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Farm Plans for Wheat Farmers in North Central South Dakota

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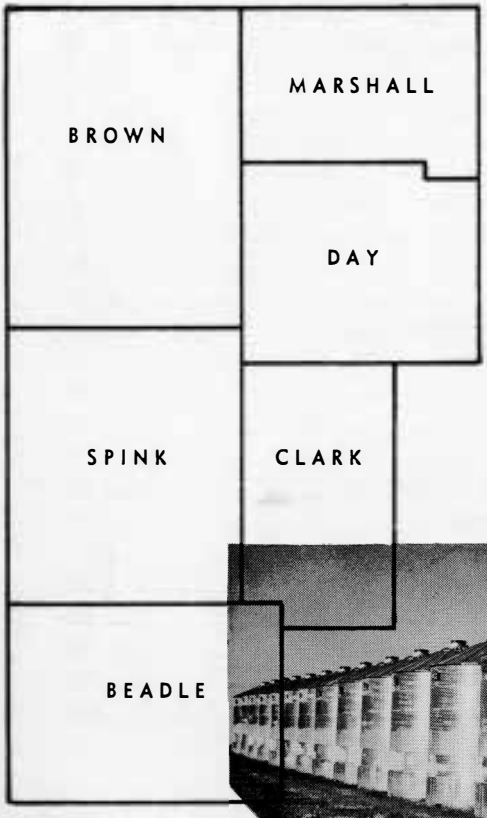

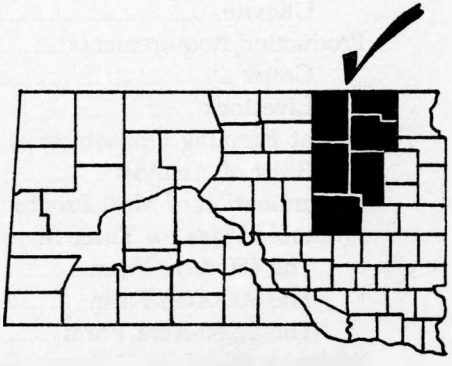

FARM PLANS

FOR WHEAT FARMERS IN NORTH CENTRAL SOUTH DAKOTA

ECONOMICS DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE, BROOKINGS

COOPERATIVE WITH AGRICULTURAL RESEARCH SERVICE, USDA

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SUMMARY

The study reported was intended to find answers to some of the questions that face farmers in north central South Dakota concerning their most profitable production plans under wheat-acreage restrictions. The method used was to estimate future rates of production for crops and livestock in the area; to estimate future prices and costs and usual size of farm; and to budget alternative crop and livestock organizations so as to find the one that will be most profitable and stable.

This analysis brought out that a grain system of farming (small grain-corn-small grain) using commercial fertilizer was more profitable than one using alfalfa or sweet clover. Either feeder-cattle and hog-raising enterprises or lamb and hog-raising enterprises were combined profitably with this system.

Further analysis indicated that on the 800-acre and 1,280-acre farms, buying and fattening additional feeder cattle increased earnings. The same cropping plan of small grain-corn-small grain was budgeted as being the most profitable, but part of the corn acreage was harvested as corn silage to supply roughage.

Analysis under different growing conditions showed that substituting grain sorghum for corn under favorable growing conditions was profitable on all soil groups except 6.

Increasing the size of business by adding more land up to at least a 1,280-acre farm or by increasing the number of litters of pigs raised up to the limit of feed supplies (if the operator was able to care for the additional hogs) increased earnings.

The value of flexible farm plans that can be changed to meet unfavorable or very favorable growing conditions and economic situations was brought out.

It was shown that these farm plans also gave a more even level of income over a period of years than other plans.

Farm Plans for Wheat Farmers in North Central South Dakota

By Rex D. Helfinstine[1]

Stocks of wheat in the United States that approach 2½ times annual domestic requirements point up the need for farmers to adjust production to meet market demands.[2] Prospects for disposing of any large quantity of wheat through foreign trade and for industrial uses seem to be inadequate. Developing farm plans that are profitable with restrictions on wheat acreage then is essential.

The study was intended to develop alternative plans for north-central South Dakota wheat farms and to compare them with the present farming systems as to future profitability, stability of earnings, and flexibility.

Many management decisions face farmers in this area. Among the questions they need to ask themselves are:

1. Is it most profitable to continue to raise wheat to the limit of my allotment?

2. Would it be profitable to adopt an intensive type of livestock farming—hogs, beef cattle, or sheep, or some combination?

3. What are the expected average farm incomes, variation in incomes over time, flexibility aspects, and capital and labor requirements for various farming systems?

Information is furnished that will be helpful to farmers in working out answers to these questions for their

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[2]Wheat stocks on hand April 1, 1959, were 1,564 million bushels in the United States, including 50 million bushels in South Dakota (Stocks of Grain in all Positions, U. S. Agr. Market Serv., Apr., 1960). Compare this with an average annual domestic use of 590,772,000 and average annual exports of 403,093,000 bushels for the period 1954-58. (Supplement for 1959 to Grain and Feed Statistics, U. S. Dept. Agr., Suppl. for 1959 to Satis. Bul. 159, Mar. 1960.)

individual farm situations. This is done by determining the most profitable farming systems for three sizes of farms (480, 800, and 1,280 acres); for three ranges of growing conditions; and for the four most common soil groups in the area. The profitability and stability of alternative farming systems are determined on the 480-acre size farm for the 4 soils groups over a 30-year historical range of growing conditions.

Figure 1. Map of the state showing area involved in the study.

PRESENT AGRICULTURE

The spring wheat area under study, known as State Economic Area 2B, includes Beadle, Brown, Clark, Day, Marshall, and Spink Counties (see figure 1). The results are particularly applicable to Spink County, since it was selected as representative of the other counties and an intensive study made there. More recent and detailed information on the soils was available for Spink County than for the other counties. However, the results are generally applicable to similar soil groups in the remaining counties of the area.

Present Farming

Wheat, corn, and oats are the principal crops grown in north central South Dakota. Other crops raised are barley, rye, and alfalfa. Land considered not suited to cultivation is used for native hay and pasture.

Raising feeder cattle is the chief livestock enterprise; adapted as it is to utilizing the native pasture and hay. Some farmers may use their feed grains for fattening cattle or raising hogs or sheep. Neither poultry nor dairy cattle enterprises are prevalent.

The average size of farm in 1954 was 510 acres for the 6-county area. A steady increase in size since initial settlement in the 1880's is evident. The U. S. Census reports the trend in average size of farm and number of farms in the 6-county area as follows:

Census Year	Number of farms	Average size, acres
1890	11,089	245
1900	8,576	445
1910	9,884	420
1920	10,678	397
1930	11,382	385
1940	10,352	420
1950	9,541	470
1954	8,843	510
1959 (prel.)	7,831	579

Factors affecting the number and size of farms since 1890 are initial homesteading and good crops, drought, low prices, wars, and profitable off-farm alternatives. The marked trend toward larger farms since the drought of the 1930's reflects partly the adoption of power machinery. Farmers tend to increase the size of their farms in order to use

large machines to fullest capacity, reduce unit costs, and increase total profits. But small farms still persist in the area. Many of these small farms may be rural residences of semi-retired and industrially employed people. Farm plans for farms of less than 480 acres that will provide adequate levels of living in this area are difficult to develop.

Soils

The texture of the soils reflects the parent material—usually glacial till. Alluvial (water-deposited) soils may occur along stream bottoms, while loessal (wind-borne) soils are found in scattered areas.

The four soil groups predominating in the area are:

1. Soil group 3 — nearly level, well-drained, and medium textured soils represented by the Beotia series;

2. Soil group 4 — nearly level, well-drained, and moderately fine-textured soils, represented by the Beadle and Harmony series;

3. Soil group 6 — nearly level, imperfectly drained and moderately fine-textured soils with claypan below the surface, represented by the Aberdeen series;

4. Soil group 13 — undulating, well-drained, and medium-textured soils,represented by the Houdek and Houdek-Bonilla series.[3]

Soil scientists consider that the chief problem in managing these soils for grain production lies in maintaining their organic matter and nitrogen level.[4] They state that organic matter should be maintained by plowing under crop residues, manure, and legumes; nitrogen should be added by using commercial fertilizers containing nitrogen or by plowing under such legumes as alfalfa or sweet clover. Wind erosion, a critical problem during dry years, may be controlled by strip-cropping, stubble mulching, addition of organic matter, and maintaining crop cover as long as possible.

Climate

Extreme changes in weather are characteristic of north-central South Dakota, as of all the Great Plains. Temperatures range from 20 to 40 degrees below zero in winter to 100 plus in July and August. Occasionally there are winds of more than 100 miles an hour. Damaging hailstorms may wipe out a crop in a matter of minutes. Precipitation averages below an optimum for crop production—approximately 18 to 20 inches as a historical annual average. But, in any particular year, precipation may vary from 11 to 30 inches. Thus crop yields are bound to vary widely. For example, since 1926 spring wheat (other than durum) planted-acre yields have ranged from a low of zero to a high of 19 bushels, as an annual average for Spink County (See table 1). Under such conditions, farm plans must be flexible and reserves high, if a farmer is to survive.

[3]For more detailed and specific description and management recommendations, see: Westin, F. C. et al, *Soil Survey of Spink County, South Dakota,* S. Dak. Agr. Exp. Sta. Bul. 439, 138 pp., illus., June, 1954.

[4]*Ibid.,* p. 89-93.

Table 1. Yield per Planted Acre of Spring Wheat (Other Than Durum), Spink County, S. D., 1926-59

Year	Yield, bu.	Year	Yield, bu.
1926	1.9	1943	8.0
1927	14.0	1944	13.3
1928	6.9	1945	15.7
1929	7.7	1946	9.4
1930	10.4	1947	14.1
1931	5.5	1948	11.7
1932	10.3	1949	8.1
1933	—	1950	9.2
1934	—	1951	14.8
1935	5.7	1952	5.7
1936	0.2	1953	7.3
1937	2.1	1954	11.9
1938	7.9	1955	10.3
1939	5.5	1956	5.5
1940	7.6	1957	18.8
1941	12.5	1958	17.9
1942	14.6	1959	2.7

Source: S. D. Crop and Livestock Rept. Serv., "South Dakota Agriculture."

PRODUCTION REQUIREMENTS

To ascertain the most profitable and stable farming systems by means of budgets, we must specify production requirements of crops and livestock, machines, and equipment.

Crops

A continued high level of crop yields usually requires that the fertility of the soils be maintained at an adequate level through the use of a regular cropping system or rotation. The nitrogen level may be maintained at an adequate level for the next 10 to 15 years either through the use of commercial nitrogen fertilizer or by including a legume (alfalfa) in the rotation. In rotations using commercial nitrogen in the production plans of the study, it was assumed that 20 pounds of nitrogen annually in fertilizer per acre is adequate to maintain nitrogen levels. While 20 pounds may be adequate under average growing conditions, larger quantities are likely to be profitable under more favorable conditions. Lower quantities or none at all may be most profitable when growing conditions are poor.

