group 1 cropland	Acre	-.413	-.413	-.513
2	Group 2 cropland	Acre	-.334	-.334	-.415
3	Group 3 cropland	Acre	-.039	-.039	-.049
4	Group 4 cropland	Acre	-.018	-.018	-.023
5	Pasture Grazing Lm.	Ton h.e.	-.063	-.063	
6	Annual cash Pd. 1	$10	20.011	20.011	
7	Annual cash Pd. 2	$10	20.011	20.011	
8	Real estate Mort.	$10	-10.006		
4	Buy land limit	Acre	1.0	1.0	
5	Rent land limit	Acre			1.0
6	Land contract credit	$10		-16.008	
	Net revenue	$	-2.70	-2.70	-19.53

Labor

In addition to the breakdown of labor shown earlier in this chapter, limited amounts of seasonal labor could be hired in periods two through five at a cost of $1.10 per hour. In periods where there was excess operator and family labor, this labor could be sold for $.50 per hour.

Credit

Credit activities included period one and two savings, borrowing on real estate mortgage, borrowing on period one and two chattel

mortgage, and contract credit. Real estate credit cost 5.5 percent, while chattel credit was charged seven percent. Period two chattel credit allowed funds to be borrowed for a half year period. Short term funds were used mainly in the hog and yearling feeding activities. The saving activities allowed excess cash to earn a four percent annual return. The contract credit activity allowed 80 percent of the purchase price to be borrowed when land was bought on contract. This activity carried a six percent interest charge and was used only when credit couldn't be obtained cheaper from other sources.

Livestock

A total of 17 beef activities were considered as production alternatives. A cow-calf enterprise, assuming a 92 percent calf crop with one sixth of the cows replaced annually, was included in the model. Annual salable products were one sixth of a 1,000 pound cull cow and 76 percent of a 430 pound calf.

The calf feeding activities allowed 430 pound steer calves to be obtained in October, wintered, and fed in drylot, with or without silage, so that a 1,050 pound choice slaughter steer was available for sale the following October. As an alternative the calves could be pastured three months in the summer before going to drylot feeding. In this case a 1,100 pound choice slaughter steer was produced.

Seven-hundred pound yearling steers could be purchased in October or April and fed six months in drylot with or without silage. Here the marketable product was a 1,100 pound choice slaughter steer.

Two levels of mechanization were permitted for all beef feeding activities. High mechanization feeding required greater capital investment, but reduced the labor requirement. A comparison of labor requirements for the respective feeding activities at the two levels of mechanization are shown in Table A-1 of the appendix.

Eight hog activities were considered. Sows could be farrowed in any of four quarters during the year. Central farrowing facilities were used in all activities, but a choice was given between portable and confinement feeding. It was assumed that eight pigs were weaned per litter. One replacement gilt was kept, and seven 225 pound market hogs were sold. Each hog activity added the value of the sow to the chattel mortgage limit.

Building and Feeding Facilities

The model allowed for the addition of housing and feeding facilities for beef and swine. When beef housing, central hog farrowing or confinement hog feeding facilities were bought, they added two thirds of purchase cost to the real estate borrowing limit. When portable hog feeding or beef feeding facilities were bought, they added two thirds of purchase price to the chattel borrowing limit.

Investment in storage facilities was assumed to be included in the land price, except for silage. A silo building activity was included in the model. This added 50 percent of purchase value to the real estate borrowing limit.

Buying and Selling

Feeder calves could be either bought or sold. When bought, they added full purchase value to the chattel borrowing limit, and were used in one of the beef feeding activities. Yearling calves could be bought to be fed in drylot. They also added full purchase value to chattel credit limit. Corn buying and selling were included in the model. Oats production was converted into corn equivalents so that it could be either sold or fed through the livestock enterprises.

Minimum Resource Model

Many of the assumptions made, and activities considered in the profit maximizing section of this study, apply to the minimum resource section. Because of this, only the major differences of the minimum resource model will be presented.

Land

Land was the resource to be minimized, therefore the number of acres in the solution was determined by the programming process. In order to have a representative situation it is necessary that each acre be representative of a typical acre in the area. The percentage

composition of a typical acre in Southeastern South Dakota is given in Table 3-5. The crop alternatives considered were the same as in the first section.

Table 3-5. Assumed Percentage Composition of an Acre of Farmland for Representative Farm in Southeastern South Dakota.

Item	Percent
Cropland composition	
Group 1	39.4
Group 2	31.7
Group 3	10.9
Group 4	1.7
Total cropland	83.7
Native hay or pasture	12.1
Farmstead and other	4.2
Total	100.0

Labor

Labor was the only resource that was not initially zero. The total operator's labor available was assumed to be 3,128 hours. Labor periods similar to those used in the first section with labor allocated as follows:

Period one - November 16 to March 15	1,028 hours
Period two - March 16 to April 30	394 hours
Period three - May 1 to July 15	652 hours

Period four - July 16 to September 30 660 hours

Period five - October 1 to November 15 394 hours

No specific allowance was made for overhead labor. Family labor was not included in available labor, but it was assumed that enough family labor was available to take care of overhead labor requirements. Average overhead labor requirements for different size and type farms are shown in Table A-2 of the appendix. Unlimited additional labor could be hired in all periods at $1.25 per hour.

The degree of mechanization is an important factor in determining the amount of labor needed. The machinery combinations used for the cropping activities for the mixed livestock farms were those originally available on the representative farm. However, the machinery combination used in the minimum resource section were the same as the one used for the large mixed livestock farm. Because of the high labor efficiency of this combination, total labor for the solutions with smaller acreages are slightly understated.

Custom work can sometimes be substituted for operator or hired labor. This is particularly true of crops grown on small acreages where overhead costs would be too great to warrant ownership of machinery. In this section of the study, hay baling and silage cutting were assumed to be hired.

Credit

In this section capital available was assumed to be unlimited as long as its rate of return exceeded the interest charge. Capital

was divided into short and long term. Short term capital was used in the hog and yearling activities as the capital was needed only for a part of the year. Capital was charged seven percent interest.

Land accounts for a considerable portion of total investment. The market rate of interest on land was assumed to be 5.5 percent, except in two of the alternative models when no return on land investment was required.

Livestock

The livestock enterprise alternatives in the basic minimum resource model were similar to those in the first section, with the exception of the inclusion of a stocker raising activity and some changes in the hog enterprises. In the stocker activity a 430 pound calf was wintered on a ration of either silage or grain plus hay. The yearling calf was then pastured until it weighed 700 pounds. It could either be sold as a yearling feeder or fed through one of the yearling activities.

Three hog activities were considered. Central farrowing and portable feeding facilities were used in these enterprises. One activity provided for a sow with litters in quarters one and three. A second activity provided for a sow with litters in quarters two and four. The final hog activity provided for two sows with two litters each.

Buildings and Facilities

As in the first section of this study, investment in storage facilities was assumed to be included in the land price except for silage. Storage costs for silage were included in the silage harvesting activity. Average investment in housing and feeding facilities was allocated to the livestock enterprise that uses them.

In the first section, variable costs were allocated to the respective crops, but no allowance was made for fixed machinery costs. In the minimum resource section fixed machinery costs were allocated as a direct cost for growing and harvesting crops.

Buying and Selling

The buying and selling activities were the same as in the first section, except that the minimum resource model allowed stockers to be sold. As alternative models were considered, all buying and selling activities were not included in all models.

Other Assumptions

In the minimum resource section certain non allocated overhead costs were assumed for the different specified levels of income. These are shown in Table A-3 of the appendix. Total overhead costs of 1,125 dollars were assumed for the 3,000 dollar income level, 1,260 dollars for the 5,000 dollar income level, and 1,395 dollars for the 10,000 dollar income level.

Costs that could not be allocated to any individual enterprise but varied with the number of acres are shown in Table A-4 of the

appendix. These costs were assumed to be 5.5 percent for interest on land, 1.33 percent for taxes and insurance, and .48 dollar per acre for fence depreciation and maintenance.

A complete listing of the activities and restrictions for the profit maximizing model is given in Tables A-5 and A-6 in the appendix. A similar listing for the minimum resource model is given in appendix tables A-7 and A-8.

Assumptions of Budgets

Budgets were developed for each of the production activities considered in the model. These budgets were based on the assumption that improved management and technological levels will be used in Southeastern South Dakota. It was assumed that practices included in the study, but not presently used by most farmers will be adopted by the majority in the next five to ten years.

Predicted crop yields and application rates for fertilizer, herbicides and insecticides for the area were developed for NC-54 and GP-5 research projects.[7] The assumptions concerning the input-output relationships for livestock activities were similar to those used in NC-54. The assumed crop yields are shown in Table A-9 of the appendix.

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[7]The data used in these research projects were developed by Professor John Sanderson of the South Dakota State University Economics Department in cooperation with staff members of the South Dakota State University Agronomy Department.

Chapter IV

OPTIMAL SOLUTIONS FOR REPRESENTATIVE MIXED LIVESTOCK FARMS WITH LAND ACQUISITION PERMITTED

This chapter presents optimal organizations of the representative mixed livestock farms for selected price combinations, with limited land acquisition considered as an alternative use of capital. The prices assumed for corn, hogs and beef in this study are presented in Table 4-1.

Table 4-1. Price Levels Assumed for Optimum Resource Combinations, Mixed Livestock Farms, Southeast South Dakota[a]

Product	Unit	High $ Price	Medium $ Price	Low $ Price
Corn	Bushel	1.10	.90	.70
Hogs	Cwt.	17.37	14.41	11.45
Beef	Cwt.	24.06	19.90	15.74

[a]The resource supplies of the farms programmed are listed in Table 3-2 of Chapter Three.

Programmed solutions for the representative mixed livestock farms differ considerably from the 1962 organizations. In this chapter the optimal solutions are first examined to observe the changes in farm size and type. In examining the type and size adjustments made, only comparisons at the medium price level are made. Then the effects of price variations on farm organizations are

examined. Finally, optimal organizations for selected price levels are compared to results obtained with a similar model that did not allow acquisition of additional land.

Optimal Farm Plans

In the following section type and size adjustments are examined. The single most significant adjustment is the intensification of the livestock enterprises. Of the livestock enterprises, the greatest expansion is in the hog enterprise. In the 1962 organizations, the small, medium and large livestock farms farrowed 3, 16 and 18 sows, respectively. In the optimal organizations the small farm has 102, the medium 220 and the large 209 litters. The beef feeding enterprises increase on all farms. The 1962 levels for fed beef were 11, 18 and 45 for the small, medium and large livestock farms. The programmed organizations include 43, 45 and 52 head, respectively.

For the 1962 production year the three livestock farms all sold corn. The small farm had the largest sales, selling 1,033 bushels. The medium sized farm had corn sales of 329 bushels, while the large farm sold only 167 bushels.

With the increase in livestock production, the farms change from a corn surplus to a corn deficit. The representative farms could meet the demand for corn either by buying it or adding additional land and raising it. At the medium price level for corn, hogs and beef, the representative farms purchase most of the needed corn rather than adding land. The small and large farms rent the

limit of land available for rent, which is 15 acres for the small and 11 acres for the large. The large farm also purchases the limit of 73 acres on contract. The medium sized livestock farm adds no land at medium prices.

Labor is an important factor in determining whether corn would be bought or raised. At the medium corn price, it is more profitable to use the labor to produce livestock than to use it to raise corn. In the optimal solutions at medium prices, the small livestock farm purchases 7,166 bushels of corn, the medium sized farm purchases 15,739 bushels and the large farm purchases 15,209 bushels.

The crop enterprises in the optimal organizations follow somewhat the pattern of the original organization. With the large increase in hog production, there is a shift away from the hay crops to growing more feed grains. On the small farm the corn acreage increases, while on the medium farm the oat acreage increases from 51 to 96 acres.

Corn is the major crop grown on the small and medium sized farms. The 1962 plans included 50 acres for the small and 92 acres for the medium sized farm. Optimal organizations include 93 acres on the small farm, and 87 acres on the medium sized farm. In the optimal organization, the large mixed livestock farm has 147 acres of corn compared to 136 acres in the 1962 plan.

In 1962 the large representative farm produced only 18 acres of soybeans, but in the optimal solution 162 acres of beans are produced. No beans are included in the optimal plans at the medium

price level on the other two representative farms. Higher labor and capital supplies on the large farm allow the large increase in bean acreage. With resources being used to produce soybeans, corn and livestock production does not expand proportionally as much as they do on the other two farms.

Effects of prices on organization

In this study corn, hog and beef prices were allowed to vary. These prices were set at three levels, (see Table 4-1) which are referred to as low, medium and high. Since price changes generally result in production responses, it is expected that price changes will affect representative farm organizations. It can also be expected that certain price changes will have a greater effect on representative farm organization and production than will others. This is the case in this study. Because of this, only the most important changes are presented in the text of this study. Of the 27 price combinations for which optimal solutions were found, only nine solutions for each farm are presented here. Complete tables of optimal solutions for all price combinations for the three representative mixed livestock farms are shown in Tables A-10 through A-18 of the appendix.

Small Mixed Livestock Farm

Initially, the small mixed livestock farm was 165 acres in size. In the programming model it could buy 105 acres and/or rent

an additional 15 acres. Enterprise levels for 1962 are listed in Table 3-2 of Chapter III. Optimal organizations for the nine selected price levels are given in Table 4-2.

At the nine price combinations analyzed the total land available is rented. Corn price is an important factor in determining whether it is profitable to add land, because the added land is used mainly for corn and oat production. Two other factors, labor and credit, limit expansion of the small livestock farm. Land could be purchased on contract with a 20 percent down payment, but additional capital and labor are required to produce a crop on the land. For all price levels in Table 4-2, all available credit is used. Also, for all price combinations all available seasonal labor is hired. Rented land requires no capital investment and is all cropland. Because of this, the farms usually acquire the land for rent first.

Livestock enterprises, the hogs in particular, are very competitive for available resources. At the lower prices, for example LLL, more labor and capital are available for land buying because of prices unfavorable for investment in livestock and facilities. At the higher corn prices, whether land is added depends on livestock price relationships. When the corn price is high in relation to livestock prices, the representative farm tends to use its credit resources to add land and grow corn. This can be seen at the HMM price level. Thirty-three acres are bought on contract, and the number of hogs produced is less than in the other solutions. At the HMH level, the

TABLE 4-2. OPTIMAL ORGANIZATIONS for SMALL MIXED LIVESTOCK FARMS in SOUTHEASTERN SOUTH DAKOTA.

