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# Effect of Alternative Wheat and Feed Grain Prices on Optimum Farm Plans and Income in Central South Dakota: Aurora, Brule, Charles Mix, Gregory and Jerauld Counties

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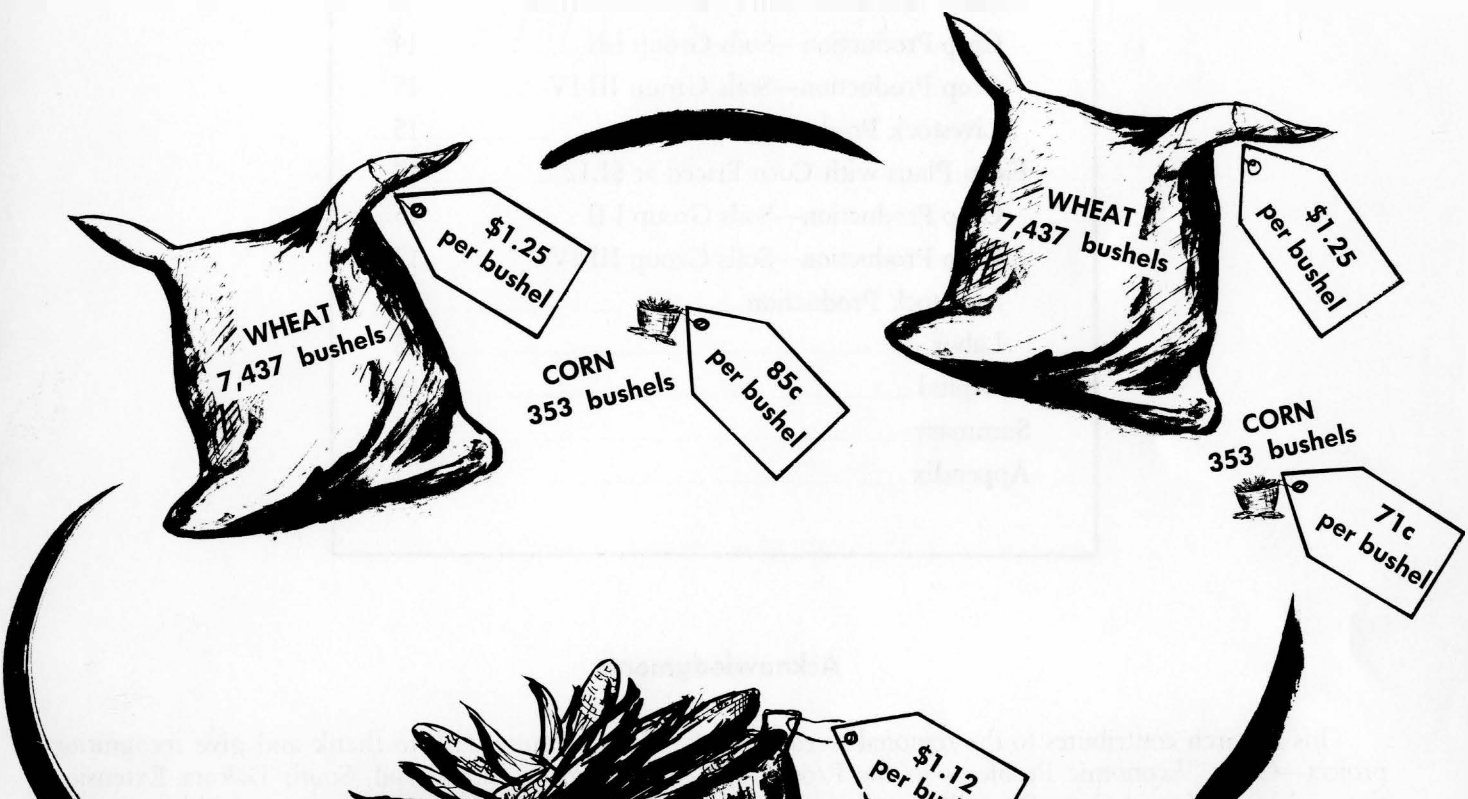
Experiment Bulletin No. 574
June 1970

# Effect of Alternative Wheat and Feed Grain Prices on Optimum Farm Plans and Income in Central South Dakota

*Aurora, Brule, Charles Mix, Gregory and Jerauld counties*

*Department of Economics in cooperation with*
*Farm Production Economics Division, Economic Research Service*
*U.S. Department of Agriculture*




**SOUTH DAKOTA STATE UNIVERSITY**
**Agricultural Experiment Station**
**Brookings, South Dakota**

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### Acknowledgments

This research contributes to the regional research project—GP-5, "Economic Problems in the Production and Marketing of Great Plains Wheat," sponsored by the Great Plains Agricultural Council. It is a cooperative effort of the Departments of Agricultural Economics in the State Agricultural Experiment Stations of Colorado, Kansas, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas; the Farm Production Economics Division, Economic Research Service, and Cooperative State Research Service of the United States Department of Agriculture. Dr. M. L. Wilson, associate director, New Mexico Agricultural Experiment Station, is the administrative advisor, and Dr. Odell L. Walker, Oklahoma State University, is chairman of the regional technical committee.

The authors wish to thank and give recognition to Wallace G. Aanderud, South Dakota Extension Service, for his participation and invaluable assistance throughout the duration of the study.

Frederick C. Westin, South Dakota Experiment Station, devoted many hours to working up the necessary data on crop rotations and yields by soils type.