In selecting crops to be included in a rotation, income potentials should be considered along with other factors. Is the crop adaptable to the soils and weather of the area? What are the necessary growing practices and the labor and machinery requirements (including seasonal labor distribution)? Does the crop have disease and insect hazards? What are the expected yields? Are yields subject to high variability? How does the crop respond to fertilizer? Crops in a rotation may complement each other in the use of power, equipment, and labor, thus making for greater efficiency and lower costs of production. For example, tillage operations for corn use the same labor and power as wheat, barley, and oats, but at different seasons.

Spring wheat (other than durum) seems to be best adapted to the prairie soils and cool springs of this area. Yields, however, vary because of the variability in rainfall and other natural hazards. In 1926-55, the coefficient of variation, which measures relative variability in annual yields as a percentage of average yield, was 51% for planted acre yields for Spink County contrasted with 31% for wheat in Cass County

in the Red River Valley of North Dakota.

Wheat may be fertilized profitably with nitrogen during years when rainfall is not deficient. Agronomists estimate that 20 pounds of nitrogen equivalent per acre will increase the yield of wheat by 3 to 10 bushels per acre: the increase depending upon the growing conditions and the particular soil group. Heavier applications of nitrogen may be more profitable with very favorable growing conditions. The 1926-57 average yield of other spring wheat for Spink County was 8.6 bushels per planted acre; the 1941-55 average was 11.1 bushels.[5] The 6-county area average yield was 9.3 bushels per planted acre for 1926-57 and 11.8 bushels for 1941-55. Agronomists from the Experiment Station estimate that future average yields will range from 4 to 30 bushels per acre, according to soils, growing conditions, and treatment (table 2).

Alternative feed grain crops adapted to north-central South Dakota are oats and barley. Oats are more popular than barley because farmers consider their yields more dependable. Agronomists believe that low fertility affects barley more than oats. From 1926 to 1957, yields of oats averaged 19.9 and barley 13.5 bushels per planted acre in Spink County (table 2).

Corn is grown widely in the area, particularly in the southern and eastern parts, where soils and climate are more favorable than in other parts of the area. In the northern part, the season is too short and rainfall in the western part too deficient for dependable yields. Yields of corn are greater when commercial fertilizer is used than in rotations with alfalfa and sweet clover which deplete soil moisture (table 2). Some alfalfa has been grown in the area for many years. The acreage of alfalfa has increased since 1940, fostered by above-average moisture conditions and by Agricultural Conservation Program payments to defray part of the cost of establishing stands. The yield of alfalfa in Spink County averaged 1.21 tons per acre for 1926-57 compared with 1.45 tons for 1941-55. Yields for the 6-county area averaged 1.3 tons per acre from 1926 to 1957, and 1.3 tons from 1941 to 1955. Agronomists estimate future yields at 0.77 to 2.28 tons per acre, depending upon growing conditions, soils, and management (table 2 and appendix tables 2 and 3).

Sweet clover has been of minor importance in the area. It is used primarily as a crop sown in the spring with small grain. It is permitted to grow until the following spring when it is plowed under at a height of about 8 inches or when the buds appear. Used in this way in years with normal rainfall, the crop adds a maximum of nitrogen to the soil without trouble from volunteer growth. However, sweet clover rotations produce lower average grain yields than commercial fertilizer (table 2).

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

Table 2. Estimated Yields of Crops for Four Soils Groups, Favorable Growing Conditions, Average Management, Spink County, South Dakota*

Soil groups	Corn, bu.	Sorghum, bu.	Wheat, bu.	Barley, bu.	Oats, bu.	Alfalfa, tons
Soil Group 3						
No fertilizer or legumes	18	18	13	17	28	
With 20 lbs. N. in fertilizer	24	24	20	26	38	
After sweet clover	20	20	17	23	32	
After alfalfa		20	19	24	36	1.65
First year after alfalfa	15					
Second year after alfalfa	30					
Soil Group 4						
No fertilizer or legumes	16	16	12	16	28	
With 20 lbs. N. in fertilizer	22	22	19	25	38	
After sweet clover	19	19	15	22	32	
After alfalfa		20	18	23	36	1.51
First year after alfalfa	15					
Second year after alfalfa	30					
Soil Group 6						
No fertilizer or legumes	11	9	10	15	22	
With 20 lbs. N. in fertilizer	15	12	17	22	30	
After sweet clover	15	12	14	19	27	
After alfalfa		12	15	20	28	1.23
First year after alfalfa	11					
Second year after alfalfa	22					
Soil Group 13						
No fertilizer or legumes	15	23	11	14	22	
With 20 lbs. N. in fertilizer	21	25	18	23	31	
After sweet clover	18	27	15	19	27	
After alfalfa		25	16	20	28	1.37
First year after alfalfa	14					
Second year after alfalfa	28					

*Estimated by agronomists, South Dakota Agricultural Experiment Station. Favorable growing conditions are defined as those represented by the central one-third array of years 1926-55 for Spink County, South Dakota.

Livestock

Many farmers in north central South Dakota combine one or two livestock enterprises with their cropping system. Most farms contain a sizeable acreage of native grassland that is not suitable for crop production. Such land is best utilized for beef cattle or sheep raising. Production of feed grains raises the question of whether to feed the grain to livestock or sell it. Some farmers produce grain for market while others feed the grain to livestock.

Raising feeder cattle for sale or for fattening is the most popular long-standing livestock enterprise. Our budgeting analysis assumes that the cow herd is grazed 7 months of the year on native pasture and crop aftermath. This seems to be

the usual practice in the area. Some winter grazing will take place, but an additional 1½ tons of hay per animal unit will be required. The only grain fed in raising feeder cattle will be 600 pounds to the herd bull.

Sheep raising seems to be equally well-adapted to utilizing available roughage. However, the enterprise is less popular than cattle raising because of the extra care required at lambing, the tighter fencing required, and the personal preferences of the operators.

Hog raising is adapted to use of surplus feed grains in the area. In the budget analysis, we assume that spring farrowing of 25 sows represents the limit for an average manager. The amount of feed grain produced in poor crop years is a further limiting factor. Some operators may be capable of caring profitably for a larger number of sows or of extending the farrowing season. A drylot system of raising hogs is assumed for farms not raising alfalfa; use of alfalfa pasture is assumed where available, thereby reducing grain-feed requirements.

Dairying seems to be least adaptable to the area because of distance to consumer markets and poor summer pastures; and it is not considered in the analysis.

WHEAT FARMING OPPORTUNITIES

Farming opportunities for wheat farmers in north central South Dakota are limited by wheat-acreage allotments, adaptability of alternative crops, market outlets for crops and livestock products, availability and quality of labor, access to capital, amount or character of land, growing conditions, and managerial ability of the operator.

Basis of Analysis

The future price level and price relationships assumed for the budget analysis are important in determining the profitability of alternative farm plans. The analysis assumes a projected price level tied to an all-product index of 235 (1910-14 = 100) for prices received by farmers and an index of 265 for prices and rates paid by farmers, including items used in production, interest, taxes, and wages. These are long-term projections tied to specific assumptions of rapid population growth, national prosperity, technological progress, a stable general price level, and a trend toward world peace. These prices were developed by economists of the Agricultural Marketing Service and the Agricultural Research Service, USDA.

Examples of prices received by South Dakota farmers for various crops under these projections compared with 1958 follow:

	1958	Projected
Wheat, per bu.	$ 1.74	$ 1.65
Barley, per bu.	.82	1.08
Oats, per bu.	.48	.67
Corn, per bu.	.95	1.29
Beef, good feeder steers, 700 lbs., per cwt.	22.80	19.40
Beef, choice slaughter steers, 1100 lbs., per cwt.	25.85	21.75
Hogs, per cwt.	20.30	18.00
Lambs, per cwt.	16.00	18.90

For purposes of the analysis, three different growing conditions are assumed—unfavorable, favorable, and very favorable. These represent the range of growing conditions from 1926 to 1955 arrayed and divided into thirds. In addition, the analysis concerned with stability assumes the 30-year range of historical growing conditions.

DETERMINATION OF MOST PROFITABLE FARM PLANS

Important factors that affect selection of the most profitable farm organization for wheat farms in north central South Dakota are size of farm, growing conditions, and soil group. Farm plans are developed considering each of these factors in turn. Another factor—the proportion of cropland – is held constant at 74% of the farmland (the proportion that cropland is of farmland in Spink County.)

The amount of wheat allotment may be an important factor bearing on profits. The assumption is made that the wheat-acreage allotment equals 28 percent of the cropland (the proportion for Spink County.) Farms with different proportions may require modifications in organization for optimum profits.

Other factors warranting consideration are prospective markets, adaptability of various crops, availability and quality of labor, and operator preferences. Operator preference determines whether an individual operator raises lambs or feeder cattle on his range pasture and hay, or whether he raises neither, sacrificing income in order to have the leisure allowed by a cash-grain farm.

Important assumptions for the budget analysis are:

1. Operators desire maximum labor and management income;
2. Operators desire minimum variation in labor and management income from year-to-year;
3. The level of managerial ability allows adoption of improved farming practices;
4. All assets, including land, machinery, equipment, and livestock, are fully owned with no rent or interest paid (rental of land is considered at one point);
5. All products are sold, except feed used on the farm;
6. The operator and family furnish up to 30 ten-hour days of labor per month when needed; the remaining labor needs are met by hiring labor;
7. No feed grain or roughage is purchased;
8. A maximum of 25 litters of pigs can be raised each year(this assumption is relaxed at one point).

PROFITABLE PLANS FOR THREE SIZES OF FARMS

Size, one of the more obvious differences among farms, is considered initially as a factor affecting farm plans. This is done by working out plans and evaluating them for 480 acre, 800-acre, and 1,280-acre farms on soil group 3 (the most important) under favorable (average) growing conditions. These sizes were selected to represent the expected modal situations 10 to 15

years in the future. Other soils and growing conditions are considered later in the analysis.

The 480-Acre Farm

The 480-acre farm was selected as representative of the minimum size farm adapted to the area in providing an adequate living for a family under different growing conditions. Smaller farms are likely to continue in the area because they are operated by men who work part-time off the farm, semi-retired persons, or beginning farmers.

The 480-acre farm was budgeted with 354 acres of cropland, 121 acres of native hay and pasture, and 5 acres of farmstead. The small grain acreage was made up of 99 acres of wheat (the allotment) and barley according to the particular rotation. Two general types of organizations budgeted were a cash grain and a livestock system. But even the cash grain system included a feeder cattle-raising enterprise to utilize the 121 acres of native hay and pasture. The livestock systems included a hog-raising enterprise to consume the feed grains raised. Commercial nitrogen fertilizer has not been used extensively in the area but its value has been established through experimentations and farm results. Therefore, it was assumed that commercial fertilizer was used with all cropping plans not including alfalfa or sweet clover.