ACTIVITY	UNIT	Prices for corn, hogs, and beef[a] LLL	MMM	MMH	MHM	MHH	HMM	HMH	MMH	HHH
Corn	Acre	104	93	93	66	68	105	114	86	68
Soybeans	Acre	8	0	0	0	0	0	0	0	0
Oats	Acre	11	16	10	51	46	36	59	32	45
Corn silage	Acre	0	0	0	0	0	5	5	0	0
Alfalfa	Acre	14	15	21	7	10	13	15	6	11
Native hay	Acre	7	7	7	7	7	7	7	7	7
Sows farrowed Q_1	Sow	43	40	35	35	33	42	36	41	33
Sows farrowed Q_2	Sow	6	11	0	35	33	34	28	41	33
Sows farrowed Q_3	Sow	0	11	8	35	33	0	0	7	33
Sows farrowed Q_4	Sow	43	40	35	35	33	0	0	41	33
Low mech. feed.										
Dlt. yrlgs.	Head	0	0	22	0	0	0	0	0	0
Calves, past.	Head	44	43	42	0	21	45	54	0	21
Calves, dlt.	Head	0	0	0	0	0	0	0	0	0
High mech. feed.										
Dlt. yrlgs.	Head	0	0	9	0	0	0	0	0	0
Calves, past.	Head	0	0	0	0	0	0	13	0	0
Calves, dlt.	Head	0	0	0	0	0	0	0	0	0
Land pur., mort.	Acre	0	0	0	0	0	0	0	0	0
Land pur., cont.	Acre	19	0	0	0	0	33	105	0	0
Land rented in	Acre	15	15	15	15	15	15	15	15	15
Gross profit	$	9,224	14,651	15,919	22,334	22,620	13,500	15,204	20,449	20,670

[a] L = Low; M = Medium; H = High

TABLE 4-2. Continued

ACTIVITY	UNIT	LLL	MMM	MMH	MHM	MHH	HMM	HMH	HHM	HHH
Resources acquired										
Real estate mort.	$	19,829	19,305	19,243	18,611	18,078	19,817	19,609	19,674	18,070
Chattel mort.	$	12,859	12,580	16,339	8,432	10,141	12,851	14,602	9,174	10,164
Land cont. cred.	$	3,040	0	0	0	0	5,280	16,800	0	0
Corn purchased	Bu.	5,546	7,166	7,737	9,479	9,699	4,790	2,232	7,525	9,698
Beef housing	Head	0	0	19	0	0	0	14	0	0
Low mech. feed.	Head	42	41	63	0	19	43	52	0	0
High mech. feed.	Head	0	0	9	0	0	0	13	0	0
Change low-high		0	0	0	0	0	0	0	0	0
Central farrow.	Sow	35	32	27	27	25	34	28	33	25
Portable feed.	Head	628	576	500	496	464	544	448	592	464
Seasonal labor	Hour	50	50	50	50	50	50	50	50	50

limit of 105 acres is bought. The beef feeding enterprise, which adds full purchase value to chattel mortgage, is favored over the hog enterprises. With the hog enterprise at a low level, credit is available to purchase land on contract. With the additional land, corn purchases are reduced to 2,232 bushels, the lowest of any of the solutions.

Soybeans entered into the optimal solution only once. At the LLL level, eight acres are produced. Corn silage is included at the HMM and HMH price levels, when calves on pasture are fed silage.

The hog enterprises dominate the livestock activities. All sows are farrowed in central farrowing units, while portable feeding facilities are used. At all price levels shown, portable feeding facilities are added. Labor limitations prevent full utilization of farrowing and feeding units in all quarters. The highest level of hog production is at MHM with 140 litters farrowed. Even when the price level is more favorable to beef, i.e., MMH and HMH price levels, there are 78 and 64 litters farrowed. However, when the price relationship is unfavorable, MHM and HHM, no beef is produced.

The beef enterprise consists mainly of low mechanization feeding of drylot yearlings, and the feeding of calves on pasture. The largest beef production is 73 head at the MMH price level, when 31 drylot yearlings and 42 calves on pasture are produced. Only at MMH and HMH price levels is high mechanization beef feeding used. The use of low mechanization feeding facilities indicates that in

most cases capital is a more limiting factor than labor. Only at MMH and HMH price combinations is it necessary to add beef housing. Six price levels require the addition of low mechanization beef feeding.

Gross profit ranges from 9,224 dollars for LLL to 22,620 dollars for MHH. Gross profit is defined as gross income less variable cash costs. Because corn is generally purchased, the lower the corn price in relation to livestock prices, the higher the gross profit. For example, at the MHH level gross profit is 22,620 dollars while at HHH gross profit drops to 20,670 dollars. Other than at the LLL level, the lowest gross profit is 13,500 dollars at the HMM level.

Medium Mixed Livestock Farm

Originally the medium mixed livestock farm was 277 acres in size. The representative farm could add 46 acres by buying it on contract or mortgage. Eleven acres of cropland were available for rent. The enterprise levels for 1962 are shown in Table 3-1 in Chapter III. Optimal organizations for nine selected price levels are shown in Table 4-3.

Land is added at four of the nine price levels selected. Only at the price combination HMH is all available land added. At MMH, only rented land is added, while at HMM, land is bought, but none is rented. All land purchased is bought on contract.

As was the case for the small mixed livestock farm, labor and capital limitations prevent the medium size farm from expanding very

TABLE 4-3. OPTIMAL ORGANIZATIONS for MEDIUM MIXED LIVESTOCK FARMS in SOUTHEASTERN SOUTH DAKOTA.

ACTIVITY	UNIT	Prices for corn, hogs, and beef[a] LLL	MMM	MMH	MHM	MHH	HMM	HMH	HHM	HHH
Corn	Acre	69	87	112	72	82	120	129	72	81
Soybeans	Acre	129	0	0	0	0	0	0	0	0
Oats	Acre	23	96	53	122	103	94	49	120	103
Corn silage	Acre	0	0	0	0	0	4	0	0	0
Alfalfa	Acre	12	18	36	7	16	13	65	9	17
Native hay	Acre	15	14	14	14	14	15	15	14	14
Sows farrowed Q_1	Sow	62	55	31	58	52	60	54	58	52
Sows farrowed Q_2	Sow	10	55	0	58	52	53	0	58	52
Sows farrowed Q_3	Sow	14	55	30	58	52	0	14	53	50
Sows farrowed Q_4	Sow	62	55	31	58	52	60	54	58	50
Low mech. feed.										
Dlt. yrlgs.	Head	0	0	0	0	0	0	0	0	0
Calves, past.	Head	45	0	55	0	0	0	71	0	0
Calves, dlt.	Head	0	0	0	0	0	0	0	0	0
High mech. feed.										
Dlt. yrlgs.	Head	0	0	266	0	0	0	0	0	0
Calves, past.	Head	0	45	0	0	45	45	58	0	45
Calves, dlt.	Head	0	0	0	0	0	0	0	0	0
Land pur., mort.	Acre	0	0	0	0	0	0	0	0	0
Land pur., cont.	Acre	34	0	0	0	0	16	46	0	0
Land rented in	Acre	11	0	11	0	0	0	11	0	0
Gross profit	$	15,378	23,484	25,684	36,090	36,431	20,758	23,037	32,803	33,118

[a] L = Low; M = Medium; H = High

TABLE 4-3. Continued

ACTIVITY	UNIT	LLL	MMM	MMH	MHM	MHH	HMM	HMH	HHM	HHH
Resources acquired										
Real estate mort.	$	27,488	25,794	25,800	26,739	25,307	29,258	28,140	26,735	25,309
Chattel mort.	$	18,739	20,532	39,097	15,164	20,203	21,047	27,846	15,161	20,197
Land cont. cred.	$	5,440	0	0	0	0	2,560	7,360	0	0
Corn purchased	Bu.	13,478	15,739	17,194	16,453	16,609	10,569	10,795	16,450	16,606
Beef housing	Head	0	0	93	0	0	0	55	0	0
Low mech. feed.	Head	43	0	53	0	0	43	69	0	0
High mech. feed.	Head	0	43	133	0	43	46	58	0	42
Change low-high	Head	0	2	0	0	2	2	0	0	2
Central farrow.	Sow	48	41	27	44	38	46	40	44	38
Portable feed.	Head	880	768	384	816	720	848	752	816	720
Seasonal labor	Hour	40	40	40	40	40	40	40	40	40

much. All available credit and seasonal labor is used at all price levels. Hogs are very competitive with land buying. When hog prices are at the high level, no land is added.

Corn and oats are the major crops produced at all price combinations except LLL. At the LLL level, because of the low return on the livestock enterprises, soybeans come into the optimal solution at 129 acres. Corn silage enters into the optimal solution only at the HMM level when calves on pasture are fed silage. Corn purchases are about 16,000 bushels, except at HMM and HMH levels. These are levels at which land is added, and then corn purchases are about 10,000 bushels.

The livestock activities in optimal plans for the medium mixed livestock farm are similar to those for the small farm, with hogs being the dominant enterprise. The highest level of hog production is 232 litters at the MHM price level. The lowest level is at MMH when 92 litters are farrowed. All sows are farrowed in central farrowing facilities, and litters are fed in portable units. Farrowing and feeding facilities are added at all price combinations. Because of a labor shortage these facilities are not always fully utilized. This is particularly true in quarters two and three at price levels where land is added, and considerable beef is raised.

At least 45 head of beef cattle are fed at each price combination except MHM and HHM. At these levels no beef is fed. The highest level of beef production is at MMH when 266 yearlings and 55 calves are fed.

The majority of beef feeding is with high mechanization facilities. The use of high mechanization beef feeding indicates that labor is a more limiting factor than capital on the medium mixed livestock farm. At the MMM, MHH, HMM and HHH levels, all beef feeding is with high mechanization equipment. In these cases the existing low mechanization feeding facilities are converted to high mechanization. Beef housing has to be added only at the two levels MMH and HMH, where the beef price is favorable in relation to the hog price.

Gross profit ranges from 15,373 dollars at LLL to 36,431 dollars at MHH prices. With other prices held constant, gross profit declines as corn prices increase. For example, at MHH gross profit is 36,431 dollars. When corn price is raised to the high level, (HHH) gross profit drops to 33,118 dollars.

An increase in the pork price adds more to gross profit than an increase in beef prices. For example, when the beef price is increased from medium to high (MMM to MMH), gross profit increases from 23,484 dollars to 25,684 dollars. However, when pork price increases from medium to high, (MMM to MHM) gross profit increases from 25,864 dollars to 36,090 dollars.

Large Mixed Livestock Farm

The original size of the large mixed livestock farm was 380 acres. Seventy-three acres could be bought, and an additional 15

acres could be rented. The enterprise levels for 1962 are shown in Table 3-1 of Chapter III. Optimal organizations for nine selected price combinations are shown in Table 4-4.

The large livestock farm adds the most land of the three representative farms. At seven price combinations all available land is added. With a higher capital and labor supply, it is profitable for the farm to add land to raise corn. The machinery combination used for the large farm made crop activities more competitive because they required less labor and capital per acre. All land buying is on contract, except at the MHM price combination, where 59 acres are purchased for mortgage. At all price levels shown here, all available capital and seasonal labor is used.

Corn and soybeans are the main crops grown. Soybeans are produced at all price levels except HMH, when the land is used to produce forage for the beef enterprises.

Hogs are again the dominant livestock activity, but not to the extent that they were on the two smaller farms. In general, the levels of livestock production on the large farm are greater than on the other farms, but on a per acre basis livestock production is less intensive.

At the HHM price combination, hog production is at its highest level with 255 litters farrowed. Lowest hog production is at the MMH level with only 45 litters farrowed. Central farrowing and portable

TABLE 4-4. OPTIMAL ORGANIZATIONS for LARGE MIXED LIVESTOCK FARMS in SOUTHEASTERN SOUTH DAKOTA.

ACTIVITY	UNIT	Prices for corn, hogs, and beef[a] LLL	MMM	MMH	MHM	MHH	HMM	HMH	HHM	HHH
Corn	Acre	128	147	147	136	136	147	147	147	147
Soybeans	Acre	187	162	73	160	64	165	0	34	46
Oats	Acre	42	47	78	45	119	54	86	184	158
Corn silage	Acre	0	0	0	0	0	0	0	0	0
Alfalfa	Acre	14	15	73	4	49	5	138	6	20
Native hay	Acre	23	22	22	22	22	22	22	22	22
Sows farrowed Q_1	Sow	75	70	15	61	57	80	55	91	69
Sows farrowed Q_2	Sow	29	32	0	61	57	46	0	91	69
Sows farrowed Q_3	Sow	15	37	15	61	56	15	15	15	17
Sows farrowed Q_4	Sow	75	70	15	61	57	80	55	58	69
Low mech. feed.										
Dlt. yrlgs.	Head	0	0	88	0	0	0	0	0	0
Calves, past.	Head	0	0	61	0	0	10	206	0	0
Calves, dlt.	Head	52	0	0	0	0	0	0	0	0
High mech. feed.										
Dlt. yrlgs.	Head	0	0	214	0	38	0	0	0	0
Calves, past.	Head	0	52	0	0	63	0	23	0	70
Calves, dlt.	Head	0	0	0	0	0	0	0	0	0
Land pur., mort.	Acre	0	0	0	59	0	0	0	0	0
Land pur., cont.	Acre	73	73	73	0	56	73	73	73	73
Land rented in	Acre	15	15	15	0	0	15	15	15	15
Gross profit	$	21,130	31,050	33,812	44,607	454,476	28,190	30,280	41,875	42,490

[a] L = Low; M = Medium; H = High

TABLE 4-4. Continued

ACTIVITY	UNIT	LLL	MMM	MMH	MHM	MHH	HMM	HMH	HHM	HHH
Resources acquired										
Real estate mort.	$	30,621	29,416	26,515	33,800	28,115	31,597	31,114	33,641	29,573
Chattel mort.	$	22,501	23,813	58,072	16,634	25,845	19,318	35,780	19,820	26,873
Land cont. cred.	$	11,680	11,680	11,680	0	8,960	11,680	11,860	11,680	11,680
Corn purchased	Bu.	14,908	15,209	21,240	16,777	17,848	13,847	14,585	12,864	14,090
Beef housing	Head	0	0	169	0	31	0	115	0	11
Low mech. feed.	Head	42	0	95	0	0	0	197	0	0
High mech. feed.	Head	0	42	207	0	90	0	23	0	60
Change low-high	Head	0	10	0	0	10	0	0	0	10
Central farrow.	Sow	60	55	0	46	42	65	25	76	54
Portable feed.	Head	1,080	1,000	120	856	792	1,160	760	1,336	984
Seasonal labor	Hour	300	300	300	300	300	300	300	300	300

feeding facilities are used. Portable feeding facilities are added at all price combinations. Central farrowing facilities are added at all price levels except MMH.

Beef production is divided between drylot yearlings and calves on pasture. Both low and high mechanization facilities are used for beef feeding. At price combinations MMM, MHH and HHH, all beef feeding is by high mechanization. At these levels, the ten low mechanization feeding units are converted to high mechanization facilities.

Gross profit ranges from 21,130 dollars at LLL to 45,476 dollars at MHH. The gross profit figure for the large farm fluctuates in much the same manner as it does for the other two mixed livestock farms. With other prices constant, gross profit declines as corn prices increase. With corn and beef prices held constant, an increase in hog price increases gross profit much more than if beef prices increase with hog and corn prices held constant.

Comparison of Results with those of Model Without Land Acquisition

John Sanderson of the South Dakota State University Economics Department found optimal organizations for representative farms in Southeastern South Dakota as part of NC-54. The model used in programming the mixed livestock farms was similar to that used in this study except that it did not allow for land acquisition.

Since the large mixed livestock farm added the most land, it offers the best chance to evaluate the effect of land acquisition on the optimal organizations of representive farms. In Table 4-5

TABLE 4-5. COMPARISON of OPTIMAL ORGANIZATIONS WITH and WITHOUT LAND PURCHASE for LARGE MIXED LIVESTOCK FARMS in SOUTHEASTERN SOUTH DAKOTA.