Some of the budgets that were worked out for this 480-acre farm are discussed. The basic budget involved a cropping plan of small grain-corn-small grain with an 8-cow beef herd for raising feeder cattle from the 121 acres of native hay and range pasture. Nearly all of the feed grain and wheat—2,832 bushels corn, 3,275 bushels barley, and 1,831 bushels wheat—were sold for cash. Operator-labor requirements were 108 man-days per year. Net labor and management income was $5,686 (table 3). The next budget included, in addition, 25 litters of pigs each year to utilize part of the feed grain. This reduced sales of feed grain to 472 and 2,753 bushels of corn and barley, respectively, and increased operator labor to 156 man-days. But net labor and management income increased to $7,992 (table 3). Next a budget using sweet clover (sown with the small grain and plowed under the following spring) rather than using commercial fertilizer for maintaining nitrogen was tested. Both hogs and a beef herd were maintained. Grain yields were reduced to allow sales of only 2,342 bushels of barley and 1,534 bushels of wheat. Operator-labor requirements were the same—156 days. Net labor and management income dropped to $6,939, because of the lower grain yields (table 3).

The other budgets had various proportions of alfalfa in the cropping plan, but included both hogs and a beef cow herd. A budget with a cropping plan of corn-small grain-alfalfa-alfalfa-corn-small grain reduced grain production so that only 473 bushels of corn and 1,732 bushels of wheat were available for sale. Sufficient feed grain and roughage were available for 25 litters of pigs and 18 beef cows. Operator-labor requirements amounted to 182 days.

Table 3. Organization, Production and Costs and Returns of Alternative Farming Systems, 480-Acre Farm, Soil Group 3, Favorable Growing Conditions, Projected Prices, North Central South Dakota

Farming system	Crops, Acres				Livestock, number		
	Corn	Barley	Wheat	Alfalfa	Breeding cows	Litters of pigs	Breeding ewes
Cash grain*	118	137	99	—	8	—	—
Grain-hogs†	118	137	99	—	8	25	—
Grain-hogs (Sw. cl.)‡	118	137	99	—	8	25	—
Grain-alfalfa-hogs—A§	118	19	99	118	18	25	—
Grain-alfalfa-hogs—B¶	71	43	99	141	22	18	—
Grain-alfalfa-hogs—C‖	59	19	99	177	28	12	—
Grain-lambs-hogs**	118	137	99	—	—	25	70

	Production					
	Wheat, bu.	Feed grains, ton	Feed units 1,000 lbs. TDN	Livestock, number		
				Hogs	Cattle	Sheep
Cash grain*	1,980	165	329	—	7	—
Grain-hogs†	1,980	165	329	175	7	—
Grain-hogs (Sw. cl.)‡	1,683	142	293	175	7	—
Grain-alfalfa-hogs—A§	1,881	85	311	175	15	—
Grain-alfalfa-hogs—B¶	1,881	55	298	126	19	—
Grain-alfalfa-hogs—C‖	1,881	36	308	84	24	—
Grain-lambs-hogs**	1,980	165	330	175	—	57

	Costs and returns					
	Gross sales dollars	Depreciation and expenses dollars	Net return dollars	Charge for capital dollars	Labor and management return dollars	Operator labor days
Cash grain*	10,972	3,925	7,047	1,361	5,686	108
Grain-hogs†	15,165	5,702	9,463	1,471	7,992	156
Grain-hogs (Sw. cl.)‡	13,482	5,072	8,410	1,471	6,939	156
Grain-alfalfa-hogs—A§	13,068	5,139	7,929	1,705	6,224	182
Grain-alfalfa-hogs—B¶	10,835	4,624	6,211	1,754	4,457	161
Grain-alfalfa-hogs—C‖	9,672	4,519	5,153	1,865	3,288	170
Grain-lambs-hogs**	15,440	5,799	9,641	1,340	8,301	149

*Small grain-corn-small grain crop plan (with 20 pounds of nitrogen in fertilizer applied per acre annually to each crop) combined with feeder cattle raising enterprise.

†Same cropping plan as above but combined with feeder cattle and hog raising enterprises.

‡Small grain-corn-small grain crop plan (with sweet clover seeded in the small grain and plowed under the following spring) combined with feeder-cattle and hog-raising enterprises.

§Corn-small grain-alfalfa-alfalfa-corn-small grain crop plan combined with feeder-cattle and hog-raising enterprises.

¶Small grain-small grain-alfalfa-alfalfa-corn crop plan combined with feeder-cattle and hog-raising enterprises.

‖Corn-small grain-small grain-alfalfa-alfalfa-alfalfa crop plan combined with feeder-cattle and hog raising enterprises.

**Same cropping plan as * but combined with lamb and hog-raising enterprises.

Net labor and management income was $6,224 (table 3). A budget with a cropping plan of small grain-alfalfa-alfalfa-corn had even less grain for sale—44 bushels of corn and 1,732 of wheat. Feed grains were adequate for only 18 litters of pigs and roughage sufficient for 22 beef cows. Operator-labor requirements amounted to 161 days; while net labor and management income was $4,457 (table 3). The budget with 50 percent alfalfa in the cropping plan (corn-small grain-small grain-alfalfa-alfalfa-alfalfa) left 18 bushels of corn and 1,732 bushels of wheat for sale. Feed grains and roughage were adequate for 12 litters of pigs and 28 beef cows. Operator-labor requirements were 170 days, net labor and management income was $3,288 (table 3).

A farm plan substituting sheep for beef cattle was used with a cropping plan of small grain-corn-small grain. Grain for sale included 483 bushels of corn, 2,643 bushels of barley, and 831 bushels of wheat. Grain and roughage supplies were adequate for 70 ewes and 25 litters of pigs, so that 150 pigs and 47 fat lambs were marketed. Operator-labor requirements were 149 days. Net labor and management income was $8,301 (table 3). It seems that returns from cattle or sheep raising differ little. The choice between these enterprises is likely to hinge upon personal preferences, available capital (less capital needed for raising lambs), type of labor available (special care is needed for ewes at lambing time), and tightness of fencing (better fencing is needed for sheep than for cattle).

The previous analysis assumed that an operator could handle adequately up to a maximum of 25 litters of pigs per year. However, an efficient operator may be able to handle more. Feed grains on a 480-acre farm on group 3 soils following a small grain-corn-small grain cropping system allow 50 instead of 25 litters of pigs to be raised. Operator's labor is increased to 207 man-days and income increased to $10,259 (table 4).

Many farmers are interested in deciding whether it is more profitable to rent or to own their land. If we assume share renting (plus cash rent for pasture and hay) instead of full ownership for a 480-acre farm on soil group 3, earnings are reduced to $5,881 (for the Sm-C-Sm rotation with feeder cattle and hog enterprises), (see table 5). Total investment drops from $30,634 to $12,286.

It would be more profitable, then, to rent a larger farm. A 1,280-acre unit could be operated with approximately the same investment, if 160 acres were owned as an operating base and the rest rented. Such a unit gives a net labor and management income of $12,601, a total investment of $31,543, and 304 days of labor required (table 6). This higher labor and management income needs to be considered against the possibility that the operator may lose his rented land and that he cannot profit from rising land values. An operator with well-established farm plans may suffer substantial losses if he can no longer find land to rent. At the same time, he is not risking losses from falling land val-

ues. Many area operators with units of this size own a larger proportion than the 160 acres represent—perhaps from 320 to 640 acres. This reduces their vulnerability to large losses from failure to rent additional land.

A further analysis for this size farm is the effect different proportions of cropland have on organization and returns. For the 480-acre farm with 50% cropland, budgets using the small grain-corn-small grain cropping plan supported 17 beef cows (raising 11 feeders for sale) and 25 litters of pigs. But farms with 74% cropland supported 8 beef cows (5 feeders raised for sale) and 25 litters of pigs. However, the first budget had only 1,015 and 1,240 bushels of corn and wheat, respectively, for sale compared with sales of 472, 2,753, and 1,831 bushels of corn, barley, and wheat, respectively, for the second. Operator-labor requirements were nearly the same:

Table 4. Comparison of Budgets for 480-Acre Wheat Farm, Hogs Limited to 25 Litters and to Feed Supplies, Soil Group 3, Favorable Weather, Projected Prices, North Central South Dakota*

	Farms on which hogs were limited to—	
	25 litters with a rotation Sm-Rc-Sm w/N w/Ls	Feed with a rotation Sm-C-Sm w/N w/Ls
Livestock, number		
Cows	8	8
Sows	25	50
Ewes	—	—
Labor used, days		
Operator	156	207
Hired	—	—
Total	156	207
Investment, dollars		
Land and buildings	$18,348	$18,348
Machinery and equipment	7,405	7,405
Livestock	4,881	6,431
Total	$30,634	$32,183
Financial summary, dollars		
Cash receipts	$15,165	$19,220
Less cash expenses	4,855	6,520
Net cash income	10,310	12,700
Less depreciation	847	877
Net farm income	9,463	11,823
Less interest on investment	1,471	1,564
Labor and management return	7,992	10,259

*Land use as shown in table 3, page 14.

157 days with 50% and 156 days with 74% cropland. Net labor and management income was higher on farms with more cropland, $7,992 compared with $5,809 (table 7).

Where the one-third alfalfa plan (corn - small grain - alfalfa - alfalfa-corn-small grain) was followed, the plan with 50% cropland provided for 23 beef cows (raising 15 feeders for sale) and 20 litters of pigs; the other plan provided for 18 beef cows (raising 11 feeders for sale) and 25 litters. More corn and wheat were produced for sale on farms with the larger amount of cropland—473 and 1,732 bushels, respectively, compared with only 11 and 1,173 for the farms with only 50% cropland. Operators were

Table 5. Budget Summary, 480-Acre Wheat Farms Rented and Owned, with the Same Organizations, Favorable Growing Conditions, Projected Prices, North Central South Dakota*

Item, unit	Farms that were— Owned	Rented
Land use, acres		
Corn	118	118
Barley	137	137
Wheat	99	99
Native hay	30	30
Native pasture	91	91
Other	5	5
Total	480	480
Livestock, number		
Cows	8	8
Sows	25	25
Labor used, days		
Operator	156	156
Hired	—	—
Total	156	156
Investment, dollars		
Land and buildings	$18,348	—
Machinery and equipment	7,405	$7,405
Livestock	4,881	4,881
Total	$30,634	$12,286
Financial summary, dollars:		
Cash receipts	$15,165	$11,618
Less cash expense	4,855	4,258
Net cash income	10,310	7,360
Less depreciation	847	742
Net farm income	9,463	6,618
Less interest on investment	1,471	737
Labor and management return	7,992	5,881

*Using small grain-corn-small grain rotation (with 20 pounds nitrogen in fertilizer applied annually per acre) combined with feeder cattle and hog raising enterprises.

required to work more days, 186 compared with 151, but also had higher incomes, $6,224 compared with $4,367 (table 7).

The 800-Acre Farm

The 800-acre farm is an important size group of farms in the area and may become more numerous in the future. This size of farm offers greater opportunity than the 480-acre farm for building up feed and financial reserves to carry a farmer over periods of adverse weather and economic conditions.

This 800-acre farm had 592 acres of cropland, 203 acres of native hay and pasture, and 5 acres of farmstead. Small grain included wheat up to the allotment of 166 acres and barley for the rest.

The basic budget includes a crop-

Table 6. Budgets for Owned 480-Acre and Partly-Owned 1,280-Acre Farms With Comparable Investment and Livestock Organizations, Favorable Growing Conditions, Projected Prices, North Central South Dakota

	480-acre farm owned	1,280-acre farm partly owned (160 acres owned)
Land use, acres		
Corn	118	316
Barley	137	366
Wheat	99	265
Native hay	30	83
Native pasture	91	245
Other	5	5
Total	480	1,280
Livestock, number		
Cows	8	24
Sows	25	25
Labor used, days		
Operator	156	226
Hired		78
Total	156	304
Investment, dollars		
Land and buildings	$18,348	$ 8,316
Machinery and equipment	7,405	12,953
Livestock	4,881	10,274
Total	$30,634	$31,543
Financial summary, dollars:		
Cash receipts	$15,165	$25,588
Less cash expense	4,855	9,766
Net cash income	10,310	15,822
Less depreciation	847	1,495
Net farm income	9,463	14,327
Less interest on investment	1,471	1,726
Labor and management income	7,992	12,601

ping system of small grain-corn-small grain with a 14-cow beef herd for raising 9 feeder cattle for sale from the 203 acres of native hay and range pasture. Most of the feed grain and wheat—4,728 bushels of corn, 5,483 bushels of barley, and 3,071 bushels of wheat—were sold for cash. Operator-labor requirements were 159 days with net labor and management income $10,594 (table 8). An addition of 25 litters of pigs to this plan reduced sales of feed grain to 2,379 bushels of corn and 4,948 bushels of barley. Operator labor increased to 195 days; net labor and management income increased to $12,586 (table 8). The

Table 7. Budget Comparison of 480-Acre Wheat Farm With 50% and 74% Cropland, North Central South Dakota

	With 74% cropland		With 50% cropland	
	Sm-c-sm w/Ls	C-sm-a-a-c-sm w/Ls	Sm-c-sm w/Ls	C-sm-a-a-c-sm w/Ls
Land use, acres				
Corn	118	118	80	80
Barley	137	19	93	13
Wheat	99	99	67	67
Alfalfa hay	—	22	—	13
Alfalfa pasture	—	96	—	67
Native pasture	91	97	176	176
Native hay	30	24	59	59
Other	5	5	5	5
Total	480	480	480	480
Livestock, number				
Cows	8	18	17	23
Sows	25	25	25	20
Labor used, days				
Operator	156	182	157	151
Hired	0	0	0	0
Total	156	182	157	151
Investment, dollars				
Land and buildings	$18,348	$18,348	$15,340	$15,840
Machinery and equipment	7,405	7,929	7,808	7,929
Livestock	4,881	8,259	7,751	9,701
Total	$30,634	$34,536	$30,899	$33,470
Financial summary, dollars				
Cash receipts	$15,165	$13,068	$12,814	$10,645
Less cash expense	4,855	4,220	4,537	3,667
Net cash income	10,310	8,848	8,277	6,978
Less depreciation	847	919	900	919
Net farm income	9,463	7,929	7,377	6,059
Less interest on investment	1,471	1,705	1,568	1,692
Labor and management return	7,992	6,224	5,809	4,367

Table 8. Organization, Production, and Costs and Returns of Alternative Farming Systems, 800-Acre Farm, Soil Group 3, Favorable Growing Conditions, Projected Prices, North Central South Dakota

Farming system	Crops, acres				Livestock, number		
	Corn	Barley	Wheat	Alfalfa	Breeding cows	Litters of pigs	Breeding ewes
Cash grain*	197	229	166	—	14	—	—
Grain-hogs†	197	229	166	—	14	25	—
Grain-hogs (sw. cl.)‡	197	229	166	—	14	25	—
Grain-alfalfa-hogs—A§	197	32	166	197	34	25	—
Grain-alfalfa-hogs—B¶	118	71	166	237	40	25	—
Grain-alfalfa-hogs—C‖	99	31	166	67	42	20	—
Grain-lambs-hogs**	197	229	166	—	—	25	120

	Production					
	Wheat, bu.	Feed grains, ton	Feed units 1,000 lbs. TDN	Livestock, number		
				Hogs	Cattle	Sheep
Cash grain*	3,320	275	551	—	12	—
Grain-hogs†	3,320	275	551	175	12	—
Grain-hogs (sw. cl.)‡	2,822	237	490	175	12	—
Grain-alfalfa-hogs—A§	3,154	143	541	175	29	—
Grain-alfalfa-hogs—B¶	3,154	91	501	175	34	—
Grain-alfalfa-hogs—C‖	3,154	60	467	140	36	—
Grain-lambs-hogs**	3,320	275	553	175	—	98

	Costs and returns					
	Gross sales, dollars	Depreciation and expenses, dollars	Net returns, dollars	Charge for capital, dollars	Labor and management returns, dollars	Operator labor days
Cash grain*	18,644	5,993	12,651	2,057	10,594	159
Grain-hogs†	22,697	7,919	14,778	2,192	12,586	195
Grain-hogs (sw. cl.)‡	20,116	6,867	13,249	2,192	11,057	195
Grain-alfalfa-hogs—A§	19,422	7,434	11,988	2,636	9,352	224
Grain-alfalfa-hogs—B¶	17,546	8,231	9,315	2,824	6,491	222
Grain-alfalfa-hogs—C‖	15,559	7,459	8,100	2,774	5,326	208
Grain-lambs-hogs**	23,157	8,113	15,044	1,986	13,058	189

*Small grain-corn-small grain crop plan (with 20 pounds of nitrogen in fertilizer applied per acre annually to each crop) combined with feeder cattle raising enterprise.

†Same cropping plan as * but combined with feeder cattle and hog raising enterprises.

‡Small grain-corn-small grain crop plan (with sweet clover seeded in the small grain and plowed under the following spring) combined with feeder cattle and hog raising enterprises.

§Corn-small grain-alfalfa-alfalfa-corn-small grain crop plan combined with feeder cattle and hog raising enterprises.

¶Small grain-small grain-alfalfa-alfalfa-corn crop plan combined with feeder cattle and hog raising enterprises.

‖Corn-small grain-small grain-alfalfa-alfalfa-alfalfa crop plan combined with feeder cattle and hog raising enterprises.

**Same cropping plan as * but combined with lamb and hog raising enterprises.

budget that used sweet clover (sown with the small grain and plowed under the following spring) instead of commercial fertilizer, but included a beef cow herd and 25 litters of pigs, produced 1,591 bushels of corn, 4,261 bushels of barley and 2,573 bushels of wheat for sale. Operator-labor requirements remained the same, 195 days; labor and management income was lowered to $11,057 because of lower grain yields (table 8).

Three livestock budgets with different proportions of alfalfa in the cropping plan were worked out. One with one-third alfalfa (corn-small grain - alfalfa - alfalfa - corn-small grain) had cash grain sales of 2,261 bushels of corn, 259 bushels of barley and 2,905 bushels of wheat. Feed supplies were adequate for 34 beef cows (raising 21 feeders for sale) and 25 litters of pigs. Operator-labor requirements were 224 days; net labor and management income $9,352 (table 8). Another budget using a 40-percent alfalfa plan (small grain-small grain-alfalfa-alfalfa-corn) had 649 bushels of barley and 2,905 bushels of wheat for sale. Feed supplies were adequate for 40 beef cows (raising 26 feeders) and 25 litters of pigs.

The operator worked 222 days; net labor and management income was $6,491 (table 8). The third budget having a 50-percent alfalfa plan (corn-small grain-small grain-alfalfa-alfalfa-alfalfa) had cash grain sales of only 23 bushels of corn and 2,905 bushels of wheat. Feed grains supported 42 beef cows (raising 28 feeders for sale) and 20 litters of pigs.

The operator worked 208 days with net labor and management income of $5,326 (table 8).

A farm plan of substituting sheep for beef cattle with hogs was tested, using the small grain-corn-small grain cropping plan. After providing feed for 120 ewes raising 81 fat lambs and 25 litters of pigs, grain left for sale amounted to 2,379 bushels of corn, 4,772 bushels of barley, and 3,071 bushels of wheat. Operators worked 189 days and net labor and management income amounted to $13,058 (table 8).

The larger feed grain supplies from this size of farm make it practicable to buy additional feeder cattle and fatten them for slaughter. The additional roughage required for them may be produced from the corn - small grain - alfalfa - alfalfa-corn-small grain rotation. This rotation provides feed for fattening 24 purchased and 21 home-raised feeders, plus 25 litters of pigs. Only 8 bushels of corn and 2,905 bushels of wheat remain for sale. The operator worked 262 days; net labor and management income was $9,749 (table 9). The additional roughage needed also may be produced with the small grain-corn-small grain cropping plan by harvesting corn silage. In this instance, sufficient roughage and grain are produced for fattening out 109 purchased feeders in addition to the 9 home-raised and raising 25 litters of pigs. Only 54 bushels of corn and 3,071 bushels of wheat remain for sale. Operator - labor requirements are 301 days; labor and management income is $13,582 (table 9). This plan, however, requires a high investment

—$61,989—and a good deal of feeding "know-how" to fatten 118 head of feeder cattle; also the risk of loss from price fluctuations is high.

The 1-280-Acre Farm

The 1,280-acre size of farm has many possibilities for future expansion. More efficient use of machinery

Table 9. Budgets, 800-Acre Wheat Farm, With Alternative Livestock Systems, Soil Group 3, Favorable Growing Conditions, Projected Prices, North Central South Dakota

	Raised feeder cattle, hogs w/sm-c-sm	Raised and purchased fat cattle, hogs w/⅓ alfalfa	Raised and purchased fat cattle, hogs w/sm-c-sm
Land use, acres			
Corn, grain	197	197	128
Corn, silage	—	—	69
Barley	229	32	229
Wheat	166	166	166
Native hay	50	50	50
Native pasture	153	153	153
Alfalfa hay	—	54	—
Alfalfa pasture	—	143	—
Other	5	5	5
Total	800	800	800
Livestock, numbers			
Cows	14	32	14
Purchased steers	—	24	109
Sows	25	25	25
Labor used, days			
Operator	195	262	301
Hired	19	41	34
Total	214	303	335
Investment, dollars			
Land and buildings	$30,624	$30,624	$30,624
Machinery and equipment	9,217	10,451	9,745
Livestock	6,896	16,612	21,720
Total	$46,737	$57,687	$61,989
Financial summary, dollars			
Cash receipts	$22,697	$24,358	$42,657
Less cash expense	6,851	10,509	24,697
Net cash income	15,846	13,849	17,960
Less depreciation	1,068	1,251	1,271
Net farm income	14,778	12,598	16,689
Less interest on investment	2,192	2,849	3,107
Labor and management income	12,586	9,749	13,582

and equipment and savings in labor needed to care for livestock are possibilities. Such a size also comes nearer than the presently dominant 480- and 800-acre farms to offering optimum conditions for accumulating feed and financial reserves for weathering poor crop years.