ACTIVITY	UNIT	Corn, hog and beef price combinations[a]					
		LLL		MMM		HHM	
	Plan:[b]	A	B	A	B	A	B
Corn	Acre	24	128	118	147	118	147
Soybeans	Acre	227	187	131	162	66	46
Oats	Acre	33	42	35	47	95	158
Alfalfa	Acre	15	14	15	15	20	20
Native hay	Acre	7	9	7	8	7	8
Sows farrowed Q_1	Sow	62	75	59	70	67	69
Sows farrowed Q_2	Sow	62	29	59	32	67	69
Sows farrowed Q_3	Sow	43	15	59	37	67	17
Sows farrowed Q_4	Sow	62	75	59	70	33	69
Low mech. feed:							
Dlt. yrlgs.	Head	24	0	23	0	0	0
Calves, past.	Head	29	52	1	0	52	0
Calves, dlt.	Head	0	0	0	0	0	0
High mech. feed:							
Dlt. yrlgs.	Head	0	0	0	0	0	0
Calves, past.	Head	0	0	28	52	0	70
Calves, dlt.	Head	0	0	0	0	0	0
Land pur., mort.	Acre	--	0	--	0	--	0
Land pur., cont.	Acre	--	73	--	73	--	73
Land rented in	Acre	--	15	--	15	--	15
Gross profit	$	20,477	21,130	30,393	31,050	40,080	42,490

[a] L = Low; M = Medium; and H = High prices.
[b] Plan A is without land acquisition; Plan B is with land acquisition.

TABLE 4-5. Continued.

ACTIVITY	UNIT	Corn, hog and beef price combinations					
		LLL		MMM		HHM	
	Plan:	A	B	A	B	A	B
Resources acquired							
Real estate mort.	$	27,799	30,621	26,964	29,416	21,189	29,573
Chattel mort.	$	19,329	33,501	20,372	23,813	26,773	26,867
Land cont. cred.	$	--	11,680	--	11,680	--	11,680
Corn purchased	Bu.	25,252	14,908	19,990	15,209	17,834	14,090
Beef housing	Head	0	0	0	0	0	11
Low mech. feed.	Head	42	42	14	0	42	0
High mech. feed.	Head	0	0	28	42	0	60
Change low-high	Head	0	0	0	10	0	10
Central farrow.	Sow	47	60	44	55	52	54
Confinement feed.	Head	0	0	0	0	0	0
Portable feed.	Head	872	1,080	824	1,000	952	984
Seasonal labor	Man Hr.	267	300	300	300	300	300

TABLE 4-5. Continued

ACTIVITY	UNIT	Corn, hog and beef price combinations[a]					
		HMM		HMH		HHH	
Plan:[b]		A	B	A	B	A	B
Corn	Acre	118	147	118	147	118	147
Soybeans	Acre	127	165	37	0	63	34
Oats	Acre	37	54	94	86	108	158
Alfalfa	Acre	17	5	50	138	10	20
Native hay	Acre	7	8	7	8	7	8
Sows farrowed Q_1	Sow	55	80	46	55	82	69
Sows farrowed Q_2	Sow	55	46	46	0	82	69
Sows farrowed Q_3	Sow	55	15	46	15	82	17
Sows farrowed Q_4	Sow	55	80	46	55	21	69
Low mech. feed.							
Dlt. yrlgs.	Head	0	0	0	0	0	0
Calves, past.	Head	46	10	76	206	0	0
Calves, dlt.	Head	0	0	52	0	0	0
High mech. feed.							
Dlt. yrlgs.	Head	0	0	0	0	0	0
Calves, past.	Head	0	0	0	23	0	70
Calves, dlt.	Head	0	0	0	0	0	0
Land pur., mort.	Acre	—	0	—	0	—	0
Land pur., cont.	Acre	—	73	—	73	—	73
Land rented in	Acre	—	15	—	15	—	15
Gross profit	$	25,992	28,190	27,551	30,280	39,990	42,490

[a] L = Low; M = Medium; and H = High prices.

[b] Plan A is without land acquisition; Plan B is with land acquisition.

TABLE 4-5. Continued

ACTIVITY	UNIT	Corn, hog and beef price combinations					
		HMM		HMH		HHH	
	Plan:	A	B	A	B	A	B
Resources acquired							
Real estate mort.	$	21,989	31,597	26,061	31,114	18,834	33,641
Chattel mort.	$	22,962	19,318	29,617	35,780	25,011	19,820
Land cont. cred.	$	--	11,680	--	11,680	--	19,820
Corn purchased	Bu.	18,317	13,883	16,981	14,585	17,834	12,864
Beef housing	Head	0	0	50	115	0	0
Low mech. feed.	Head	37	0	119	197	0	0
High mech. feed.	Head	0	0	0	23	0	0
Change low-high	Head	0	0	0	0	0	0
Central farrow.	Sow	40	65	31	25	67	76
Confinement feed.	Head	0	0	0	0	0	0
Portable feed.	Head	760	1,160	616	760	1,192	1,336
Seasonal labor	Man Hr.	271	300	300	300	300	300

optimal organizations for the two models are given for six price combinations. Model A is the model used by Professor Sanderson, and does not allow for land acquisition. Model B is the land acquisition model used in this study.

At all six price combinations considered, model B adds all of the available land. The most notable change in crop activities is the increase in the amount of feed grain produced. In all cases, corn and oats production is increased. This enables the representative farm to reduce the amount of corn bought. At the LLL level 10,000 bushels more corn are bought in model A than model B. At the other price combinations, about 3,000 to 5,000 bushels less corn are purchased in the plans obtained with model B.

Soybeans are a major source of income with both models. Both models result in the highest bean acreages at LLL when plan A has 227 acres and plan B has 187 acres.

The hog enterprises show minor reductions at all price levels for model B. The largest reduction in sows farrowed is at the HMH price combination, when in model B, 125 litters are farrowed. In model A 184 litters are reaised at this price level. Because of labor shortages with model B, the number of sows farrowed in each quarter varies. Therefore, with model B more hog facilities are required to raise fewer hogs. This can be seen by comparing the amount of farrowing and feeding facilities added with the two models.

The volume of beef production with model B remains close to the levels with model A. The greatest difference occurs at HMH and HHM.

With model A, 128 beef cattle are fed at HMH, and none at HHM. In the results with model B, 229 head are fed at HMH, and 70 head at HHM. Model B results include more high mechanization beef feeding than model A. This indicates that with the additional land, model B has a labor shortage.

Gross profit is greater for all price combinations for model B, but the increase is not large. The largest increases are 2,729 dollars at the HMH level, and 2,590 dollars at HHH. The smallest gains are 653 dollars at the LLL combination, and 657 dollars at MMM.

Chapter V

MINIMUM RESOURCE MODELS

The purposes of this chapter are to examine and evaluate the minimum resources needed to obtain specified levels of labor management returns for selected models. The minimum resource requirements needed to obtain specified levels of labor management returns may give some indication of adjustments that farmers in Southeastern South Dakota are likely to make.

Seven different models are considered in the minimum resource section of this study. The basic difference in the models is that some models include livestock feeding or corn buying alternatives, that are not included in other models. A brief description of the models is presented below. This is followed by an analysis of the minimum resource requirements for the different models.

The crop activities listed in Table A-6 of the appendix are included in all seven models. A beef cow herd is allowed, but it does not enter into any of the optimal solutions.

Model one: This model includes all enterprise alternatives considered in this study. Livestock feeding activities include raising hogs and fattening beef on pasture or in drylot. Model one includes a corn buying activity that allows the purchase of unlimited amounts of corn.

Model two: This model is like model one except that the hog enterprises are excluded.

Models three and four: These models are the same as models one and two respectively, except that no corn buying is allowed.

Model five: In this model no livestock feeding is allowed. Income is generated through cash crops and/or the raising of stockers.

Models six and seven: In the first five models a 5.5 percent return on land investment is assumed. Models six and seven are the same as models one and five respectively except that no return to investment in land is required.

The tables are similar for all seven models. They include: (1) total land with a breakdown of its use, (2) corn bought or sold, depending on the model, (3) sizes and types of livestock enterprises, (4) labor, which is divided into operator's and hired, (5) investment which includes land, machinery, feeding and housing facilities, livestock and operating capital.

In the determination of total capital requirement, crop machinery, livestock feeding and housing facilities are figured as an average investment, i.e., at one-half of their new value.

The breakdown of gross income for all seven models is shown in Table A-19 of the appendix. Five seperate sources of gross income are shown. The prices used in the minimum resource requirement section of this study are the same as the high prices used in the first part. They are given in Table 4-1 of Chapter IV.

Model one

Minimum resource requirements to earn specified returns to labor and management with model one are shown in Table 5-1. When corn buying is allowed, the representative farm buys corn and feeds livestock, keeping land at a minimum.

The total land requirement to earn a 3,000 dollar return to labor and management is only 25 acres. Corn purchased is 5,593 bushels, total labor is 1,324 hours, and the total capital requirement is 25,681 dollars.

As expected, an increase in the specified income level results in an increase in the minimum resource requirements. The major resources increase proportionately with the income levels, indicating a linear relationship. A 5,000 dollar return to labor and management requires 38 acres of land, corn purchases are 8,489 bushels, total labor is 1,854 hours, and total capital requirement is 63,398 dollars. To earn a 10,000 dollar return, 70 acres are required, 13,474 bushels of corn are bought, total labor is 2,795 hours, and the total capital requirement is 63,398 dollars.

In this model, land only accounts for a minor portion of total capital; 19 percent at the 3,000 dollar and 5,000 dollar levels; and 22 percent at the 10,000 dollar level. A more important capital requirement is that used to purchase corn. Corn buying requires 26 percent of total capital at each of the income targets.

TABLE 5-1. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: CORN BUYING, SWINE and FED BEEF MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	25	38	70
Corn	Acre	1	2	11
Oats	Acre	5	7	11
Corn silage	Acre	5	7	10
Alfalfa	Acre	11	16	23
Native hay	Acre	0	0	2
Native pasture	Acre	2	4	10
Farmstead & other	Acre	1	2	4
Corn purchased	Bushel	5,593	8,489	13,474
Livestock				
Sows farrowed	Litter	34	52	94
Feed calves, dlt.	Head	43	65	85
Feed calves, past.	Head	3	5	10
Labor				
Operator	Hour	1,324	1,854	2,795
Hired	Hour	0	0	0
Investment				
Land	Dollar	5,003	7,604	14,007
Crop machinery	Dollar	927	1,407	1,982
Feeding	Dollar	2,896	4,396	7,096
Livestock	Dollar	5,624	7,597	12,059
Operating capital	Dollar	11,231	18,026	28,254
Total capital Requirement	Dollar	25,681	39,030	63,398

Cropland is used mainly to produce roughage for the livestock. The majority of corn production is used for silage. At all three income levels enough operator labor is available in each period, and that no hired labor is required.

Livestock production is divided between hogs and beef feeding. Thirty-four, 52 and 94 litters are farrowed at the three income levels. Fed beef number 46, 70 and 95 at the three levels. Beef feeding is mainly in drylot because of limited pasture.

Gross income is 21,973 dollars at the 3,000 dollar level, 33,522 dollars at the 5,000 dollar level, and 52,642 dollars at the 10,000 dollar level. At the two lower income levels, fed beef is the most important source of gross income, providing 53 percent of the total, while swine provide 47 percent. At the 10,000 dollar level, swine is the most important source of gross income, providing 54 percent of the total, while 46 percent comes from fed beef.

Model two

Minimum resource requirements with model two are given in Table 5-2. When hogs are removed as a livestock alternative, the land requirement increases substantially. The total land requirement to earn a 3,000 dollar return to labor and management is 140 acres. Corn purchased is 9,192 bushels, total labor is 3,314 hours, and total capital requirement is 86,113 dollars. At the 5,000 dollar level, 245 acres are required. Corn purchases are 6,425 bushels, total labor is 3,419 hours, and total capital is 102,821 dollars.

TABLE 5-2. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: CORN BUYING and FED BEEF MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	140	245	532
Corn	Acre	20	76	166
Soybeans	Acre	0	36	129
Oats	Acre	23	32	56
Corn silage	Acre	24	0	0
Alfalfa	Acre	44	57	85
Native hay	Acre	4	7	16
Native pasture	Acre	16	26	62
Farmstead & other	Acre	9	11	18
Corn purchased	Bushel	9,192	6,425	1,830
Livestock				
Feed calves, dlt.	Head	217	179	108
Feed calves, past.	Head	21	43	139
Labor				
Operator	Hour	3,020	3,079	3,375
Hired	Hour	294	340	893
Investment				
Land	Dollar	28,015	49,026	106,459
Crop machinery	Dollar	4,329	5,968	10,983
Feeding	Dollar	7,173	6,690	7,454
Livestock	Dollar	25,830	24,094	26,814
Operating capital	Dollar	20,766	17,943	15,371
Total capital Requirement	Dollar	86,113	102,821	167,081

To earn a 10,000 dollar return to labor and management, 532 acres are required, 1,930 bushels of corn are purchased, total labor is 4,268 hours, and total capital requirement is 167,081 dollars.

At the higher income targets, corn production increases enough to allow a reduction in corn bought. Corn bought is reduced from 9,192 bushels at the 3,000 dollar level to only 1,830 bushels at the 10,000 dollar level. Soybeans become an important cash crop because of the corn acreage limit.

Livestock production is limited to fed beef. Beef production is about the same at all three income levels. At the 3,000 dollar level 238 calves are fed. Two hundred twenty-two head are fed at the 5,000 dollar level, and 247 head are fed at the 10,000 dollar income target. At the low income level, there is enough operator labor to reach the 3,000 dollar income target by buying corn and producing a large number of fed beef, thus minimizing the amount of land. However, at the higher income targets, limitations on operator labor prevent proportionate expansion of livestock enterprises. At those levels, it is profitable to shift some labor from livestock to crop production, and increased corn production is substituted for purchased corn. This reduces the number of beef fed, but increases the investment in land.

As the income target increases, land becomes a greater portion of the total capital requirement. At the 3,000 dollar level, land accounts for 33 percent of the total capital requirement; at the 5,000 dollar level, it is 48 percent; and for the 10,000 level it

accounts for 64 percent. With the reduction in corn purchases, operating capital actually declines as the income goal increases.

Gross income is 60,379 dollars at the 3,000 dollar level, and 58,311 dollars at the 5,000 dollar level. For this model, fed beef is the main source of gross income. For the 5,000 and 10,000 dollar income levels, soybeans provide a minor portion of total gross income.

Model three

The minimum resource requirements for model three are given in Table 5-3. When the farm is forced to grow all its corn, it becomes almost entirely a swine operation. Twenty-eight, 44 and 78 litters are farrowed at the 3,000, 5,000 and 10,000 dollar income levels, respectively.

For a 3,000 dollar return to labor and management, 94 acres of land are required, total labor is 1,006 hours, and total capital requirement is 26,577 dollars. At the 5,000 dollar level, 142 acres are required, total labor is 1,319 hours, and total capital requirement is 40,203 dollars. At the 10,000 dollar level, 259 acres of land are required, 2,243 hours of labor are used, and total capital requirement is 73,284 dollars.

With this model, most of the cropland is used to produce corn and oats to provide the feed for the hog enterprise. All three income targets are met without the hiring of any labor. Land is by far the largest percentage of total capital. At all three levels, land accounts for 71 percent of the total capital.