The 1,280-acre farm has 947 acres of cropland, 328 acres of native hay and pasture, and 5 acres of farmstead. Small grain production included wheat up to the allotment of 265 acres, with the rest barley.

Again, the cropping system in the basic plan was small grain-corn-small grain with a 24-cow beef herd for raising 15 feeder cattle on 328 acres of native hay and range pasture. Substantial quantities of feed grain and wheat are produced for cash sale: 7,584 bushels of corn, 8,771 bushels of barley, and 4,902 bushels of wheat. Operator-labor requirements were 187 days; net labor and management income was $16,931 (table 10). Adding 25 litters of pigs to this plan reduced sales of feed grain to 5,235 bushels of corn, and 8,236 bushels of barley. Operator-labor requirements increased to 226 days; net labor and management income amounted to $18,930 (table 10). Substituting sweet clover (sown with the small grain and plowed under the following spring) for the commercial fertilizer, but including the same beef-cow herd and 25 litters of pigs, resulted in cash grain sales of 3,971 bushels of corn, 7,128 bushels of barley, and 4,107 bushels of wheat. Operator-labor requirements remained at 226 days; but, because of lower grain yields, labor and management income decreased to $16,487 (table 10).

Next, three livestock budgets using varying proportions of alfalfa in the cropping plan were tested. Corn - small grain - alfalfa alfalfa-corn-small grain rotation (one-third alfalfa) had cash grain sales of 4,939 bushels of corn, 655 bushels of barley, and 4,637 bushels of wheat. Feed supplies under this system supported 59 beef cows (raising 38 feeders for sale) and 25 litters of pigs. Operator-labor requirements were 264 days; net labor and management income was $13,530 (table 10). The small grain-small grain-alfalfa-alfalfa-corn rotation (40 percent alfalfa) produced 664 bushels of corn, 2,050 bushels of barley, and 4,637 bushels of wheat for sale. Feed supplies supported 66 beef cows (raising 43 feeders for sale) and 25 litters of pigs. Operator-labor requirements were 267 days; net labor and management income, $10,437 (table 10). Increasing alfalfa to 50 percent (corn - small grain - small grain-alfalfa-alfalfa-alfalfa) gave cash grain sales of 199 bushels of corn, 664 bushels of barley, and 4,637 bushels of wheat. Feed supplies supported 78 beef cows (raising 50 feeders for sale) and 25 litters of pigs. Operator-labor requirements were 275 days; while net labor and management income was $9,019 (table 10).

Replacing beef cattle with sheep, but using the small grain-corn-small grain cropping plan, produced 5,235 bushels of corn, 7,942 bushels of barley, and 4,902 bushels of wheat for sale. Feed supplies were

Table 10. Organization, Production, Costs and Returns, Alternative Farming Systems, 1,280-Acre Farm, Soil Group 3, Favorable Growing Conditions, Projected Prices, North Central South Dakota

Farming system	Crops, acres				Livestock, numbers		
	Corn	Barley	Wheat	Alfalfa	Breeding cows	Litter of pigs	Breeding ewes
Cash grain*	316	366	265	—	24	—	—
Grain-hogs†	316	366	265	—	24	25	—
Grain-hogs (sw. cl.)‡	316	366	265	—	24	25	—
Grain-alfalfa-hogs—A§	316	50	265	316	59	25	—
Grain-alfalfa-hogs—B¶	189	114	265	379	66	25	—
Grain-alfalfa-hogs—C‖	158	51	265	473	78	25	—
Grain-lambs-hogs**	316	366	265	—	—	25	195

Farming system	Production					
	Wheat, bu.	Feed grains, tons	Feed units 100 lbs. TDN	Livestock, numbers		
				Hogs	Cattle	Sheep
Cash grain*	5,300	441	884	—	20	—
Grain-hogs†	5,300	441	884	175	20	—
Grain-hogs (sw. cl.)‡	4,505	379	788	175	20	—
Grain-alfalfa-hogs—A§	5,035	228	869	175	50	—
Grain-alfalfa-hogs—B¶	5,035	145	806	175	56	—
Grain-alfalfa-hogs—C‖	5,035	96	827	175	66	—
Grain-lambs-hogs**	5,300	441	887	175	—	160

Farming system	Costs and returns					
	Gross sales, dollars	Depreciation and expenses, dollars	Net returns, dollars	Charge for capital, dollars	Labor and management returns, dollars	Operator labor days
Cash grain*	29,937	9,787	20,150	3,219	16,931	187
Grain-hogs†	33,990	11,706	22,284	3,354	18,930	226
Grain-hogs (sw. cl.)‡	29,863	10,022	19,841	3,354	16,487	226
Grain-alfalfa-hogs—A§	28,855	11,216	17,639	4,109	13,530	264
Grain-alfalfa-hogs—B¶	25,608	10,921	14,687	4,250	10,437	267
Grain-alfalfa-hogs—C‖	24,825	11,279	13,546	4,527	9,019	275
Grain-lambs-hogs**	34,686	12,038	22,648	3,014	19,634	229

*Small grain-corn-small grain crop plan (with 20 pounds of nitrogen in fertilizer applied per acre annually to each crop) combined with feeder cattle raising enterprise.

†Same cropping plain as * but combined with feeder cattle and hog raising enterprises.

‡Small grain-corn-small grain crop plan (with sweet clover seeded in the small grain and plowed under the following spring) combined with feeder cattle and hog raising enterprises.

§Corn-small grain-alfalfa-alfalfa-corn-small grain crop plan combined with feeder cattle and hog raising enterprises.

¶Small grain-small grain-alfalfa-alfalfa-corn crop plan combined with feeder cattle and hog raising enterprises.

‖Corn-small grain-small grain-alfalfa-alfalfa-alfalfa crop plan combined with feeder cattle and hog raising enterprises.

**Same cropping plan as * but combined with lamb and hog raising enterprises.

adequate for 195 ewes raising 132 fat lambs and 25 litters of pigs. Operators were required to work 229 days; while net labor and management income amounted to $19,634 (table 10).

Large feed-grain supplies from this large farm permit buying and fattening additional feeder cattle. Additional roughage may be produced from the corn-small grain alfalfa-alfalfa-corn-small grain rotation to buy and fatten 59 additional feeders, plus fattening 35 home-raised feeders, and raising 25 litters of pigs. Only 61 bushels of barley and 4,637 bushels of wheat remain for sale. Operator-labor requirements were 334 days; net labor and management income amounted to $14,336 (table 11). The additional roughage supplies also may be silage-produced from the small grain-corn-small grain rotation. This will produce sufficient roughage and grain for fattening out 206 purchased feeders in addition to 15 home-raised feeders and raising 25 litters of pigs. This plan leaves 3 bushels of corn and 4,902 bushels of wheat for sale. Operator-labor requirements were 352 days; net labor and management income reached a high of $21,256 (table 11). Investment and managerial requirements are high with this plan: a total investment of $100,765 and feeding 216 feeders requires management of a high order.

PROFITABLE PLANS FOR DIFFERENT GROWING CONDITIONS

Farmers well know how any unusual growing condition can upset their carefully laid plans. A cold, wet spring may delay corn planting so the crop fails to mature in the fall; a hailstorm in August may wipe out a corn crop in a matter of minutes; or extreme drought during the entire growing season may result in production of too little feed to carry the livestock through the winter. All these situations call for changes in farm plans to minimize losses, yet allow the operator to maintain his farming operations so he will be able to take advantage of more favorable conditions.

This section deals with some of these problems by analyzing how returns are affected by different growing conditions—unfavorable, favorable, and very favorable. These growing conditions were defined by arraying the years 1926 to 1955 for Spink County according to crop yields and dividing into thirds.

On the 480-acre farm, the farm plan—small grain-corn-small grain rotation combined with feeder cattle and hog-raising enterprises, or combined with lamb and hog-raising enterprises—is most profitable for all three growing conditions. Differences in labor and management income are striking. They range from a low of —$183 with unfavorable growing conditions to $7,992 with favorable growing conditions and to $15,418 with very favorable growing conditions (table 12).

PROFITABLE PLANS ON DIFFERENT SOIL GROUPS

Farmers realize the importance of different soils in determining the most profitable plans for their particular farm; in setting the income

to be expected; and in how their crop production is affected by growing conditions. Some of these effects are shown in the following section, which presents farm plans for the 480-acre farm under favorable (average) growing conditions on four soil groups—3, 4, 6, and 13. The analysis is not extended to larger farms, as the results would be comparable for them.

The analysis suggests that soil

Table 11. Budgets, 1,280-Acre Wheat Farm, With Alternative Livestock Systems, Soil Group 3, Favorable Growing Conditions, Projected Prices, North Central South Dakota

	Raised feeder cattle, hogs w/sm-c-sm	Raised and purchased fat cattle, hogs w/⅓ alfalfa	Raised and purchased fat cattle, hogs w/sm-c-sm
Land use, acres			
Corn, grain	316	316	187
Corn, silage	—	—	129
Barley	366	50	366
Wheat	265	265	265
Native hay	83	83	83
Native pasture	245	245	245
Alfalfa hay	—	100	—
Alfalfa pasture	—	216	—
Other	5	5	5
Total	1,280	1,280	1,280
Livestock, numbers			
Cows	24	54	24
Purchased steers	—	59	206
Sows	25	25	25
Labor used, days			
Operator	226	334	352
Hired	78	147	178
Total	304	481	530
Investment, dollars			
Land and buildings	$48,994	$48,994	$48,994
Machinery and equipment	12,953	13,074	13,481
Livestock	10,274	29,085	38,290
Total	$72,221	$91,153	$100,765
Financial summary, dollars			
Cash receipts	$33,990	$40,129	$71,606
Less cash expense	10,211	19,667	43,547
Net cash income	23,779	20,462	28,059
Less depreciation	1,495	1,636	1,737
Net farm income	22,284	18,826	26,322
Less interest on investment	3,354	4,490	5,066
Labor and management income	18,930	14,336	21,256

group does not affect the relative profitability of the various plans. The small grain-corn-small grain rotation combined with either feeder cattle and hog-raising enterprises, or lamb and hog-raising enterprises, is the most profitable plan on each of the four soil groups (table 13). However, the soil group does affect the returns. Labor and management income is $7,992 with group 3, $7,430 with group 4, $5,662 with group 6, and $6,401 with group 13 (table 9). On soil group 13, labor and management returns from the corn-small grain-alfalfa alfalfa-corn-small grain rotation combined with feeder cattle and hog-raising enterprises come closer to the above plans than on the other soil groups—$5,742 compared with $6,401 in contrast with returns of $6,224 and $7,992 with group 3.