TABLE 5-3. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: CORN GROWING, SWINE and STOCKER MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	94	142	259
Corn	Acre	29	44	80
Oats	Acre	46	70	129
Alfalfa	Acre	1	2	0
Native hay	Acre	3	3	7
Native pasture	Acre	11	17	31
Farmstead & other	Acre	5	6	12
Livestock				
Sows farrowed	Head	28	44	78
Raise stockers	Head	1	2	3
Labor				
Operator	Hour	1,006	1,319	2,243
Hired	Hour	0	0	0
Investment				
Land	Dollar	18,810	28,416	51,828
Crop machinery	Dollar	1,573	2,387	4,344
Feeding	Dollar	1,339	2,032	3,698
Livestock	Dollar	629	1,036	1,776
Operating capital	Dollar	4,226	6,332	11,638
Total capital Requirement	Dollar	26,577	40,203	73,284

Gross incomes with this model are the smallest of all models. At the 3,000 return to labor and management, gross income is 8,655 dollars; at the 5,000 dollar level, it is 13,671 dollars; and at the 10,000 level, gross income is 24,148 dollars. The income is mainly from swine, with small amounts coming from stockers.

Model four

The minimum resource requirements for model four are given in Table 5-4. When corn buying and hog activities are excluded, it takes 180 acres to earn a 3,000 return to labor and management. Total labor is 1,671 hours, and total capital investment is 54,244 dollars. At the 5,000 dollar level, 273 acres are required; total labor is 2,298 hours; and total capital requirement is 82,290 dollars. At the 10,000 dollar level, 536 acres are required; total labor is 3,847 hours; and total capital requirement is 159,404 dollars.

Cropland is used mainly for corn, oats and soybeans. Fed beef is divided between drylot and pasture, with the majority being in drylot for the two lower income levels. At the 10,000 dollar level, the majority, 159 of 214 head, are fed on pasture. Labor is hired only at the 10,000 dollar level, when 664 hours are hired. Land is again the major component of the total capital requirement. At all three levels, land accounts for 66 percent of the total.

Gross income comes from the sale of fed beef and soybeans. At the 3,000 dollar and 5,000 dollar income levels beans are 12 percent,

TABLE 5-4. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: CORN GROWING and FED BEEF MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	180	273	536
Corn	Acre	56	85	167
Soybeans	Acre	52	79	130
Oats	Acre	22	34	57
Alfalfa	Acre	17	26	86
Native hay	Acre	25	38	15
Native pasture	Acre	21	32	64
Farmstead & other	Acre	7	9	18
Livestock				
Feed calves, dlt.	Head	42	64	55
Feed calves, past.	Head	31	47	159
Labor	Hour			
Operator	Hour	1,671	2,298	3,183
Hired	Hour	0	0	664
Investment				
Land	Dollar	36,020	54,630	107,259
Crop machinery	Dollar	3,797	5,763	10,627
Feeding	Dollar	2,204	3,345	6,451
Livestock	Dollar	7,924	12,050	23,232
Operating capital	Dollar	4,299	6,468	11,835
Total capital Requirement	Dollar	54,244	82,290	159,404

with fed beef accounting for 88 percent. At the 10,000 dollar level, beans are 10 percent of gross income, with fed beef making up the other 90 percent.

Model five

The minimum resource requirements for model five are given in Table 5-5. In model five, no livestock feeding is allowed. To earn a 3,000 dollar return to labor and management, requires 319 acres of land. Corn sold is 6,538 bushels; 1,400 hours of labor are used; and the total capital requirement is 81,268 dollars. At the 5,000 dollar level, 499 acres are required; corn sold is 10,284 bushels; total labor is 2,054 hours; and the total capital requirement is 127,374 dollars. To return 10,000 dollars to labor and management, 972 acres are required. Corn sold is 20,012 bushels; total labor is 3,687 hours, and total capital requirement is 248,793 dollars.

Cropland is used mainly to produce corn and soybeans for sale. Hay and pasture land is used to raise stockers. At the 3,000 dollar level, 43 stockers are raised; 67 are raised at the 5,000 dollar level; and 130 head at the 10,000 dollar level. Operator labor is adequate at the 3,000 dollar level, but 181 hours are hired at the 5,000 level, and 1,021 hours are hired at the 10,000 dollar income level.

Land accounts for 78 percent of the total capital requirement for each of the specified income levels. Operating capital is low, averaging only about seven percent of total capital for the three income targets.

TABLE 5-5. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: CASH CROP and STOCKER MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	319	499	972
Corn	Acre	99	154	302
Soybeans	Acre	118	185	359
Oats	Acre	42	64	128
Alfalfa	Acre	4	5	9
Native hay	Acre	4	13	28
Native pasture	Acre	37	60	115
Farmstead & other	Acre	15	18	31
Corn sold	Bushel	6,538	10,284	20,012
Livestock				
Raise stocker	Head	43	67	130
Labor				
Operator	Hour	1,400	1,873	2,666
Hired	Hour	0	181	1,021
Investment				
Land	Dollar	63,835	99,855	194,506
Crop machinery	Dollar	6,136	9,600	18,634
Feeding	Dollar	1,290	2,020	3,932
Livestock	Dollar	4,668	7,274	14,113
Operating capital	Dollar	5,339	8,625	17,561
Total capital Requirement	Dollar	81,268	127,374	248,793

Gross income comes from the sale of corn, soybeans and stockers. At all three income levels corn accounts for 36 percent of gross income. Beans account for 29 percent of gross income at the 3,000 and 10,000 dollar levels. At the 5,000 level, beans are 26 percent of gross income. Stockers are 35 percent of gross income at the 3,000 and 10,000 levels and 38 percent at the 5,000 level.

Model six

Table 5-6 shows the minimum resource requirements for model six. When no return to land is required, a 3,000 dollar return to labor and management can be earned with only 24 acres of land. Corn purchases are 5,231 bushels, total labor is 1,250 hours, and total capital is 22,661 dollars. For a 5,000 dollar return, 36 acres are required, corn purchased is 7,939 bushels, total labor is 1,756 hours, and total capital requirement is 34,304 dollars. For the 10,000 dollar level, 65 acres are required, 13,311 bushels of corn are purchased, total labor is 3,849 hours, and total capital is 57,896 dollars.

Livestock production is divided between swine and fed beef. Enough operator labor is available in all periods at all income levels. As with model one, land is a smaller part of the total capital requirement than operating capital because of the large corn purchases. Land averages 22 percent of total capital for the three income targets, while operating capital is 40 percent of the total capital requirement.

TABLE 5-6. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT WITHOUT a RETURN to LAND in SOUTHEASTERN SOUTH DAKOTA: CORN BUYING, HOG and FED BEEF MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	24	36	65
Corn	Acre	0	1	4
Oats	Acre	4	6	10
Corn silage	Acre	5	7	11
Alfalfa	Acre	11	15	28
Native hay	Acre	0	1	1
Native pasture	Acre	3	4	8
Farmstead & other	Acre	1	2	3
Corn purchased	Bushel	5,231	7,939	13,311
Livestock				
Sows farrowed	Litter	32	48	86
Feed calves, dlt.	Head	39	60	91
Feed calves, past.	Head	3	4	9
Labor				
Operator	Hour	1,250	1,746	2,849
Hired	Hour	0	0	0
Investment				
Land	Dollar	4,803	7,204	13,007
Crop machinery	Dollar	867	1,315	2,328
Feeding	Dollar	2,709	4,111	6,968
Livestock	Dollar	5,155	7,841	12,456
Operating capital	Dollar	9,127	13,833	23,137
Total capital Requirement	Dollar	22,661	34,304	37,896

Gross income is 20,357 dollars at the 3,000 dollar level, 30,781 dollars at the 5,000 dollar level, and 51,466 dollars at the 10,000 dollar level. The percentages of swine and fed beef in gross income are the same as with model one.

Model seven

The minimum resource requirements for model seven are given in Table 5-7. With no return to land and no livestock feeding, 169 acres are required to obtain a 3,000 dollar return to operator labor and management. Corn sold is 3,477 bushels, total labor is 1,020 hours, and total capital is 43,371 dollars. At the 5,000 dollar level 256 acres are required, corn purchased is 5,277 bushels, total labor is 1,365 hours, and total capital is 65,246 dollars. To earn a 10,000 return, 474 acres are required, 9,756 bushels of corn are bought, total labor is 1,965 hours, and total capital is 120,933 dollars.

In this model, similar to model five except no return to land is required, cropland is used to produce corn and soybeans for sale, while the hay land is used to raise stockers. Hired labor is added only at the 10,000 dollar solution when 151 hours are hired.

Land is the major component of total capital. It makes up 79 percent of total capital at all three income levels.

Comparison of Minimum Resource Models

Minimum resource requirements needed to earn a 3,000, 5,000 and 10,000 dollar return to labor and management for the three models in

TABLE 5-7. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT WITHOUT a RETURN to LAND in SOUTHEASTERN SOUTH DAKOTA: CASH CROP and STOCKER MODEL.

ITEM	UNIT	Return to Operator Labor and Management		
		$ 3,000	$ 5,000	$10,000
Total land	Acre	169	256	474
Corn	Acre	53	76	147
Soybeans	Acre	62	94	175
Oats	Acre	18	34	62
Alfalfa	Acre	1	2	4
Native hay	Acre	5	7	14
Native pasture	Acre	20	30	56
Farmstead & other	Acre	10	13	26
Corn sold	Bushel	3,477	5,277	9,756
Livestock				
Raise stocker	Head	22	34	63
Labor				
Operator	Hour	1,020	1,365	1,814
Hired	Hour	0	0	151
Investment				
Land	Dollar	33,819	51,228	94,852
Crop machinery	Dollar	3,247	4,927	9,109
Feeding	Dollar	683	1,036	1,916
Livestock	Dollar	2,388	3,691	6,839
Operating capital	Dollar	3,234	4,364	8,217
Total capital Requirement	Dollar	43,371	65,246	120,933

which no corn buying was allowed are given in Tables 5-8, 5-9 and 5-10. Model three allows all livestock feeding activities, model four excludes hog feeding, and model five excludes both hogs and fed beef. In Table 5-11, the percentage changes in resource requirements are shown and comparisons are made between the different models.

When hogs are excluded as an enterprise alternative, (model four), land requirements increase 91 percent at the 3,000 dollar level, 92 percent at the 5,000 dollar level, and 107 percent at the 10,000 dollar level. Labor increases about 70 percent at the two lower income levels, but increases only two percent at the 10,000 dollar level. Total capital increases over 100 percent for all income levels, but this is mainly due to the increase in land. Operating capital increases only two percent for each income level.

Gross income increases when hogs are excluded. At the 3,000 dollar level the increase is 146 percent; at the 5,000 dollar level gross income increases 137 percent; at the 10,000 dollar level the increase is the largest, at 157 percent.

When income is derived from cash crops and the sale of stockers, (Model five), land requirements average about 250 percent greater than with model three. The increase ranges from 239 percent at the 3,000 dollar level, up to 275 percent at the 10,000 dollar level. The percentage of corn acreage increases about the same as land, except at the 10,000 dollar level when corn increases 378 percent as compared to a 275 percent increase in land.

TABLE 5-8. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN a $3,000 OPERATOR LABOR and MANAGEMENT RETURN in SOUTHEASTERN SOUTH DAKOTA: SELECTED ALTERNATIVE MODELS.

ITEM	UNIT	Model Number 3	4	5
Total land	Acre	94	180	319
Corn	Acre	29	56	99
Soybeans	Acre	0	52	118
Oats	Acre	46	22	42
Alfalfa	Acre	1	17	4
Native hay	Acre	2	3	0
Native pasture	Acre	12	23	41
Farmstead & other	Acre	5	7	15
Corn sold	Bushel	0	0	6,538
Livestock				
Sows farrowed	Litter	28	0	0
Feed calves, dlt.	Head	0	42	0
Feed calves, past.	Head	0	31	0
Raise stocker	Head	1	0	43
Labor				
Operator	Hour	1,006	1,671	1,400
Hired	Hour	0	0	0
Investment				
Land	Dollar	18,810	36,020	63,835
Crop machinery	Dollar	1,573	3,797	6,136
Feeding	Dollar	1,339	2,204	1,290
Livestock	Dollar	629	7,924	4,668
Operating capital	Dollar	4,226	4,229	5,339
Total capital Requirement	Dollar	26,577	54,244	81,268

TABLE 5-9. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN a $5,000 OPERATOR LABOR and MANAGEMENT RETURN in SOUTHEASTERN SOUTH DAKOTA: SELECTED ALTERNATIVE MODELS.

ITEM	UNIT	Model Number 3	4	5
Total land	Acre	142	273	499
Corn	Acre	44	85	154
Soybeans	Acre	0	79	185
Oats	Acre	70	34	64
Alfalfa	Acre	2	26	5
Native hay	Acre	2	5	8
Native pasture	Acre	18	35	65
Farmstead & other	Acre	6	9	18
Corn sold	Bushel	0	0	10,284
Livestock				
Sows farrowed	Litter	44	0	0
Calves, dlt.	Head	0	64	0
Calves, past.	Head	0	47	0
Raise stockers	Head	2	0	67
Labor				
Operator	Hour	1,319	2,298	1,873
Hired	Hour	0	0	181
Investment				
Land	Dollar	28,416	54,630	99,855
Crop machinery	Dollar	2,387	5,763	9,600
Feeding	Dollar	2,032	3,345	2,020
Livestock	Dollar	1,036	12,050	7,272
Operating capital	Dollar	6,332	6,468	8,625
Total capital Requirement	Dollar	40,203	82,290	127,374

TABLE 5-10. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN a $10,000 OPERATOR LABOR and MANAGEMENT RETURN in SOUTHEASTERN SOUTH DAKOTA: SELECTED ALTERNATIVE MODELS.

ITEM	UNIT	Model Number 3	4	5
Total land	Acre	259	536	972
Corn	Acre	80	167	302
Soybeans	Acre	0	130	359
Oats	Acre	129	57	128
Alfalfa	Acre	0	86	9
Native hay	Acre	4	9	16
Native pasture	Acre	34	70	31
Farmstead & other	Acre	12	18	31
Corn sold	Bushel	0	0	20,012
Livestock				
Sows farrowed	Litter	78	0	0
Feed calves, dlt.	Head	0	55	0
Feed calves, past.	Head	0	159	0
Raise stockers	Head	3	0	130
Labor				
Operator	Hour	2,243	3,183	2,666
Hired	Hour	1,673	664	1,021
Investment				
Land	Dollar	51,828	107,259	194,506
Crop machinery	Dollar	4,344	10,627	18,684
Feeding	Dollar	3,698	6,451	3,932
Livestock	Dollar	1,776	23,232	14,113
Operating capital	Dollar	11,638	11,835	17,561
Total capital Requirement	Dollar	73,284	159,404	248,793

TABLE 5-11. PERCENTAGE CHANGE in MINIMUM RESOURCE REQUIREMENTS WITH SELECTED ALTERNATIVE MODELS for SOUTHEASTERN SOUTH DAKOTA.

Return to Operator Labor and Management	Selected Resources Measured	Models Compared[a] 3-4	3-5	4-5
		Percent Change		
$ 3,000	Total land	+ 91	+ 239	+ 77
	Corn acreage	+ 93	+ 241	+ 77
	Labor	+ 66	+ 39	- 16
	Operating capital	+ 2	+ 26	+ 24
	Total capital	+ 104	+ 206	+ 50
	Gross Income	+ 146	+ 127	- 8
$ 5,000	Total land	+ 92	+ 251	+ 83
	Corn acreage	+ 93	+ 250	+ 81
	Labor	+ 74	+ 56	- 11
	Operating capital	+ 2	+ 36	+ 33
	Total capital	+ 104	+ 217	+ 55
	Gross Income	+ 137	+ 125	- 5
$10,000	Total land	+ 107	+ 275	+ 81
	Corn acreage	+ 109	+ 378	+ 81
	Labor	+ 2	- 6	- 4
	Operating capital	+ 2	+ 51	+ 48
	Total capital	+ 118	+ 239	+ 56
	Gross Income	+ 157	+ 148	- 4

[a] The figures show the percentage change between the two models, with the model listed first considered as the base.

At the 3,000 dollar level labor increases 39 percent; at the 5,000 dollar level the increase is 56 percent. At the 10,000 dollar level labor decreases six percent. Total capital increases, but the percentage increase is less than that for land. This is because operating capital and investment in livestock and facilities increase at a slower rate than land. Gross income increases over 100 percent, with the largest increase being 148 percent at the 10,000 dollar level.

When beef feeding also is excluded from the model (model five), acreages increase 77 percent at 3,000 dollar level; 83 percent at the 5,000 dollar level; and 81 percent at the 10,000 dollar level. Without any livestock feeding, the total labor requirement decreases at all income levels. Because of no investment in livestock or livestock facilities, the percentage increase in total capital is less than the percentage increase in land.

Gross incomes for model five are lower for all income levels than they are for model four. At the 3,000 dollar level, gross income declines eight percent; at the 5,000 dollar level, the decline is five percent; and at the 10,000 dollar level, the decline is four percent.

In Table 5-12 the resource requirements for model five and model seven are compared at the 5,000 dollar and 10,000 dollar income targets. The models are the same, except model seven does not require a return on land investment. Some of the farmers in Southeastern South

TABLE 5-12. ESTIMATED MINIMUM RESOURCE REQUIREMENT NEEDED to EARN SPECIFIED RETURNS to OPERATOR LABOR and MANAGEMENT; COMPARISON of RESULTS WITH and WITHOUT RETURN to LAND; CASH CROP and STOCKER MODELS.

ITEM	UNIT	Return to Operator Labor and Management			
		$ 5,000		$10,000	
	Model:	5	7	5	7
Total land	Acre	499	256	972	474
Corn	Acre	154	76	302	147
Soybeans	Acre	185	94	359	175
Oats	Acre	64	34	128	62
Alfalfa	Acre	5	2	9	4
Native hay	Acre	13	7	28	14
Native pasture	Acre	60	30	115	56
Farmstead & other	Acre	18	13	31	26
Corn sold	Bushel	10,284	5,277	20,012	9,756
Livestock					
Raise stocker	Head	67	34	130	63
Labor					
Operator	Hour	1,873	1,365	2,666	1,814
Hired	Hour	181	0	1,021	151
Investment					
Land	Dollar	99,855	51,228	194,506	94,852
Crop machinery	Dollar	9,600	4,927	18,634	9,109
Feeding	Dollar	2,020	1,036	3,932	1,916
Livestock	Dollar	7,274	3,691	14,113	6,839
Operating capital	Dollar	128,625	4,364	17,561	128,217
Total capital Requirement	Dollar	127,374	65,246	248,793	120,933

Dakota who do not want to sell their land may be forced to take less than a 5.5 percent return to land. When no return is required acreages are substantially reduced.

At the 5,000 dollar level land is reduced from 499 acres to 256 acres, a 49 percent reduction. At the 10,000 dollar level the reduction is 51 percent, from 972 acres to 474 acres. There is a linear relationship among the other resources. Corn acreages, livestock production, operating capital, total capital and gross income all decrease 49 percent. At the 10,000 dollar level the relationships are the same, with the resources decreasing 51 percent when no return to land is required.

Total labor decreases 34 percent at the lower income target, and 47 percent at the 10,000 dollar level. With no return to land, no labor is hired at the 5,000 dollar income level, and only 151 hours are hired at the 10,000 dollar level.

No comparison of models one and six is made in the text of this study. Because of the small amounts of land in the solutions, there is little change in the optimal solutions when the return to land is removed. Table A-20 of the appendix gives a comparison of models one and six for the 5,000 and 10,000 dollar income targets.

In Table 5-13, a comparison is made between models one and three at the 5,000 dollar income level. The difference between the models is that model one allows corn buying, and model three does not.

When the representative farm is forced to grow its own corn the land requirement increases 274 percent, from 38 acres to 142

TABLE 5-13. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN a $5,000 DOLLAR RETURN to OPERATOR LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: COMPARISON of SELECTED ALTERNATIVE MODELS.

ITEM	UNIT	Model: 1	3	Percent change
Total land	Acre	38	142	+ 274
Corn	Acre	2	44	+2,100
Oats	Acre	7	70	+ 900
Corn silage	Acre	7	2	- 71
Alfalfa	Acre	16	3	- 81
Native hay	Acre	0	0	-
Native pasture	Acre	4	17	+ 325
Farmstead & other	Acre	2	6	+ 200
Corn purchased	Bushel	8,489	0	-
Livestock				
Sows farrowed	Litter	52	44	- 15
Feed calves, dlt.	Head	65	8	-
Feed calves, past.	Head	5	0	-
Raise stocker	Head	0	2	-
Labor				
Operator	Hour	1,854	1,319	- 29
Hired	Hour	0	0	0
Investment				
Land	Dollar	7,604	28,416	+ 274
Crop machinery	Dollar	1,407	2,387	+ 70
Feeding	Dollar	4,396	2,032	- 54
Livestock	Dollar	7,597	1,036	- 86
Operating capital	Dollar	18,026	6,332	- 65
Total capital Requirement	Dollar	39,030	40,203	+ 3

acres. The additional land is used to grow corn. When corn is raised rather than bought, the 5,000 dollar income goal can be reached by raising less livestock than in model one. Pork production is reduced 15 percent, from 52 litters to 44 litters. With model one, 70 head of fed beef are raised, but with model three no beef is fed. With model three two stockers are raised. Because of fewer livestock, less labor is required with model three. Labor falls from 1,854 hours to 1,319 hours.

Operating capital declines 65 percent, but the total capital requirement increases 3 percent. This is because of the increase in land. Gross income delines from 33,522 dollars in model one to 13,671 dollars in model three.

No comparison is shown in the text for the 3,000 and 10,000 dollar levels, because the relationships are the same as for the 5,000 dollar level. A comparison is made in Tables A-21 and A-22 of the appendix.

In Table 5-14, a comparison is made between models two and four at the 5,000 dollar income level. Comparisons at the 3,000 and 10,000 dollar levels are shown in Appendix Tables A-23 and A-24. Model four does not allow corn buying. Neither model allows for hog raising.

Land requirement increases 11 percent, from 245 acres to 273 acres when corn buying is not permitted. The major change in cropland is that in model four, soybeans increase 119 percent, from 36 acres to 79 acres. Fed beef decreases from 222 head to 111 head,

TABLE 5-14. ESTIMATED MINIMUM RESOURCE REQUIREMENTS NEEDED to EARN a $5,000 DOLLAR RETURN to LABOR and MANAGEMENT in SOUTHEASTERN SOUTH DAKOTA: COMPARISON of SELECTED ALTERNATIVE MODELS.

ITEM	UNIT	Model: 2	4	Percent change
Total land	Acre	245	273	+ 11
Corn	Acre	76	85	+ 12
Soybeans	Acre	36	79	+ 119
Oats	Acre	32	34	+ 6
Alfalfa	Acre	57	26	- 54
Native hay	Acre	7	8	+ 14
Native pasture	Acre	26	32	+ 23
Farmstead & other	Acre	11	9	- 18
Corn purchased	Bushel	6,425	0	-
Livestock				
Feed calves, dlt.	Head	179	64	- 64
Feed calves, past.	Head	43	47	+ 9
Labor				
Operator	Hour	3,079	2,298	- 25
Hired	Hour	340	0	-
Investment				
Land	Dollar	49,026	54,630	+ 11
Crop machinery	Dollar	5,968	5,763	- 3
Feeding	Dollar	6,690	3,345	- 50
Livestock	Dollar	24,094	12,050	- 50
Operating capital	Dollar	17,043	6,468	- 62
Total capital Requirement	Dollar	102,821	82,290	- 20

with the main reduction being calves fed in drylot. Because of the reduction in livestock, labor is reduced. Total labor for model two is 3,419 hours, while only 2,298 hours are used with model four.

Operating capital is reduced 62 percent with model four, while total capital falls 20 percent. Gross income also declines. With model two, gross income is 58,311 dollars, while with model four, it is 32,359 dollars.

CHAPTER VI

SUMMARY, CONCLUSIONS AND IMPLICATIONS

This study consisted of two parts. In part one optimal organizations were found for representative mixed livestock farms where land acquisition was considered as an alternative. In the second part, combinations of farm enterprises consistent with minimum resource estimates for specified levels of income were determined. In this chapter the two parts of the study are summarized. Conclusions are drawn from the results and implications are discussed.

Profit Maximizing Plans with Land Acquisition

The major purpose of the first part of this study was to examine the types of adjustments representative mixed livestock farms in Southeastern South Dakota could profitably make if additional land could be acquired. Linear programming was used to determine the organizations that would maximize farm incomes under varying prices for corn, hogs and beef subject to the resource restrictions found on the representative farms in a survey covering 1962 data. Three price levels, low, medium and high were used for corn, hogs and beef.

Land could be added by renting or purchasing on contract or for mortgage. Land available for rent was assumed to be all cropland. Land bought on contract required a 20 percent down payment, while that bought for mortgage required 50 percent down. The amount of land

available for acquisition was determined from information on the survey which indicated the amount of land available for rent or sale in the area.

The enterprises considered were typical or recommended for the area. Crop enterprises included corn, oats, soybeans and alfalfa. Native hay was included as an activity.

Livestock enterprises considered included the feeding of calves on pasture or in drylot. Yearlings could be fed in drylot, either in period one or two. Hogs were also considered as a production possibility. Central farrowing facilities were used, and a choice was given between portable and confinement feeding facilities. A beef-cow herd was included in the model, but didn't enter into any of the optimal solutions. Two levels of mechanization were considered for the beef feeding enterprises.

The general conclusion for this section of the study is that under the assumed conditions, whether it is profitable for the mixed livestock farms in Southeastern South Dakota to add land depends on the relationship among corn, hog and beef prices. However, at the more normal price relations, it was usually more profitable for the representative farms to use their available resources to buy corn and produce livestock rather than to add additional land. Farm size was an important factor.

When additional land was added, it was used mainly for feed grain production. Rented land was all cropland, and because of this it was usually added first. Since the added land was used for feed grain

production, it became more profitable for the representative farms to add land as the corn price rose. However, the livestock enterprises, particularly the hogs, were very competitive for the available resources. When the corn price was high in relationship to livestock prices, resources were available for adding land. When hog prices were high, it was more profitable to use the farm's available resources to produce pork rather than to purchase the limit of land available. This was true even when corn was at high price levels.

The resources that were most limiting to the mixed livestock farms were labor and capital. In almost all instances in which land was purchased, it was purchased on contract. Except for three of the lower price combinations for the large mixed livestock farm, all available credit was used up.

Labor was particularly limiting on the two smaller representative farms. Labor shortages were overcome by substituting capital for labor when the capital was available. This was done by using high mechanization beef feeding rather than low mechanization. Hog facilities were not fully utilized in all quarters because of labor shortages during certain periods. Despite labor shortages in some periods, there were labor surpluses in other periods, particularly during the winter months. This would indicate that there is an opportunity for seasonal off-farm employment, if a job could be found.

Certain important implications for farm operators in Southeastern South Dakota can be made from the above information. Despite expanding levels of borrowing, capital probably will continue to be a limiting factor on all but some of the larger farms. Although additional capital may be available, many farmers are unwilling to accept the risk which accompanies borrowed money, or are simply unwilling to borrow for personal reasons. Other individual farmers may have high debt-to-asset ratios which make it difficult for them to borrow additional funds.

The increasing attractiveness of non-farm employment, combined with increased minimum wage legislation, is making it more difficult to find capable farm labor at the price the farm operator is willing to pay. Although labor may not be as strictly limited as it was in the first section of this study, lack of sufficient labor in periods when it is needed will continue to be a problem for the farm operator in Southeastern South Dakota.

Assuming limitations of capital and labor, it would appear that mixed livestock farms in this area could increase their income most by using their available resources to intensify livestock production rather than expanding their acreages substantially. Of the livestock enterprises considered, hog production tends to dominate in most of the optimal solutions.

In most of the optimal solutions it was profitable to purchase corn. Therefore, if the plans were adopted on all mixed livestock farms, corn would have to be shipped into the area, unless it was produced on other types of farms in the area.

Minimum Resource Requirements

The purposes of part two of this study were: (1) to determine for selected technical, economic and environmental conditions the minimum combination of resources required to obtain specified levels of return to operator labor and management; and (2) to evaluate the effects of changes in return to land and changes in livestock enterprises on the minimum resources required.

Each acre in the model was divided in such a manner that it was representative of a typical acre in the area. The farms were assumed to be operator-owned. The supply of operator labor available was assumed to be 3,128 hours, with none of this being allocated to overhead labor. If it was profitable, additional labor could be hired in an unlimited amount for $1.25 per hour. Capital could be borrowed in unlimited amounts as long as the return was equal to or greater than the assumed interest rate.

The crop enterprises considered were similar to those used in part one. Livestock production alternatives varied for the different model formulations.

Linear programming was used to determine the minimum resource requirements for all alternative models. The three levels of operator labor-management returns selected were 3,000, 5,000 and 10,000 dollars. Land was the criterion minimized.

Assumed crop yields were the same as in part one, but in the minimum resource requirement section only one price level for corn, hogs and beef was used. The price level was the same as the high prices used in the first part.

The results of this section indicate that at all operator earning levels, enterprise combinations allowing hogs to be raised would require the smallest amounts of resources in terms of land, labor and capital compared to other possibilities. Land could be further reduced by allowing corn buying, but the total capital requirement remains about the same, while the labor requirement increases.

For example, when corn could be purchased in the swine model, only 25, 38 and 70 acres of land were required to reach the 3,000, 5,000 and 10,000 dollar income targets. When the corn had to be raised, 94, 142 and 259 acres were required. In the corn purchasing model, total capital requirements were 25,681, 39,030 and 63,398 dollars, compared to 26,577, 40,203 and 73,284 dollars for the three income levels in the corn raising model. Total labor requirements with the corn buying model were 1,324, 1,854 and 2,795 hours for the three income levels. With the corn raising model, total labor decreased to 1,006, 1,319 and 2,243 hours for the three income targets.

Labor was an important factor in determining whether it was more profitable to buy or raise corn. Fewer livestock were needed to earn the specified incomes when corn was raised than when it was bought. Because operator labor was assigned no cost, it was more profitable for the representative farm to buy corn and feed larger numbers of livestock than to raise the corn and feed fewer livestock, even though it required more total labor. However, at the higher income levels in some of the alternative models, the income level couldn't be reached without hiring additional labor at $1.25 per hour. In those cases the plans switched from corn buying to corn raising in order to reduce the labor requirement. An example of this is at the 10,000 dollar income level in model two, where corn was allowed to be bought, and fed beef was the main source of income. Here corn purchased was only 1,830 bushels, the smallest amount for any of the three income levels in the model.

When swine production was excluded as an enterprise alternative, minimum resource requirements in terms of land, labor and capital increased substantially. An idea of this increase can be seen by comparing models three and four. No corn could be purchased with either model. Model three allowed swine production while model four did not. With model four total land increased 86, 131 and 277 acres for the three income levels. Total labor increased 665, 979 and 1,604 hours. Total capital requirement increased 27,677, 42,087 and 86,120 dollars, respectively for the 3,000, 5,000 and 10,000 dollar income targets.