PROFITABILITY OF INCREASING THE SIZE OF BUSINESS

In an earlier section, we noted the marked trend to larger farms since the 1930's. Studies of land transfers in the area show that a high proportion of sales are made for farm enlargement purposes.[6] This continuing trend toward larger farms raises this question, How profitable is it to

[6]Binkley, K. J., "An Analysis of Farm Enlargement by Owner-Operators in Spink County, South Dakota, 1958," (Unpublished master's thesis. Copy on file S. Dak. State College).

Table 12. Labor and Management Income With Various Organizations, 480-Acre Wheat Farm, by Different Growing Conditions, Soil Group 3, Projected Prices, North Central South Dakota

Organization*	Labor and management income, dollars†		
	Unfavorable growing conditions	Favorable growing conditions	Veryfavorable growing conditions
Small grain-corn-small grain (feeder cattle)	—1,395	5,686	13,247
Small grain-corn-small grain‡ (feeder cattle, hogs)	—183	7,992	15,418
Small grain-corn-small grain w/Sc§ (feeder cattle, hogs)	—201	6,939	13,600
Corn-small grain-alfalfa-alfalfa-corn-small grain (feeder cattle, hogs)	—855	6,224	14,370
Small grain-small grain-alfalfa-alfalfa-corn (feeder cattle, hogs)	—1,194	4,457	12,134
Corn-small grain-small grain-alfalfa-alfalfa-alfalfa (feeder cattle, hogs)	—1,466	3,288	10,768
Small grain-corn-small grain‡ (lambs, hogs)	—	8,301	—

*Rotations without sweet clover or alfalfa have 20 pounds of nitrogen in fertilizer applied per acre annually to each crop. Yields estimated by South Dakota Agricultural Experiment Station agronomists, other input data from survey and secondary sources.

†Defined as total receipts less total expenses and interest on investment.

‡Hogs raised limited to 25 litters per year.

§The term w/Sc means that sweet clover is seeded with the small grain and plowed under the following spring.

increase the size of a farm? A similar problem concerns the profitability of increasing the size of the present livestock enterprises. Both methods of expansion are discussed in this section.

Adding Land

Existing farms are being enlarged by buying or renting extra tracts. Advantages of renting, if on a crop-share basis, are (1) part of the risk of loss from crop failure is shared by the landlord, and (2) the inexperienced tenant may profit from the advice of his landlord. However, the disadvantages are that a tenant cannot realize the entire profit resulting from his superior management; and that he may lose possession of the farm by sale or lease.[7] Furthermore, other land of suitable quality may not be available for rent. Other factors that influence an operator's decision to rent or buy additional land include his appraisal of future trends in land values, and the extent of his financial resources. Each operator must weigh the advantages and disadvantages of renting and buying additional land according to his own situation.

A method set up to determine the value of additional land to operators of particular size units was to consider the difference in farm returns earned by the respective investments (capital incomes) to represent the annual value of the ad-

[7]See page 15 for an economic comparison of returns from rented and owned lands.

Table 13. Labor and Management Income With Various Organizations, by Four Soil Groups, 480-Acre Wheat Farm, Favorable Growing Conditions, Projected Prices, North Central South Dakota

Organization*	Labor and management income, dollars†			
	Soil group 3	Soil group 4	Soil group 6	Soil group 13
Small grain-corn-small grain (raised feeder cattle)	5,686	5,211	3,436	4,696
Small grain-corn-small grain (raised feeder cattle and hogs)‡	7,992	7,430	5,662	6,401
Small grain-corn-small grain, w/Sc§ (raised feeder cattle and hogs)	6,939	6,492	5,358	6,004
Corn-small grain-alfalfa-alfalfa-corn-small grain (raised feeder cattle and hogs)	6,224	6,037	4,097	5,742
Small grain-small grain-alfalfa-alfalfa-corn (raised feeder cattle and hogs)	4,457	4,308	2,702	3,421
Corn-small grain-small grain-alfalfa-alfalfa-alfalfa (raised feeder cattle and hogs)	3,288	3,008	1,581	2,215

*Rotations without sweet clover or alfalfa have 20 pounds of nitrogen in fertilizer applied per acre annually to each crop. Yields estimated by South Dakota Agricultural Experiment Station agronomists, other input data from survey and secondary sources.

†Defined as total receipts less total expenses and interest on investment.

‡Hogs raised limited to 25 litters per year.

§The term w/Sc means that sweet clover is seeded with the small grain and plowed under the following spring.

ditional land.[8] This annual value may be capitalized into a value for the additional land by considering it as interest and computing the principal for such interest. Such a figure reduced to a per acre basis gives the upper limit of what these operators could afford to pay for the additional land.

The analysis, using a small grain-corn-small grain rotation combined with feeder-cattle and hog-raising enterprises and assuming 6 percent interest, shows:

1. That 160 acres of group 3 soil are worth up to $203 per acre for expanding a 480-acre farm to 640 acres;

2. That 160 acres of group 3 soil are worth $244 per acre for expanding a 640-acre farm to 800 acres; and

3. That 480 acres of group 3 soil are worth $211 for expanding an 800-acre farm to 1,280 acres (table 14).

These are the prices that an operator could afford to pay for the additional land and break even. Likely he would want to pay somewhat less to compensate for added risk and yield a profit. These calculations suggest that an operator can pay more per acre for additional land than for an entire unit. Operating costs per acre are lower on the additional land than on the original farm. Machinery and equipment expenses do not go up in proportion to increases in size. In many instances, very little additional machinery and equipment are required.

Table 14. Value per Acre of Additional Land, by Different Size Farms, Favorable Growing Conditions, Soil Group 3, Projected Prices, North-Central South Dakota*

Size of farm (acres)	Expanded size acres	Value per acre with assumed interest rate at— 4% Dollars	5% Dollars	6% Dollars
480	640	305	244	203
640	800	367	293	244
800	1,280	317	253	211

*With small grain-corn-small grain rotation combined with feeder-cattle and hog-raising enterprises. Computed by capitalizing the difference in capital income, less an interest charge on operating capital. Capital income is defined as net farm income (total cash receipts less total expenses, not including interest on investment) less a charge for operator labor at hired labor cost, and less a management charge of 7% of total receipts from which the cost of purchased feeds and feeders has been deducted.

Expanding Livestock Enterprises

The other method of increasing the size of business by expanding livestock enterprises requires raising more litters of pigs, buying and fattening more feeder steers, or buying and fattening more feeder lambs. Additional managerial skill and labor are required to expand these enterprises.

Feed grains on the 480-acre farm on group 3 soils following a cropping system of small grain-corn-small grain allow 50 instead of 25 litters of pigs to be raised. By doubling the hog enterprise, labor and management income increases

[8] Capital income is defined as net farm income (total cash receipts less total expenses, not including interest on investment) less a charge for operator labor at hired labor costs, and less a management charge of 7 percent of total receipts from which the cost of purchased feeds and livestock feeders has been deducted.

$2,267, but 51 days more of operator labor are necessary (table 4).

Roughage production on the 480-acre farm is too low to permit additional feeders to be bought and fed. But on the 800-acre farm on group 3 soil, sufficient roughage can be produced for fattening out 24 purchased feeder cattle in addition to the 21 raised on the farm. The additional roughage could be produced by using the alfalfa rotation—corn-small grain-alfalfa-alfalfa-corn-small grain. By such a system, labor and management returns are reduced compared with the small grain-corn-small grain rotation combined with raised feeder cattle and hogs—$10,796 compared with $12,586 (table 12). However, if the alfalfa rotation is used, it is profitable to buy and fatten additional cattle feeders rather than to raise them—labor and management returns are $10,796 compared with $9,352 (table 15).[9]

FLEXIBILITY IN FARM ORGANIZATIONS

Successful farmers in north-centra South Dakota have learned from recurring droughts and depressions that they need to adjust their crop and livestock plans according to growing conditions and prices. Therefore, the crop and livestock plans previously listed are considered most profitable under average growing conditions and assumed prices.

Farm plans need to be changed if (1) a below-average sub-soil moisture level at planting time tells the alert operator to modify his cropping plans; (2) a prolonged below-average condition of native pastures dictates adjustment in cattle numbers; and (3) prospective large supplies of hogs and lower prices indicate the need for adjusting the number of hog litters farrowed.

Several practicable measures may be taken in adjusting to different growing and price conditions. For example, a below-average subsoil moisture level at planting time indicates to a conservative operator that it may be more profitable to substitute grain sorghum for corn on part of the row-crop acreage, to reduce the planting rate for his corn, and to reduce or eliminate fertilizer (of course, it is possible that subsequent seasonal rainfall may be higher than expected). Farmers have learned that in dry years corn yields more with thinner stands and less fertilizer; and grain sorghum may yield more than corn. Another example is the adjustment indicated by an adverse outlook for hog prices at this time. The number of sows intended for farrowing should be reduced and the feed grain sold or used in the cattle enterprise. Poor pasture conditions, especially for a prolonged period, indicates the need to reduce cattle numbers to fit feed supplies. Limited adjustment may involve only changing from a cow-yearling to a cow-calf basis. Prolonged drought is likely to require a cut in stock cow numbers with additional breeding stock purchased later.

The effect of adverse growing and economic conditions can be ameliorated partly by postponing purchases of new machinery and equipment,

[9] See pages 21 and 25 for other alternatives for expanding livestock enterprises.

and reducing living expenses to a minimum. Necessity frequently requires that old machines be repaired rather than replaced and more food home-produced rather than bought.

By the same token, an alert operator adjusts to very favorable growing and economic conditions. Improved feed supplies are likely to mean that more cattle and hogs can be fed profitably. However, changes made should interfere as little as possible with later downward adjustments. For example, improved pasture conditions may mean keeping feeders longer, or buying calves and keeping them until they are yearlings. An experienced operator looks on good conditions as the time to build up his feed and financial reserves. Hay and silage may be stored for a number of years. Surplus earnings may be placed in readily available investments, such as industrial stocks or government bonds.

A concrete example of increased labor and management income arising from changes in crop and livestock plans to meet unfavorable

Table 15. Comparison of Farm Plans, with Different Cattle Organizations, 800-Acre Farm, Soil Group 3, Favorable Weather, Projected Prices, North Central South Dakota*

	Sm-c-sm w/N w/Ls (raised cattle and hogs)	C-sm-a-a-c-sm w/Ls (raised cattle and hogs)	C-sm-a-a-c-sm (raised and purchased cattle and hogs)
Livestock, numbers			
Feeders bought	—	—	24
Cows	14	34	32
Sows	25	25	25
Labor used, days			
Operator	195	224	262
Hired	19	27	41
Total	214	251	303
Investment, dollars			
Land and buildings	$30,624	$30,624	$30,624
Machinery and equipment	9,217	9,338	10,451
Livestock	6,896	14,182	16,612
Total	$46,737	$54,144	$57,687
Financial summary, dollars			
Cash receipts	$22,697	$19,422	$25,405
Less cash expenses	6,851	6,324	10,509
Net cash income	15,846	13,098	14,896
Less depreciation	1,068	1,110	1,251
Net farm income	14,778	11,988	13,645
Less interest on investment	2,192	2,636	2,849
Labor and management income	12,586	9,352	10,796

*Land use as shown in table 6, p. 18.

growing conditions follows: Agronomists estimate that under such conditions grain sorghum will yield up to two-thirds more than corn on soil groups 3, 4, and 13. There is little advantage on soil group 6. Budget analysis of a 480-acre farm for soil group 3 under unfavorable growing conditions shows that substitution of grain sorghum for corn increases labor and management income, from $-183 to $166, using a small grain-row crop-small grain rotation combined with feeder cattle and hog-raising enterprises. Adjustments are made in the number of livestock in line with feed supplies. Thus, 8 breeding cows are kept when growing conditions are favorable, but only 6 when conditions are unfavorable. Favorable growing conditions permit the maximum 25 litters of pigs to be raised, compared with only 14 under unfavorable conditions when corn is raised. Substituting grain sorghum for corn provides enough feed for an additional litter (table 16).