Of the models considered, model five, which allowed stockers and a beef-cow herd as the only livestock alternatives, required the most land; 319, 419 and 972 acres at the three income levels. However, labor and total capital requirements did not increase proportionately as much. In fact, total labor was substantially below the fed beef model and only slightly above the swine model. Total capital was only 5, 23 and 48 percent greater than in the fed beef model.

When no return on land investment was required, the minimum resource requirements with the above mentioned model were reduced. Land requirements were reduced to 169, 256 and 474 acres for the three income levels. The other important resources were reduced in a similar manner.

This part of the study indicated that farm operators in Southeastern South Dakota should consider hog and beef feeding enterprises as a least-cost methods of obtaining desired income levels rather than adding the additional land needed for alternative enterprise combinations. The livestock enterprise or combination of livestock enterprises selected by the farm operator will be a major factor in determining the types and amounts of resources needed to earn specified levels of income. Another important factor is whether acreages will be enlarged to grow needed corn, or if the corn will be purchased.

It would appear that if the farm operator wants to minimize his land, labor and capital requirements, pork production will be a major enterprise. Fed beef enterprises require more land, labor and

capital than swine, but require less land and capital than a cash crop-stocker program. The chief advantage of a cash crop-stocker plan is that the labor requirement is low.

The increase in farm size and corresponding decline in farm numbers in Southeastern South Dakota will most likely continue as there is a tendency for equalization of earnings for farm labor and management and that of the non farm sector. However, land need not be a limiting resource if the farm operator has adequate supplies of other resources. Opportunities exist to earn desired income through intensive livestock production, supplementing corn production with corn buying when necessary.

The extent to which farmers are willing to sacrifice returns on investment to owned resources will affect future adjustments in farm size. If farm operators are willing to take less than a maximum return on investment, farm size will not increase as rapidly as if the opposite were true.

Limitations and needs for further study

There are many reasons why programmed organizations and adjustments may differ from what the farm operators will actually do. Most important of all is that it might not be profitable for all farmers to make the indicated changes because of the aggregate impacts of these adjustments on product and input markets.

Many farm operators may not have the desire or managerial ability to assume the increased responsibility and decision making that would

go with expanded operations. Furthermore, perfect knowledge does not exist, and uncertainty will affect adjustments and sizes of enterprises.

In the minimum resource section of this study only one price-cost relationship was considered. Slight price-cost changes, if misjudged, could have important effects on profitable organizations. Only one level of crop yields was used in this study. Although yield variability is not as great in Southeastern South Dakota as it is in most other dryland sections of South Dakota, changes in yields will affect most profitable resource organizations and requirements.

The characteristics that surround the linear programming model itself may cause programmed results to differ from what actually happens. Solutions are in some cases fractional and impractical. For example, .4 of a sow farrowed or a beef feeding enterprise with two head being the total number fed. Linear programming assumes a linear relationship among inputs, therefore no allowance is made for increasing returns to scale; and because of this, programmed solutions may differ from what actually happens.

Further research as to the effect of yield variability upon the minimum resource requirements and optimal farm organizations is needed. As linear programming results are no better than the data fed into the computer, further research might be conducted to ascertain the reliability of input-output relationships concerning the production of various products.

Off farm employment offers a chance to substantially reduce the desired farm income levels and needed minimum resource requirements. Further investigation of off farm employment opportunities is needed.

The livestock alternatives in this study were limited to swine and beef. Although sheep production in Southeastern South Dakota is limited, a study of possible sheep production in this area might provide valuable insights.

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APPENDIX

Table A-1. Labor Requirements for Low and High Degree of Mechanization for Beef Feeding Activities

Activity	Total	Labor Period 1	2	3	4	5
			-Labor Hours-			
Low mechanization						
Calf, drylot	9.58	2.52	1.29	3.10	1.92	.75
Calf, pasture	7.73	2.03	1.04	2.50	1.56	.60
Period 1 yearling	5.28	3.52	.88	-	-	.88
Period 2 yearling	5.28	-	.44	2.20	2.20	.44
High mechanization						
Calf, drylot	6.42	1.68	.87	2.08	1.29	.50
Calf, pasture	5.18	1.36	.70	1.68	1.04	.40
Period 1 yearling	3.54	2.36	.59	-	-	.59
Period 2 yearling	3.54	-	.29	1.48	1.48	.29

Table A-2. General Overhead Labor Requirements for Representative Farms in Southeastern South Dakota

Size (Acres)	Type of Farm: Grain	Stock
	Hours	
Less than 100	300	300
100 - 320	400	400
320 - 640	490	720
640 - 960	570	890

[a]Based on estimates of overhead labor requirements by Wallace Aanderud in Guidebook for Planning a Farm or Ranch Business.

Table A-3. Assumed Non-allocated Annual Overhead Costs for Specified Levels of Income in Southeastern South Dakota

Item	Income Level 3,000	5,000	10,000
		-Annual Cost-	
1/2 Ton Pickup			
Interest	80	90	100
Depreciation	300	330	360
Gas, oil, lubrication	225	250	275
Repairs	70	80	90
Insurance	60	60	60
License	20	20	20
Wagons (2) with hoist	75	85	95
Fuel tank	5	10	15
Tools and equipment	40	50	60
Miscellaneous			
Telephone and electricity	155	175	195
Tax and bookkeeping service	40	50	60
Insurance (Liability)	55	60	65
Total specified overhead costs	$1,125	$1,260	$1,395

Table A-4. Assumed Per Acre Overhead Costs for Minimum Resource Section of This Study

Item	Cost Per Acre ($)
Interest on Land[a]	11.00
Land tax	2.66
Depreciation and Maintenance, fences	.48
Total overhead cost per acre	14.14

[a]When land price is assumed to be $200.11 and interest rate is 5.5 per cent.

Table A-5. Resource Restrictions Used in Optimum Resource Combination Tableau for Southeastern South Dakota

Item	Row	Unit
Group I Cropland	1	Acre
Group II Cropland	2	Acre
Group III Cropland	3	Acre
Group IV Cropland	4	Acre
Pasture Grazing Limit	5	Tons Hay Equiv.
Corn Acre Limit	6	Acre
Hay to Harvest	7	Tons
Corn to Harvest	8	Bushel
Corn Equivalents	9	Cwt.
Corn Silage	10	Cwt.
Hay Equivalents	11	Cwt.
Central Farrowing Q_1	12	Sow
Central Farrowing Q_2	13	Sow
Central Farrowing Q_3	14	Sow
Central Farrowing Q_4	15	Sow
Confinement Feeding Q_1	16	Head
Confinement Feeding Q_2	17	Head
Confinement Feeding Q_3	18	Head
Confinement Feeding Q_4	19	Head
Portable Feeding Q_1	20	Head
Portable Feeding Q_2	21	Head
Portable Feeding Q_3	22	Head
Portable Feeding Q_4	23	Head
Beef Housing Period 1	24	Head
Beef Housing Period 2	25	Head
Low Mechanization Beef Feeding, Pd. 1	26	Head
Low Mechanization Beef Feeding, Pd. 2	27	Head
High Mechanization Beef Feeding, Pd. 1	28	Head
High Mechanization Beef Feeding, Pd. 2	29	Head
Annual Labor	30	
Period 1	31	Man Hour
Period 2	32	Man Hour
Period 3	33	Man Hour
Period 4	34	Man Hour
Period 5	35	Man Hour

Table A-5. Continued

Item	Row	Unit
Annual Cash, Period 1	36	10 Dollar
Annual Cash, Period 2	37	10 Dollar
Real Estate Mortgage	38	10 Dollar
Chattel Mortgage, Period 1	39	10 Dollar
Chattel Mortgage, Period 2	40	10 Dollar
Silo Capacity	41	Tons
Calf Transfer	42	Head
Seasonal Labor Limit	43	Man Hour
Buy Land Limit	44	Acre
Rent Land Limit	45	Acre
Land Contract Credit	46	10 Dollar

Table A-6. Description of Activities Considered for Representative Mixed Livestock Farms in Southeastern South Dakota

Eq. No.	Activity Description	Unit of Measure
1	Buy Corn	10 Bushel
2	Sell Corn	10 Bushel
3	Buy feeder calves	Head
4	Sell feeder calves	Head
5	Beef Cow Herd	Head
	Group I Cropland Activities	
6	Corn	Acre
7	Beans	Acre
8	Oats	Acre
9	Oats-Alfalfa-Alfalfa-Alfalfa	Acre
	Group II Cropland Activities	
10	Corn-Corn-Corn-Oats-Alfalfa-Alfalfa	Acre
11	Corn-Corn-Corn-Oats	Acre
12	Beans-Beans-Beans-Oats-Alfalfa-Alfalfa	Acre
13	Beans-Beans-Beans-Oats	Acre
	Group III Cropland Activities	
14	Oats-Oats-Oats-Alfalfa-Alfalfa-Alfalfa	Acre
15	Corn-Oats	Acre
16	Corn-Corn-Oats-Alfalfa	Acre
	Group IV Cropland Activities	
17	Native Hay	Acre
18	Harvest Corn, Grain	10 Bushel
19	Harvest Corn, Silage	10 Bushel
20	Harvest Hay, Hay	Ton
21	Harvest Hay, Graze	Ton
22	Build Silo	Ton

Table A-6. Continued

Eq.No.	Activity Description	Unit of Measure
	Hog Activities	
23	Central Farrowing Confinement Finish Q_1	Sow
24	Central Farrowing Confinement Finish Q_2	Sow
25	Central Farrowing Confinement Finish Q_3	Sow
26	Central Farrowing Confinement Finish Q_4	Sow
27	Central Farrowing Portable Finish Q_1	Sow
28	Central Farrowing Portable Finish Q_2	Sow
29	Central Farrowing Portable Finish Q_3	Sow
30	Central Farrowing Portable Finish Q_4	Sow
31	Invest Central Farrowing	Sow
32	Invest Confinement Feeding	Head
33	Invest Portable Feeding	Head
	Low Mechanization Beef Feeding Activities	
34	Calf-Drylot-No Silage	Head
35	Calf-Drylot-Silage	Head
36	Calf-Pasture-No Silage	Head
37	Calf-Pasture-Silage	Head
38	Drylot Yearling Period 1-No Silage	Head
39	Drylot Yearling Period 1-Silage	Head
40	Drylot Yearling Period 2-No Silage	Head
41	Drylot Yearling Period 2-Silage	Head
	High Mechanization Beef Activities	
42	Calf-Drylot-No Silage	Head
43	Calf-Drylot-Silage	Head
44	Calf-Pasture-No Silage	Head
45	Calf-Pasture-Silage	Head
46	Drylot Yearling Period 1-No Silage	Head
47	Drylot Yearling Period 1-Silage	Head
48	Drylot Yearling Period 2-No Silage	Head
49	Drylot Yearling Period 2-Silage	Head
	Beef Investment Activities	
50	Invest. Beef Housing	Head
51	Invest. Low Mechanization Feeding	Head
52	Invest. High Mechanization Feeding	Head
	Change Low Mechanization to High	Head

Table A-6. Continued

Eq.No.	Activity Description	Unit of Measure
	Labor Activities	
53	Hire Labor Period 2	Hour
54	Hire Labor Period 3	Hour
55	Hire Labor Period 4	Hour
56	Hire Labor Period 5	Hour
57	Hire Labor	Hour
58	Sell Labor	Hour
	Capital Activities	
59	Saving Account Period 1	10 Dollar
60	Saving Account Period 2	10 Dollar
61	Real Estate Mortgage	100 Dollar
62	Chattel Mortgage Period 1	100 Dollar
63	Chattel Mortgage Period 2	100 Dollar
64	Land Contract Credit	100 Dollar
	Land Activities	
65	Buy Land Mortgage	Acre
66	Buy Land Contract	Acre
67	Rent Land In	Acre

Table A-7. Resource Restrictions Used in Minimum Resource Tableau for Southeastern South Dakota

Item	Row	Unit
Group I Cropland	1	Acre
Group II Cropland	2	Acre
Group III Cropland	3	Acre
Group IV Cropland	4	Acre
Pasture Grazing Limit	5	Ton H.E.
Corn to Harvest	6	Bushel
Hay to Harvest	7	Ton
Corn Equivalents	8	Cwt.
Corn Silage	9	Cwt.
Hay Equivalents	10	Cwt.
Annual Labor	11	Man Hour
Period 1	12	Man Hour
Period 2	13	Man Hour
Period 3	14	Man Hour
Period 4	15	Man Hour
Period 5	16	Man Hour
Calf Transfer	17	Head
Yearling Transfer, Period 1	18	Head
Yearling Transfer, Period 2	19	Head
Annual Capital	20	10 Dollar
Short Term Capital	21	10 Dollar
Total Capital	22	10 Dollar
Crop Equipment Investment	23	10 Dollar
Feeding Investment	24	10 Dollar
Corn Acreage Limit	25	10 Dollar
Income Requirement	26	10 Dollar

Table A-8. Description of Activities Considered for Representative Farm Situation for Minimum Resource Study in Southeastern South Dakota

Eq.No.	Activity Description	Unit of Measure
	Group I Cropland Activities	
1	Corn	Acre
2	Beans	Acre
3	Oats	Acre
4	Oats-Alfalfa-Alfalfa-Alfalfa	Acre
	Group II Cropland Activities	
5	Corn-Corn-Corn-Oats-Alfalfa-Alfalfa	Acre
6	Corn-Corn-Corn-Oats	Acre
7	Beans-Beans-Beans-Oats-Alfalfa-Alfalfa	Acre
8	Beans-Beans-Beans-Oats	Acre
	Group III Cropland Activities	
9	Oats-Oats-Oats-Alfalfa-Alfalfa-Alfalfa	Acre
10	Corn-Oats	Acre
11	Corn-Corn-Oats-Alfalfa	Acre
	Group IV Cropland Activities	
12	Corn-Oats-Oats-Oats	Acre
13	Corn-Oats-Alfalfa-Alfalfa-Alfalfa	Acre
14	Native Hay	Acre
	Harvesting Activities	
15	Harvest Corn, Grain	10 Bushel
16	Harvest Corn, Silage	10 Bushel
17	Harvest Hay, Hay	Ton
18	Harvest Hay, Graze	Ton
19	Buy Corn	10 Bushel
20	Sell Corn	10 Bushel
	Hog Activities	
21	1 Sow-Litters Q_1 and Q_3	Sow
22	1 Sow-Litters Q_2 and Q_4	Sow
23	2 Sows-Litters Q_1, Q_2, Q_3, Q_4	2 Sows

Table A-8. Continued

Eq.No.	Activity Description	Unit of Measure
	Hog Activities - (cont'd)	
24	Buy Feeder Calves	Head
25	Sell Feeder Calves	Head
26	Sell Stockers	Head
27	Buy Period 1 Yearling	Head
28	Buy Period 2 Yearling	Head
29	Beef Cow Herd	Head
	Low Mechanization Beef Feeding	
30	Calf Drylot-No Silage	Head
31	Calf Drylot-Silage	Head
32	Calf Pasture-No Silage	Head
33	Calf Pasture-Silage	Head
34	Raise Stocker-No Silage	Head
35	Raise Stocker-Silage	Head
36	Drylot Yearling Period 1-No Silage	Head
37	Drylot Yearling Period 1-Silage	Head
38	Drylot Yearling Period 2-No Silage	Head
39	Drylot Yearling Period 2-Silage	Head
40	Drylot Yearling Period 1 & 2-No Silage	2 Head
41	Drylot Yearling Period 1 & 2-Silage	2 Head
	High Mechanization Beef Feeding	
42	Calf Drylot-No Silage	Head
43	Calf Drylot-Silage	Head
44	Calf Pasture-No Silage	Head
45	Calf Pasture-Silage	Head
46	Drylot Yearling Period 1-No Silage	Head
47	Drylot Yearling Period 1-Silage	Head
48	Drylot Yearling Period 2-No Silage	Head
49	Drylot Yearling Period 2-Silage	Head
50	Drylot Yearling Period 1 & 2-No Silage	2 Head
51	Drylot Yearling Period 1 & 2-Silage	2 Head
	Labor Activities	
52	Hire Labor, Period 1	Man Hour
53	Hire Labor, Period 2	Man Hour
54	Hire Labor, Period 3	Man Hour
55	Hire Labor, Period 4	Man Hour
56	Hire Labor, Period 5	Man Hour

Table A-8. Continued

Eq.No.	Activity Description	Unit of Measure
	Capital Activities	
57	Short Term Capital	100 Dollar
58	Long Term Capital	100 Dollar
59	Buy Land	Acre

Table A-9. Estimated Average Yields Per Acre, Using Recommended Cropping Practices, By Land Group, Southeastern South Dakota

Item	Unit	Yield by Land Group I	II	III	IV	Weighted Average[a]
Corn	Bu.	65	59	49	32	60
Oats	Bu.	66	60	53	26	61
Soybeans	Bu.	25	22	--	--	24
Alfalfa	Ton	3.2	2.9	2.5	1.7	3.0
Native Hay -- Estimated yield was 1 ton per acre						
Native Pasture -- Estimated yield was 70 AUM						

[a]The weighted average is the sum of the average yield for each land group times the percent that land group is of the total.