STABILITY OF ALTERNATIVE FARMING SYSTEMS

Highly variable growing conditions characterizing farming in north central South Dakota, influence many farmers in the area to seek crop and livestock systems with a minimum year-to-year variation in returns consistent with high average returns. In line with this objective, budgets can be set up to compare both average returns and variability of returns from year to year.[10]

This study compares the stability and average returns from the various farm plans by constructing budgets over the 30-year period 1926-55, under specified assumptions for the 480-acre farm. Briefly, these assumptions involve constant prices and costs; production of crops varying relatively with Spink County average yields; production of livestock varying according to feed supplies; and machinery and equipment and labor costs remaining constant.

Calculation of annual labor and management income for the period of the previously described cash grain and feeder-cattle and hog organizations and the four soil groups indicates the small grain-corn-small grain rotation combined with feeder cattle and hog raising is, on the average, both the most profitable and the least variable (table 17).[11]

The results on soil group 3 illustrate the relative returns and variability of different plans. Average annual labor and management income from the small grain-corn-small grain rotation combined with feeder cattle and hog-raising enterprises is $7,538 and the coefficient of variation is 82 percent. Compare this with an average labor and management income of $5,535 and a variability of 87% from the corn-small grain-alfalfa alfalfa-corn-small grain rotation

[10] The details of the technique and necessary assumptions for testing variability are described in: Rex D. Helfinstine, Estimating Variations in Production and Income over Time in Farm Plans for the Great Plains, *Jour. Farm Econ.* 41:262-267, May, 1959, (reprint available from Economics Department).

[11] The combination of lamb and hog-raising enterprises is not considered in this analysis, but likely it would show equal variability and slightly higher average returns.

combined with feeder-cattle and hog-raising enterprises; and with $2,466 and 168% for the small grain-corn-small grain rotation combined with a feeder cattle-raising enterprise.

Including alfalfa in a crop rotation seems unlikely then to increase either the stability or the profitability of farming operations in the area. The reasons for this are the assumption that alfalfa stands are obtained half of the years; and the reduced feed-grain production from fewer

Table 16. Budget Summary, 480-Acre Wheat Farm, Soil Group 3, Unfavorable Growing Conditions, Grain Sorghum Compared With Corn, Projected Prices, North Central South Dakota

Item, unit	With grain sorghum			With corn		
	Sm-rc-sm (Cattle)	Sm-rc-sm w/N (Cattle)	Sm-rc-sm w/N w/Ls (Cattle,hogs)	Sm-rc-sm (Cattle)	Sm-rc-sm w/N (Cattle)	Sm-rc-sm w/N (Cattle,hogs)
Land use, acres						
Grain sorghum	118	118	118	—	—	—
Corn	—	—	—	118	118	118
Barley	137	137	137	137	137	137
Wheat	99	99	99	99	99	99
Native hay	31	31	31	31	31	31
Native pasture	90	90	90	90	90	90
Other	5	5	5	5	5	5
Total	480	480	480	480	480	480
Livestock, numbers						
Cows	6	6	6	6	6	6
Sows	0	0	15	0	0	14
Labor used, days						
Operator	100	100	131	100	100	137
Hired	0	0	0	0	0	0
Total	100	100	131	100	100	137
Investment, dollars						
Land and buildings	$18,348	$18,348	$18,348	$18,348	$18,348	$18,348
Machinery and equipment	7,187	7,187	7,405	7,187	7,187	7,405
Livestock	2,422	2,422	3,382	2,422	2,422	3,323
Total	$27,957	$27,957	$29,135	$27,957	$27,957	$29,076
Financial summary, dollars						
Cash receipts	$2,725	$3,440	$6,383	$2,536	$3,775	$6,056
Less cash expense	2,173	2,980	4,015	2,280	3,087	4,049
Net cash income	552	460	2,368	256	688	2,007
Less depreciation	772	772	821	772	772	812
Net farm income	—220	—312	1,547	—516	—84	1,195
Less interest on Investment	1,311	1,311	1,381	1,311	1,311	1,378
Labor and management income	—1,531	—1,623	166	—1,827	—1,395	—183

Table 17. Labor and Management Income, 480-Acre Wheat Farm, Various Farm Organizations, Soil Group 3, Constant Projected Prices, North Central South Dakota, 1926-55*

Year	Dollars income					
	Sm-rc-sm	Sm-Rc-Sm w/Ls	Sm-Rc-Sm w/Sc w/Ls	Rc-Sm-A-A-Rc Sm w/Ls	Sm-Sm-A-A-Rc w/Ls	Rc-Sm-Sm-A-A-A w/Ls
1926	—1,447	1,946	2,392	3,163	3,684	2,310
1927	14,694	16,549	14,251	12,394	7,078	4,870
1928	4,476	7,296	6,886	5,518	6,024	6,501
1929	2,475	5,301	4,945	5,065	4,140	2,621
1930	6,604	9,424	9,005	7,230	5,247	4,304
1931	—515	3,248	3,114	4,432	4,960	3,416
1932	5,047	6,267	5,821	903	1,382	916
1933	—5,552	879	1,240	656	1,533	—47
1934	—5,880	—5,340	—5,249	—4,223	—4,102	—3,789
1935	1,450	—1,592	—1,883	—2,691	—2,431	—2,405
1936	—5,635	796	888	727	64	—803
1937	—3,496	—4,254	—4,170	—3,913	—3,443	—3,323
1938	2,016	1,086	682	701	341	1,532
1939	1,129	3,981	3,803	2,178	1,918	1,024
1940	679	3,968	3,789	2,427	2,498	1,452
1941	4,602	6,768	5,961	3,754	3,843	3,334
1942	13,338	16,147	14,678	5,915	6,500	4,302
1943	6,082	8,892	7,826	7,548	6,600	6,128
1944	10,709	13,519	11,667	11,810	7,713	5,882
1945	13,178	15,988	13,999	11,648	10,304	8,956
1946	9,997	12,807	11,289	10,066	7,591	6,069
1947	9,469	12,279	10,756	8,818	8,688	8,016
1948	13,206	16,016	14,369	13,174	9,946	6,042
1949	3,781	6,877	6,173	5,968	6,306	6,888
1950	7,659	10,468	9,748	8,838	5,442	3,156
1951	12,006	14,816	14,143	11,004	10,186	8,991
1952	4,521	7,331	7,054	5,829	5,657	6,172
1953	8,821	11,631	10,506	9,911	6,844	4,363
1954	10,316	13,126	12,095	9,729	8,275	8,178
1955	7,097	9,906	9,395	7,481	7,345	5,960
Mean	5,028	7,538	6,839	5,535	4,671	3,700
Standard deviation	5,968	6,180	5,583	4,832	3,878	3,489
Coefficient of variation	119%	82%	82%	87%	83%	94%

*Assuming yields to vary relatively with Spink County average, 1926-55. Labor and management income defined as cash receipts less cash expenses less a charge for depreciation on buildings and equipment and for interest on investment. Sm=small grain; Rc=row crop; A=alfalfa; w/Sc=sweet clover seeded in small grain and plowed under the following spring, 20 lbs. N per acre used in rotations without sweet clover or alfalfa; w/Ls=hogs raised to limit of feed grain supplies up to 25 litters annually, feeder cattle raised in all instances to limit of roughage supplies.

acres of grain which in turn allows fewer hogs to be raised. If rainfall is below average, feed-grain production is reduced also in an alfalfa rotation by lower yields of corn the first year following alfalfa (see table 2).

Stability of farm income from year to year affects the ability of farmers to stay in farming (that is, their ability to continue in business during prolonged periods of drought and other forms of physical and economic adversities). An attempt was made to measure this ability by subtracting a cost of living allowance from each year's net cash income (table 18). Table 18 shows the run of years with negative incomes, indicating the farming systems that are best for withstanding prolonged adverse weather. The rotation of small grain-corn-small grain combined with feeder-cattle and hog-raising enterprises has 2 years of **large negative** incomes; but the same rotation without hogs has 2 years of even **larger negative** incomes and also the **largest total negative** income. The organization with the largest amount of negative income in one period is the small grain-small grain-alfalfa alfalfa-corn rotation combined with feeder cattle and hog-raising. However, if incomes are cumulated over the 30 years, the small grain-corn-small grain and feeder-cattle and hog-raising organization shows up most favorably. With such an organization and savings from the most profitable years, an operator should be able to continue operation in the years with lowest returns.

POLICY IMPLICATIONS

This report has focused on farming adjustments that would be profitable to individual farm operators. Individually, farmers would find it profitable to use more fertilizer and to adopt other practices that would increase crop yields and expand total farm output. Let us consider the effect of such expansion on the economy of the area and beyond.

The most profitable farming adjustments under assumed prices would mean a large increase in output of feed grains and hogs in the area. The question is whether this expanded output would depress product prices below those assumed and whether this in turn would affect what adjustments would be most profitable. Even if the study area expanded output of grain and hogs, as indicated by the budget analysis, the expansion would have little effect on grain and hog prices nationally. Production, farm income, and trade would increase materially in the area. If other areas have a similar adjustment opportunity, whereby expanded grain and hog production would be profitable, the result eventually might be a drop in prices and lower farm incomes than those estimated in the budgets. But it seems likely that grain and hog prices would regain equilibrium so it would be profitable to produce grain for feed for hogs in the area.