Table A-10. Optimal Organizations for Small Mixed Livestock Farm in the Southeastern Area of South Dakota for Low Corn Price

Corn Price $ .70/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	104	57	64	66	67	53	66	66	66
Soybeans	Ac.	8	0	0	0	0	0	0	0	0
Oats	Ac.	11	16	17	52	31	19	52	52	47
Alfalfa	Ac.	14	41	43	6	11	37	6	6	11
Native Hay	Ac.	7	7	7	7	7	7	7	7	7
Sows Far. Q_1	Sow	43	0	0	35	32	8	35	35	33
Sows Far. Q_2	Sow	6	0	0	35	32	0	35	35	33
Sows Far. Q_3	Sow	0	0	0	35	32	8	35	35	33
Sows Far. Q_4	Sow	43	8	0	35	32	8	35	35	33
Low Mech. Feed.										
Dlt. Yrlgs.	Head	0	123	68	36	0	140	36	36	0
Calves, Past.	Head	44	36	38	38	22	36	38	38	31
Calves, Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech. Feed.										
Dlt. Yrlgs.	Head	0	160	233	0	0	110	0	0	0
Calves, Past.	Head	0	0	0	0	0	0	0	0	0
Land Pur.,Mort.	Ac.	0	0	0	0	0	0	0	0	0
Land Pur.,Cont.	Ac.	19	0	0	0	0	0	0	0	0
Land Rented In	Ac.	15	5	15	15	0	0	15	15	15
Gross Profit	$	9,224	11,778	17,698	16,287	16,587	18,145	24,230	24,230	24,576

Table A-10. Continued

Corn Price $ .70/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources Acquired										
Real Est. Mort.	$	19,829	17,792	18,212	18,616	17,862	17,191	18,616	18,616	18,040
Chattel Mort.	$	12,859	30,225	32,790	8,420	10,235	27,368	8,432	8,432	10,152
Land Cont. Cr.	$	3,040	0	0	0	0	0	0	0	0
Corn Pur.	Bu.	5,546	12,676	12,257	9,479	10,062	12,921	9,479	9,479	9,793
Beef Hous.	Head	0	87	94	0	0	75	0	0	0
Low Mech. Fed.	Head	42	96	72	0	20	103	0	0	19
High Mech. Fed.	Head	0	80	117	0	0	55	0	0	0
Cent. Far.	Sow	35	0	0	27	24	0	27	27	25
Confin. Fed.	Head	0	0	0	0	0	0	0	0	0
Port. Fed.	Head	628	0	0	496	448	64	495	495	464
Seas. Labor	M.Hr.	50	50	50	50	50	50	50	50	50

Table A-11. Optimal Organizations for Small Mixed Livestock Farms in the Southeast Area of South Dakota for Medium Corn Price

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	120	124	82	93	93	93	66	66	68
Soybeans	Ac.	14	0	0	0	0	0	0	0	0
Oats	Ac.	15	36	16	25	16	10	51	51	46
Alfalfa	Ac.	11	32	39	6	15	21	7	7	10
Native Hay	Ac.	7	7	7	7	7	7	7	7	7
Sows Far. Q_1	Sow	25	8	0	43	40	35	35	35	33
Sows Far. Q_2	Sow	0	0	0	39	11	0	35	35	33
Sows Far. Q_3	Sow	0	0	0	0	11	8	35	35	33
Sows Far. Q_4	Sow	25	8	0	43	40	35	35	35	33
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	0	0	0	22	0	0	0
Calves,Past.	Head	45	82	43	0	43	42	0	0	21
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	52	288	0	0	9	0	0	0
Calves,Past.	Head	0	0	0	0	0	0	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	0	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	55	105	19	0	0	0	0	0	0
Land Rented In	Ac.	15	15	15	15	15	15	15	15	15
Gross profit	$	8,141	10,107	15,290	14,618	14,651	15,919	22,334	22,334	22,620

Table A-11. Continued

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est. Mort.	$	16,861	15,392	18,094	20,110	19,305	19,243	18,611	18,611	18,078
Chattel Mort.	$	2,011	8,047	33,042	9,367	12,580	16,339	8,432	8,432	10,141
Land Cont. Cr.	$	8,800	16,800	3,040	0	0	0	0	0	0
Corn Pur.	Bu.	0	0	10,687	6,804	7,166	7,737	9,479	9,479	9,699
Beef Hous.	Head	0	41	92	0	0	19	0	0	0
Low Mech.Fed.	Head	43	80	41	0	41	63	0	0	19
High Mech.Fed.	Head	0	26	144	0	0	9	0	0	19
Cent.Far.	Sow	17	0	0	35	32	27	27	27	25
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	336	64	0	624	576	500	496	496	464
Seas. Labor	M.Hr.	50	50	50	50	50	50	50	50	50

Table A-12. Optimal Organizations for Small Mixed Livestock Farms in the Southeast Area of South Dakota for High Corn Price

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	143	129	113	94	105	114	86	86	68
Soybeans	Ac.	20	0	0	0	0	0	0	0	0
Oats	Ac.	27	30	41	25	36	59	32	32	45
Corn silage	Ac.	1	5	5	0	5	5	0	0	0
Alfalfa	Ac.	0	28	33	6	13	15	6	6	11
Native hay	Ac.	7	7	7	7	7	7	7	7	7
Sows Far. Q_1	Sow	8	8	43	0	42	36	41	41	33
Sows Far. Q_2	Sow	0	0	39	0	34	28	41	41	33
Sows Far. Q_3	Sow	0	0	0	0	0	0	7	7	33
Sows Far. Q_4	Sow	8	8	43	0	0	0	41	41	33
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	0	0	0	0	0	0	0
Calves,Past.	Head	83	0	0	0	45	54	0	0	21
Calves,Dlt.	Head	13	0	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	196	0	0	0	0	0	0
Calves,Past.	Head	0	0	65	0	0	13	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	101	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	0	105	105	1	33	105	0	0	0
Land Rented In	Ac.	15	15	15	15	15	15	15	15	15
Gross profit	$	8,320	10,208	13,936	13,271	13,500	15,204	20449	20,449	20,670

Table A-12. Continued

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	24,243	14,960	17,266	20,135	19,817	19,609	19,674	19,674	18,070
Chattel Mort.	$	0	4,422	27,136	9,379	12,851	14,602	9,174	9,174	10,164
Land Cont.Cr.	$	0	16,800	16,800	160	5,280	16,800	0	0	0
Corn Pur.	Bu.	0	0	4,358	6,721	4,790	2,232	7,527	7,527	9,698
Beef Hous.	Head	0	33	77	0	0	14	0	0	0
Low Mech.Fed.	Head	12	94	0	0	43	52	0	0	0
High Mech.Fed.	Head	0	0	161	0	0	13	0	0	0
Change low-hi.	Head	0	0	2	0	0	28	0	0	0
Cent.Far.	Sow	0	0	35	0	34	28	33	33	25
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	64	64	624	0	544	448	592	592	464
Seas. Labor	M.Hr.	50	50	50	50	50	50	50	50	50

Table A-13. Optimal Organizations for Medium Mixed Livestock Farms in the Southeastern Area of South Dakota for Low Corn Prices

Corn Price $ .70/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	69	108	77	61	73	87	66	66	79
Soybeans	Ac.	129	0	0	27	12	0	8	8	4
Oats	Ac.	23	30	57	105	98	56	118	118	101
Alfalfa	Ac.	12	63	67	8	18	58	9	9	17
Native hay	Ac.	15	14	14	14	14	14	14	14	14
Sows Far. Q_1	Sow	62	0	0	55	51	14	57	57	52
Sows Far. Q_2	Sow	10	0	0	55	51	0	57	57	52
Sows Far. Q_3	Sow	14	0	0	55	51	14	57	57	52
Sows Far. Q_4	Sow	62	0	0	55	51	14	57	57	52
Low Mech.Fed. Dlt.Yrlgs.	Head	0	4	245	0	0	113	0	0	0
Calves,Past.	Head	45	51	48	0	13	50	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech.Fed.		0	460	262	0	0	296	0	0	0
Calves,Past.	Head	0	0	0	0	32	0	0	0	45
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	0	0	0	0	0	0	0	0	0
Land Pur. Cont.	Ac.	34	0	0	0	0	0	0	0	0
Land Rented In	Ac.	11	0	0	0	0	0	0	0	0
Gross profit	$	15,378	19,004	28,449	26,550	26,871	29,394	39,433	39,433	39,775

Table A-13. Continued

Corn Price $ .70/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt. Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired									
Real Est.Mort. $	27,488	25,917	27,751	26,367	25,174	25,239	26,520	26,520	25,211
Chattel Mort. $	18,739	53,172	56,998	14,897	19,684	48,390	15,011	15,011	20,136
Land Cont.Cr. $	5,440	0	0	0	0	0	0	0	0
Corn Pur. Bu.	13,478	19,284	20,936	17,198	17,148	20,057	16,855	16,855	16,781
Beef Hous. Head	0	155	189	0	0	142	0	0	0
Low Mech.Fed. Head	43	51	203	0	11	113	0	0	0
High Mech.Fed. Head	0	230	131	0	32	148	0	0	0
Change low-hi. Head	0	0	0	0	0	0	0	0	0
Cent.Far. Sow	48	0	0	41	37	0	43	43	38
Confin.Fed. Head	0	0	0	0	0	0	0	0	0
Port.Fed. Head	880	0	0	768	704	112	800	800	720
Seas. Labor M.Hr.	40	40	40	40	40	40	40	40	40

Table A-14. Optimal Organizations for Medium Mixed Livestock Farms in the Southeast Area of South Dakota for Medium Corn Price

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	127	129	112	80	87	112	72	72	82
Soybeans	Ac.	80	51	0	0	0	0	0	0	0
Oats	Ac.	25	21	33	114	96	53	122	122	103
Alfalfa	Ac.	13	42	65	7	18	36	7	7	16
Native hay	Ac.	15	15	14	14	14	14	14	14	14
Sows far. Q_1	Sow	60	14	0	61	55	31	58	58	52
Sows far. Q_2	Sow	0	0	0	61	55	0	58	58	52
Sows far. Q_3	Sow	0	0	0	61	55	30	58	58	52
Sows far. Q_4	Sow	60	14	0	61	55	31	58	58	52
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	0	0	0	0	0	0	0
Calves,Past.	Head	45	58	18	0	0	55	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	270	494	0	0	266	0	0	0
Calves,Past.	Head	0	0	34	0	45	0	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	0	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	46	46	0	0	0	0	0	0	0
Land Rented In	Ac.	11	11	11	0	0	11	0	0	0
Gross profit	$	13,297	15,568	24,570	23,205	23,484	25,684	36,090	36,090	36,431

Table A-14. Continued

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	27,312	22,853	26,507	27,371	25,794	25,800	26,739	26,739	25,307
Chattel Mort.	$	12,395	29,051	56,836	15,597	20,532	39,097	51,164	15,164	20,203
Land Cont.Cr.	$	7,360	7,360	0	0	0	0	0	0	0
Corn Pur.	Bu.	6,877	10,717	18,999	15,323	15,739	17,194	16,453	16,453	16,609
Beef Hous.	Head	0	97	166	0	0	93	0	0	0
Low Mech.Fed.	Head	43	56	17	0	0	53	0	0	0
High Mech.Fed.	Head	0	135	281	0	43	133	0	0	43
Change low-hi.	Head	0	0	0	0	2	0	0	0	0
Cent.Far.	Sow	46	0	0	47	41	27	44	44	38
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	848	112	0	864	768	384	816	816	720
Seas. Labor	M.Hr.	40	40	40	40	40	40	40	40	40

Table A-15. Optimal Organizations for Medium Mixed Livestock Farms in the Southeast Area of South Dakota for High Corn Prices

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	127	127	124	112	120	129	72	72	81
Soybeans	Ac.	87	59	59	0	0	0	0	0	0
Oats	Ac.	30	18	52	95	94	49	120	120	103
Corn silage	Ac.	0	0	5	0	4	0	0	0	0
Alfalfa	Ac.	0	40	63	4	13	65	9	9	17
Native hay	Ac.	15	15	15	14	15	15	14	14	14
Sows far. Q_1	Sow	38	0	0	64	60	54	58	58	52
Sows far. Q_2	Sow	0	0	0	64	53	0	58	58	52
Sows far. Q_3	Sow	0	0	0	0	0	14	53	53	50
Sows far. Q_4	Sow	38	14	0	50	60	54	58	58	50
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	14	0	0	0	0	0	0
Calves,Past.	Head	11	58	0	0	0	71	0	0	0
Calves,Dlt.	Head	0	96	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	453	0	0	0	0	0	0
Calves,Past.	Head	0	0	61	0	45	58	0	0	45
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	46	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	0	46	46	0	16	46	0	0	0
Land Rented In	Ac.	11	11	11	0	0	11	0	0	0
Gross profit	$	12,630	14,655	21,263	20,546	20,758	23,037	32,803	32,803	33,118

Table A-15. Continued

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	23,314	21,537	26,582	29,732	29,258	28,140	26,735	26,735	25,309
Chattel Mort.	$	0	696	56,971	14,522	21,047	27,846	15,161	15,161	20,197
Land Cont.Cr.	$	0	7,360	7,360	0	2,560	7,360	0	0	0
Corn Pur.	Bu.	0	1,234	16,337	10,801	10,569	10,795	16,450	16,450	16,606
Beef Hous.	Head	0	0	71	167	0	55	0	0	0
Low Mech.Fed.	Head	9	152	12	0	43	69	0	0	0
High Mech.Fed.	Head	0	0	288	0	46	58	0	0	42
Change low-hi.	Head	0	0	0	0	2	0	0	0	2
Cent.Far.	Sow	24	0	0	50	46	40	44	44	38
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	496	0	0	912	848	752	816	816	720
Seas. Labor	M.Hr.	40	40	40	40	40	40	40	40	40