This budget analysis indicates also that the present wheat acreage-control program is unlikely to control effectively the production of wheat in South Dakota. Farmers

Table 18. Net Cash Income Less Living Allowance, 480-Acre Wheat Farm, Various Farm Organizations, Soil Group 3, Constant Projected Prices, North Central South Dakota, 1926-55*

Year	Dollars income					
	Sm-Rc-Sm†	Sm-Rc-Sm w/Ls	Sm-Rc-Sm w/Sc w/Ls	Rc-Sm-A-A-Rc Sm w/Ls	Sm-Sm-A-A-Rc w/Ls	Rc-Sm-Sm-A-A-A w/Ls
1926	—890	2,010	2,456	3,529	4,116	2,849
1927	15,210	16,557	14,253	12,796	7,509	5,379
1928	5,082	7,409	7,268	6,119	6,737	7,358
1929	3,039	5,372	5,554	5,716	4,722	3,429
1930	7,176	9,503	9,622	8,032	6,010	5,144
1931	—48	3,322	3,726	5,099	5,739	4,252
1932	5,552	6,249	6,278	1,494	1,937	1,508
1933	—4,978	960	1,590	1,297	2,142	658
1934	—5,375	—5,426	—4,797	—3,785	—3,573	—3,212
1935	1,879	—1,754	—1,507	—2,282	—1,926	—2,065
1936	—5,093	845	1,475	1,304	741	—70
1937	—3,029	—4,378	—3,756	—1,076	—3,044	—2,861
1938	2,522	1,037	1,108	1,301	897	2,134
1939	1,672	4,031	4,660	2,886	2,758	1,893
1940	1,195	3,991	4,619	3,211	3,271	2,236
1941	5,144	6,806	6,537	4,441	4,502	4,057
1942	13,909	16,225	15,025	6,511	7,075	4,978
1943	6,701	9,018	7,952	8,177	7,184	6,878
1944	11,294	13,611	11,759	12,232	8,196	6,493
1945	13,795	16,112	14,123	12,137	10,883	9,699
1946	10,603	12,920	11,402	10,532	8,142	6,768
1947	10,064	12,381	10,858	9,260	9,210	8,686
1948	13,806	16,123	14,745	13,763	10,633	6,837
1949	4,385	6,988	6,553	6,565	7,014	7,739
1950	8,228	10,544	10,362	9,497	6,190	3,973
1951	12,591	14,908	14,773	11,830	11,008	9,915
1952	5,140	7,457	7,718	6,593	6,565	7,206
1953	9,392	11,709	11,122	10,709	7,609	5,201
1954	10,911	13,228	12,466	10,440	8,959	8,998
1955	7,687	10,003	10,030	8,184	8,181	6,875
Cumulated income	167,564	227,761	217,974	186,512	159,387	132,935
Sum of negative incomes	—19,412	—11,558	—10,060	—7,143	—8,543	—8,208
Average	5,585.5	7,592.0	7,265.8	6,217.1	5,312.9	4,431.2
Coefficient of variation	107.3%	82.1%	76.1%	75.8%	73.7%	80.7%

*Assuming yields to vary relatively with Spink County average, 1926-55. Net cash income defined as the difference between total cash receipts and cash expenses (not including depreciation or interest on investment). Living allowance of $2,250 per year assumed.

†Sm=small grain; Rc=row crop; A=alfalfa; w/Sc=sweet clover seeded in small grain and plowed under the following spring, 20 lbs. N per acre used in rotation without sweet clover or alfalfa; w/Ls=hogs raised to limit of feed grain supplies up to 25 litters annually, feeder cattle raised in all instances to limit of roughage supplies.

would find it profitable to use more fertilizer than they are now using, and higher rates would increase yield and production.

Not all operators will make those adjustments described as most profitable. Therefore, the shifts in aggregate production would tend to be less than otherwise indicated. Individual preferences and available resources differ so much that optimum adjustments differ from farm to farm.

If wheat acreage-control programs are regarded as social experiments, appraisal and analysis of them are needed. Failure to control production indicates the need for changes.

Farmers first to adopt new technology that results in higher production of wheat and livestock are likely to increase their profits. However, as the practices become more widespread, market prices paid to all are likely to decline more than proportionately. Those who are responsible for farm programs must recognize this real possibility, perhaps, by programs that make it attractive for some farmers to shift out of agriculture.

Table A-1. Rates of Livestock Production Assumed for Budgeting Farms in Area 2b, South Dakota

	Rate
Calf crop, %	85
Age of cows at calving, year*	2½
Cows per bull, number	25
Replacement age of cows, years	8
Lamb crop from ewes 1 year and over, %	90
Death loss, all ewes, %	8
Replacement age of ewes, years	7
Ewes per ram, number	25
Pigs raised per litter, number	7
Sows per boar, number	20
Weight of animals sold	
Steers (fat), lbs.	1,150
Heifers (fat), lbs.	1,100
Steers (feeders), lbs.	700
Heifers (feeders), lbs.	650
Beef cows, lbs.	1,050
Ewes, lbs.	120
Lambs (fat), lbs.	95
Lambs (feeders), lbs.	65
Wool sold per ewe and ram, lbs.	9
Weight of pigs sold, lbs.	230
Weight of sows sold, lbs.	350

*Assumes one-half calve as 2-year olds, balance as 3-year olds.

Table A-2. Estimated Yields of Crops on Four Soils Groups Under Unfavorable Growing Conditions, Spink County, South Dakota*

Soil Groups	Corn, bu.	Sorghum, bu.	Wheat, bu.	Barley, bu.	Oats, bu.	Alfalfa, tons
Soil Group 3						
No fertilizer or legumes	5	7	5	6	9	—
With 20 lbs. N in fertilizer	7	10	8	9	13	—
After sweet clover	6	8	7	8	11	—
After alfalfa	—	—	8	8	12	1.04
First year after alfalfa	4	8	—	—	—	—
Second year after alfalfa	8	10	—	—	—	—
Soil Group 4						
No fertilizer or legumes	4	7	5	5	9	—
With 20 lbs. N in fertilizer	6	9	8	8	13	—
After sweet clover	5	8	6	7	11	—
After alfalfa	—	—	7	8	12	.95
First year after alfalfa	4	7	—	—	—	—
Second year after alfalfa	8	11	—	—	—	—
Soil Group 6						
No fertilizer or legumes	3	4	4	5	7	—
With 20 lbs. N in fertilizer	4	5	7	7	10	—
After sweet clover	4	5	6	6	9	—
After alfalfa	—	—	6	7	9	.77
First year after alfalfa	3	4	—	—	—	—
Second year after alfalfa	6	7	—	—	—	—
Soil Group 13						
No fertilizer or legumes	4	7	4	5	7	—
With 20 lbs. N in fertilizer	6	10	7	8	10	—
After sweet clover	5	9	6	6	9	—
After alfalfa	—	—	6	7	9	.86
First year after alfalfa	4	8	—	—	—	—
Second year after alfalfa	8	10	—	—	—	—

*Estimated by Agronomists, South Dakota Agricultural Experiment Station under average management. Unfavorable growing conditions defined as those represented by lowest one-third of array of years 1926-55 for Spink County, South Dakota.

Table A-3. Estimated Yields of Crops for Four Soils Groups Under Very Favorable Growing Conditions, Spink County, South Dakota*

Soil Groups	Corn, bu.	Sorghum, bu.	Wheat, bu.	Barley, bu.	Oats, bu.	Alfalfa, tons
Soil Group 3						
No fertilizer or legumes	35	18	20	28	44	—
With 20 lbs. N in fertilizer	45	24	30	42	60	—
After sweet clover	38	20	26	37	50	—
After alfalfa	58	24	29	39	57	2.28
Soil Group 4						
No fertilizer or legumes	31	16	19	26	44	—
With 20 lbs. N in fertilizer	41	22	29	41	60	—
After sweet clover	36	19	23	36	50	—
After alfalfa	58	24	28	37	57	2.08
Soil Group 6						
No fertilizer or legumes	21	11	16	24	35	—
With 20 lbs. N in fertilizer	27	14	26	36	47	—
After sweet clover	29	14	22	31	42	—
After alfalfa	42	21	23	33	44	1.70
Soil Group 13						
No fertilizer or legumes	29	29	17	23	35	—
With 20 lbs. N in fertilizer	39	39	27	37	49	—
After sweet clover	35	35	23	31	42	—
After alfalfa	54	54	25	33	44	1.89

*Estimated by Agronomists, South Dakota Agricultural Experiment Station under average management. Very favorable growing conditions defined as those represented by highest one-third of array of years 1926-55 for Spink County, South Dakota.

Table A-4. Annual Tractor and Man-Labor Requirements With Seasonal Distribution of Man-Labor for Crops as Used for Budgeting Farms in Area 2b, South Dakota*

Item	Requirements per acre, hours		Monthly distribution, %					
	Man	Tractor	April	May	June	July	Aug.	Sept.
Small grain (wheat)	1.66	1.49	15	25	—	10	40	10
Small grain (other)	1.14	1.06	15	25	—	10	40	10
Corn	3.12	2.85	—	30	20	10	—	40
Wild hay	1.95	1.35	—	—	—	—	100	—
Alfalfa	8.88	4.32	—	—	60	—	40	—

*Derived from: Ulvilden, James, "Farm Labor, Power and Machinery Performance for Selected Operations, under Dryland and Irrigated Crops in Central South Dakota," South Dakota Agricultural Experiment Station, Agricultural Economics Pamphlet 43, 1953.

Table A-5. Yearly Feed Requirements for Livestock as Used in Farm Budgets for Area 2b, South Dakota*

Livestock	Hay, tons	Protein supplement 40%, lbs.	Grain, cwt.	Minerals, lbs.	Salt, lbs.	Pasture, AUM
Beef cow	1.5	—	—	—	20	7
Beef heifer	1.5	—	—	—	20	7
Beef yearling feeder	1.5	—	—	—	20	3.5
Beef yearlings, fat	1.5	105	20.2	—	20	3.5
Beef calf	1	—	—	—	2	—
Beef bull	1.5	—	6.4	—	20	7
Hog litter (7)—no pasture	—	1,168	62.9	67	—	—
Hog litter (7)—alfalfa pasture	—	920	56.6	40	—	2.5
Ewe with lamb	0.35	25	—	—	12	1.4
Lambs, fat	0.085	10	—	—	2	—
Rams	0.35	25	—	—	12	1.4

*Derived from: Stangeland, Sigurd, "Estimated Feed Requirements for Livestock and Poultry," South Dakota Agricultural Experiment Station, Agricultural Economics Pamphlet 39, May 1952.

Table A-6. Annual Man-Labor Requirements and Seasonal Distribution for Livestock as Used for Budgeting Farms in Area 2b, South Dakota*

Item	Annual requirements, hrs. per head	Monthly distribution, % Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Beef Cows													
Under 10	42												
10 to 19	29												
20 to 29	22												
30 to 39	19												
40 to 49	18	16	14	14	14	5	2	1	2	3	4	10	15
50 to 59	17												
60 to 69	16												
70 to 79	15												
80 to 89	14												
90 to 100	13												
Sheep, farm flocks													
Under 25 ewes	6.0												
25 to 49	4.5	13	12	15	13	6	3	2	4	4	7	9	12
50 to 74	3.5												
75 to 100	3.0												
Hogs													
Under 5 sows	45												
5 to 9	32												
10 to 14	25	8	7	9	11	9	8	8	8	8	8	8	8
15 to 19	21												
20 to 30	20												

*Derived from: Sigurd Stangeland, "Labor Inputs for Livestock Enterprises," South Dakota Agricultural Experiment Station, Agricultural Economics Pamphlet 40, 1952.