Table A-16. Optimal Organizations for Large Mixed Livestock Farms in the Southeast Area of South Dakota for Low Corn Prices

Corn Price $ .80/bushel

Hog Price/cwt.		11.45			14.41			17.37		
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	128	126	124	76	74	124	74	75	89
Soybeans	Ac.	187	131	64	241	196	74	174	179	157
Oats	Ac.	42	39	42	47	38	42	43	37	34
Alfalfa	Ac.	14	75	78	3	15	73	8	8	19
Native hay	Ac.	23	23	21	23	22	21	21	21	21
Sows far. Q_1	Sow	75	0	0	61	58	15	77	73	58
Sows far. Q_2	Sow	29	0	0	61	58	0	77	73	58
Sows far. Q_3	Sow	15	0	0	61	58	15	64	68	58
Sows far. Q_4	Sow	75	15	0	61	58	15	62	41	58
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	142	191	0	0	170	0	10	20
Calves,Past.	Head	52	53	48	0	0	49	0	0	0
Calves,Dlt.	Head	0	410	460	0	0	187	0	0	11
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	0	0	0	0	0	0	0
Calves,Past.	Head	0	0	0	0	39	0	0	0	40
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	0	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	73	73	0	68	13	0	0	0	0
Land Rented In	Ac.	15	15	15	15	15	15	0	0	0
Gross profit	$	21,130	25,975	37,853	34,530	34,939	38,703	48,778	48,784	49,672

Table A-16. Continued

Corn Price $ .70/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	30,621	27,089	28,657	28,138	26,985	26,793	30,640	29,964	27,334
Chattel Mort.	$	22,501	59,892	66,824	16,759	21,495	59,013	17,893	17,562	22,124
Land Cont.Cr.	$	11,680	11,680	0	10,880	2,080	0	0	0	0
Corn Pur.	Bu.	14,908	22,615	25,564	20,432	22,452	25,075	21,944	22,677	22,526
Beef Hous.	Head	0	180	209	0	0	174	0	0	12
Low Mech.Fed.	Head	42	114	134	0	4	124	0	0	10
High Mech.Fed.	Head	0	205	230	0	39	187	0	0	51
Change low-hi.	Head	0	0	0	0	43	0	62	58	43
Central far.	Sow	60	0	0	46	0	0	0	0	0
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	1,080	0	0	856	808	120	1,112	1,048	808
Seas. Labor	M.Hr.	300	300	300	300	300	300	300	300	300

Table A-17. Optimal Organizations for Large Mixed Livestock Farms in the Southeast Area of South Dakota for Medium Corn Prices

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	147	147	147	147	147	147	136	136	136
Soybeans	Ac.	168	114	49	173	162	73	160	160	64
Oats	Ac.	41	38	54	49	47	78	45	45	119
Alfalfa	Ac.	15	72	121	2	15	73	4	4	49
Native hay	Ac.	22	22	22	22	22	22	22	22	22
Sows far. Q_1	Sow	87	15	0	79	70	15	61	61	57
Sows far. Q_2	Sow	0	0	0	48	32	0	61	61	57
Sows far. Q_3	Sow	0	0	0	19	37	15	61	61	56
Sows far. Q_4	Sow	87	15	0	79	70	15	61	61	57
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	65	25	0	0	88	0	0	0
Calves,Past.	Head	52	56	128	0	0	61	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	446	283	0	0	214	0	0	38
Calves,Past.	Head	0	0	0	0	52	0	0	0	63
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	0	0	0	0	0	0	0	59	0
Land Pur.Cont.	Ac.	73	73	73	73	73	73	58	0	56
Land Rented In	Ac.	15	15	15	15	15	15	0	0	0
Gross profit	$	18,498	21,664	32,913	30,968	31,050	33,812	44,604	44,607	45,476

Table A-17. Continued

Corn Price $ .90/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	32,809	26,502	28,938	31,640	29,416	26,515	27,950	33,800	28,115
Chattel Mort.	$	23,079	58,767	65,018	18,460	23,813	58,072	13,128	16,634	25,845
Land Cont.Cr.	$	11,680	11,680	11,680	11,680	11,680	11,680	9,280	0	8,960
Corn Pur.	Bu.	11,635	21,062	21,251	14,085	15,209	21,240	16,777	16,777	17,848
Beef Hous.	Head	0	169	215	0	0	169	0	0	31
Low Mech.Fed.	Head	42	79	130	0	0	95	0	0	0
High Mech.Fed.	Head	0	223	242	0	42	207	0	0	90
Change low-hi.	Head	0	0	0	0	10	0	0	0	10
Cent.Far.	Sow	72	0	0	64	55	0	46	46	42
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	1,272	120	0	1,144	1,000	120	856	856	792
Seas. Labor	M.Hr.	211	300	300	300	300	300	300	300	300

Table A-18. Optimal Organizations for Large Mixed Livestock Farms in the Southeast Area of South Dakota for High Corn Price

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Corn	Ac.	147	147	147	147	147	147	147	147	147
Soybeans	Ac.	176	141	28	159	165	0	34	34	46
Oats	Ac.	48	26	59	54	54	86	184	184	158
Alfalfa	Ac.	0	57	137	11	5	138	6	5	20
Native hay	Ac.	22	22	22	22	22	22	22	22	22
Sows Far. Q_1	Sow	41	0	0	80	80	55	91	91	69
Sows Far. Q_2	Sow	0	0	0	53	46	0	91	91	69
Sows Far. Q_3	Sow	0	0	0	15	15	15	15	15	17
Sows Far. Q_4	Sow	41	15	0	80	80	55	58	58	69
Low Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	0	0	0	0	0	0	0
Calves,Past.	Head	24	187	150	0	10	206	0	0	0
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
High Mech.Fed.										
Dlt.Yrlgs.	Head	0	0	468	0	0	0	0	0	0
Calves,Past.	Head	0	0	8	0	0	23	0	0	70
Calves,Dlt.	Head	0	0	0	0	0	0	0	0	0
Land Pur.Mort.	Ac.	12	0	0	0	0	0	0	0	0
Land Pur.Cont.	Ac.	61	73	73	73	73	73	73	73	73
Land Rented In	Ac.	15	15	15	15	15	15	15	15	15
Gross profit	$	17,465	19,720	28,594	28,184	28,190	30,280	41,872	41,875	42,490

Table A-18. Continued

Corn Price $1.10/bushel

Hog Price/cwt.		11.45			14.41			17.37	
Beef Price/cwt.	Unit	15.74	19.90	24.06	15.74	19.90	24.06	15.74	19.90	24.06
Resources acquired										
Real Est.Mort.	$	25,689	22,836	29,257	31,701	31,597	31,114	33,641	33,641	29,573
Chattel Mort.	$	0	0	65.177	18,629	19,318	35,780	19,820	19,820	26,867
Land Cont.Cr.	$	0	11,680	11,680	11,680	11,680	11,680	11,680	11,680	11,680
Corn Pur.	Bu.	0	1,716	20,849	13,883	13,847	14,585	12,864	12,864	14,090
Beef Hous.	Head	0	87	221	0	0	115	0	0	11
Low Mech.Fed.	Head	14	176	140	0	0	197	0	0	0
High Mech.Fed.	Head	0	0	242	0	0	23	0	0	60
Change low-hi.	Head	0	0	0	0	0	0	0	0	10
Cent.Far.	Sow	26	0	0	65	65	25	76	76	54
Confin.Fed.	Head	0	0	0	0	0	0	0	0	0
Port.Fed.	Head	536	0	0	1,160	1,160	760	1,336	1,336	984
Seas. Labor	M.Hr.	300	300	300	300	300	300	300	300	300

Table A-19. Sources of Gross Income for Seven Planning Models for the Southeastern Area of South Dakota

Source of Income	Models: 1	2	3	4	5	6	7
			3,000 dollar return to labor and management				
Corn	-	-	-	-	7,192	-	3,825
Soybeans	-	-	-	2,469	5,604	-	2,944
Swine	10,316	-	8,496	-	-	9,710	-
Fed beef	11,657	60,379	-	18,815	-	10,647	-
Sell stockers	-	-	160	-	6,880	-	3,520
Gross Income ($)	21,973	60,379	8,656	21,284	19,676	20,357	10,289
			5,000 dollar return to labor and management				
Corn	-	-	-	-	11,312	-	5,805
Soybeans	-	1,710	-	3,752	8,786	-	4,464
Swine	15,778	-	13,351	-	-	14,565	-
Fed beef	17,744	56,601	-	28,607	-	16,216	-
Sell stockers	-	-	320	-	10,720	-	5,440
Gross Income ($)	33,522	58,311	13,671	32,359	30,818	30,781	15,709
			10,000 dollar return to labor and management				
Corn	-	-	-	-	22,013	-	10,732
Soybeans	-	6,126	-	6,173	17,049	-	8,311
Swine	28,522	-	23,668	-	-	26,095	-
Fed beef	24,120	64,072	-	55,976	-	25,371	-
Sell stockers	-	-	480	-	20,800	-	10,080
Gross Income ($)	52,642	70,198	24,148	62,149	59,862	51,466	29,123

Table A-20. Estimated Minimum Resource Requirements Needed to Earn Specified Returns to Operator Labor and Management in Southeastern South Dakota: Corn Buying and Corn Growing Models Compared

Item	Unit	Return to Labor and Management $5,000		$10,000	
	Model:	1	6	1	6
Total Land	Acre	38	36	70	65
Corn	Acre	2	1	11	4
Corn silage	Acre	7	7	10	11
Oats	Acre	7	6	11	10
Alfalfa	Acre	16	15	23	28
Native Hay	Acre	1	1	2	1
Native Pasture	Acre	4	4	10	8
Farmstead & other	Acre	2	2	4	3
Corn Purchased	Bushel	8,489	7,939	13,474	13,311
Livestock					
Sows farrowed	Litter	52	48	94	86
Feed calves, dlt.	Head	65	60	85	91
Feed calves, past.	Head	5	4	10	9
Labor					
Operator	Hour	1,854	1,746	2,795	2,849
Hired	Hour	0	0	0	0
Investment					
Land	Dollar	7,604	7,204	14,007	13,007
Crop mach. inv.	Dollar	1,407	1,315	1,982	2,328
Feeding inv.	Dollar	4,396	4,111	7,096	6,968
Livestock	Dollar	7,597	7,841	12,059	12,456
Operating capital	Dollar	18,026	13,833	28,254	23,137
Total capital inv.	Dollar	39,030	34,304	63,398	57,896

Table A-21. Estimated Minimum Resource Requirements Needed to Earn a 3,000 Dollar Return to Operator Labor and Management in Southeastern South Dakota: Comparison of Selected Alternative Models

Item	Unit	Model: 2	4	Percent change
Total Land	Acre	140	180	+ 29
Corn	Acre	20	56	+180
Soybeans	Acre	0	52	-
Oats	Acre	23	22	- 4
Corn silage	Acre	24	0	-
Alfalfa	Acre	44	17	- 61
Native hay	Acre	4	5	+ 25
Native pasture	Acre	16	21	+ 31
Farmstead & other	Acre	9	7	- 22
Corn Purchased	Bushel	9,192	0	-
Livestock				
Feed calves, dlt.	Head	217	42	- 81
Feed calves, past.	Head	21	31	+ 48
Labor				
Operator	Hour	3,020	1,671	- 45
Hired	Hour	294	0	-
Investment				
Land	Dollar	28,015	36,020	+ 29
Crop machinery	Dollar	4,329	3,797	- 12
Feeding facil.	Dollar	7,173	2,204	- 69
Livestock	Dollar	25,830	7,924	- 69
Operating capital	Dollar	20,766	4,299	- 79
Total capital requirement	Dollar	86,113	54,244	- 37

Table A-22. Estimated Minimum Resource Requirements Needed to Earn a 10,000 Dollar Return to Operator Labor and Management in Southeastern South Dakota: Comparison of Selected Alternative Models

Item	Unit	Model: 1	3	Percent change
Total Land	Acre	70	259	+ 270
Corn	Acre	11	80	+ 627
Oats	Acre	11	129	+1072
Corn silage	Acre	10	0	-
Alfalfa	Acre	23	0	-
Native hay	Acre	2	7	+ 250
Native pasture	Acre	10	31	+ 210
Farmstead & other	Acre	4	21	+ 200
Corn Purchased	Bushels	13,474	0	-
Livestock				
Sows farrowed	Litter	94	78	- 17
Feed calves, dlt.	Head	85	0	-
Feed calves, past.	Head	10	0	-
Raise stockers	Head	0	3	-
Labor				
Operator	Hour	2,795	2,243	- 20
Hired	Hour	0	0	
Investment				
Land	Dollar	14,007	51,828	+ 270
Crop machinery	Dollar	1,982	4,344	+ 119
Feeding facilities	Dollar	7,096	3,698	- 48
Livestock	Dollar	12,059	1,776	- 85
Operating capital	Dollar	28,254	11,638	- 59
Total capital requirement	Dollar	63,398	73,284	+ 16

Table A-23. Estimated Minimum Resource Requirements Needed to Earn a 3,000 Dollar Return to Operator Labor and Management in Southeastern South Dakota: Comparison of Selected Alternative Models

Item	Unit	Model: 1	3	Percent change
Total Land	Acre	25	94	+ 276
Corn	Acre	1	29	+2900
Oats	Acre	5	46	+ 820
Corn silage	Acre	5	0	-
Alfalfa	Acre	11	1	- 91
Native hay	Acre	0	3	-
Native pasture	Acre	2	11	+ 450
Farmstead & other	Acre	1	5	+ 400
Corn Purchased	Bushel	5,593	0	-
Livestock				
Sows farrowed	Litter	34	28	- 18
Feed calves, dlt.	Head	43	0	-
Feed calves, past.	Head	3	0	-
Raise stocker	Head	0	1	-
Labor				
Operator	Hour	1,324	1,006	- 24
Hired	Hour	0	0	
Investment				
Land	Dollar	5,003	18,810	+ 276
Crop machinery	Dollar	927	1,573	+ 70
Feeding facilities	Dollar	2,896	1,339	- 54
Livestock invest.	Dollar	5,624	629	- 91
Operating capital	Dollar	11,231	4,226	- 62
Total capital requirement	Dollar	25,681	26,577	+ 3

Table A-24. Estimated Minimum Resource Requirements Needed to Earn a 10,000 Dollar Return to Operator Labor and Management in Southeastern South Dakota: Comparison of Selected Alternative Models

Item	Unit	Model: 2	4	Percent change
Total Land	Acre	532	536	+ 1
Corn	Acre	166	167	+ 1
Soybeans	Acre	129	130	+ 1
Oats	Acre	56	57	+ 1
Alfalfa	Acre	85	86	+ 1
Native hay	Acre	16	15	- 6
Native pasture	Acre	62	64	+ 3
Farmstead & other	Acre	18	18	-
Corn Purchased	Bushel	1,830	0	-
Livestock				
Feed calves, dlt.	Head	108	55	- 49
Feed calves, past.	Head	139	159	+ 14
Labor				
Operator	Hour	3,375	3,183	- 6
Hired	Hour	893	664	- 26
Investment	Dollar	106,459	107,259	+ 1
Crop machinery	Dollar	10,983	10,627	- 3
Feeding facilities	Dollar	7,454	6,451	- 13
Livestock	Dollar	26,814	23,232	- 13
Operating capital	Dollar	15,371	11,835	- 23
Total capital requirement	Dollar	167,081	159,404	- 5