James Kendrick and Glenn A. Helmers, University of Nebraska, and William F. Lagrone, ERS, also deserve special recognition for their contributions, particularly in the final programming.

## PREFACE

The purpose of this report is to present some results of a cooperative research project between the South Dakota Agricultural Experiment Station and the Farm Production Economics Division, Economic Research Service, U. S. Department of Agriculture. This research contributes to a larger project—GP-5, "Economic Problems in the Production and Marketing of Great Plains Wheat."

The general objectives of the research undertaken in South Dakota were: (1) To provide economic data needed by farmers to make profitable adjustments in their farming systems and production practices and (2) To develop a research background for evaluating Government farm programs under varying assumptions.

Similar contributing projects to GP-5 were simultaneously conducted in most of the other Great Plains States. Objectives in the regional research project which were specifically related to production and farm management are as follows:

1. To develop information on technical production relationships and opportunities for grain farms in the Great Plains.
2. To determine the nature and magnitude of adjustments needed in specific farm situations which will achieve the most profitable systems of farming under a range of conditions with respect to prices of major products and quantities of available resources, such as land, labor, and capital, and to determine the quantities of resources required to provide selected levels of farm income.
3. To determine the effect upon total agricultural production, farm income, farm organization, and resources employed in the Great Plains if selected percentages of all farmers adjust to their most profitable farming systems for various assumed product demand conditions, factor supply conditions and specific agricultural programs and institutional arrangements.

The South Dakota study area included 26 counties in Central South Dakota (Figure 1). This area normally accounts for about 68% of the state's wheat acreage, 43% of the feed grain acreage, 60% of the state's flax acreage, and about 55% of the total tame- and native-hay acreage. For analytical purposes, the GP-5 study area was divided into eight sub-areas on the basis of selected farm and soil characteristics and cropping practices.

The analysis of this study was based on possible adjustments on individual farming units. Thus, model farms were developed to represent a significant number, group, or segment of farms within a defined geographic area. Model farms were grouped on the basis of similar characteristics, plus similar alternative production opportunities.

Determining characteristics for grouping farms into model or typical farms included: Farm size, proportion of cropland to native hay and rangeland, soil characteristics, land use and tillage practices, farm organization and enterprise, labor use and labor availability.

In all, 14 model farms were developed in the eight sub-areas of the 26 county study—characteristics were so similar in four sub-areas that only one model farm was needed in each, but in the remaining areas there existed enough diversity to require three model farms in each of two sub-areas and two model farms in each of the other two.

Data used to develop model farms for each South Dakota study area and costs for crop and livestock enterprises for each model farm were derived from a variety of sources, which included: Farm surveys, Agricultural Stabilization and Conservation Service county office records, county assessor's records, U. S. Agricultural Census, S. D. State-Federal Crop and Livestock Reporting Service statistics, South Dakota State University Economics Department and actual cost data from machine dealers, insurance agents, and others.

**The purpose of this bulletin is to present the most profitable combination of farm enterprises at various combinations of crop and livestock product prices on two different size model farms in Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties. The optimal farm plans presented herein are the results of computer programming using specific assumptions with regard to farm size and cropland acreage, crop yields, costs, commodity market prices, and other such factors.**

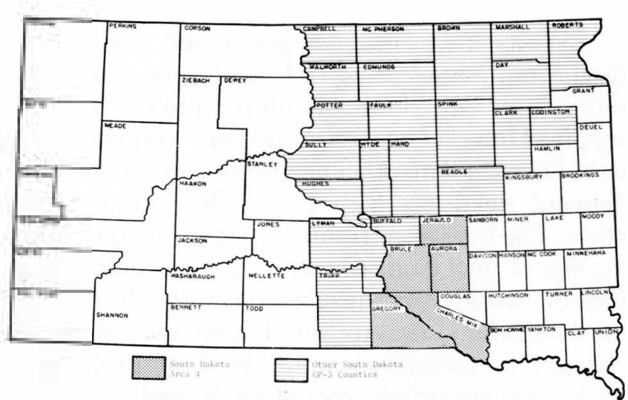


Figure 1. South Dakota GP-5 Study Area

# Effect of Alternative Wheat and Feed Grain Prices on Optimum Farm Plans and Income in Central South Dakota, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties

By Erwin O. Ullrich Jr. and
John T. Sanderson*

## INTRODUCTION

The United States has witnessed rapid technological advances in agricultural production over the past several decades. At the same time, changes in the nature of demand also have occurred. These two phenomena have helped to create or further aggravate an imbalance between supply and demand for specific agricultural commodities. **Stated differently, the nation's productive capacity for wheat greatly exceeds the domestic needs and export demand at satisfactory prices under free market conditions.**

Associated with technological advancement in agricultural is the trend toward fewer and larger farms. In 1967, 31.5% of the nation's farms accounted for 85.1% of the total farm cash receipts.[1]

The upward trend in U. S. per capita income has been associated with a declining per capita consumptions of wheat and wheat products; total domestic consumption, however, remains fairly constant. With a continued increase in per capita income, the decline in per capita consumption of wheat can be expected to continue. As income levels rise, dietary changes also occur—usually from lower priced bulky and starchy foods to those which may be higher in protein as well as higher priced food items. Thus, there is now a growing tendency for people with rising incomes to view foods, once considered luxuries, as necessities. In addition, convenience foods now command an increasing share of the consumer's food dollar. The future level of total domestic demand depends upon the rate of population growth relative to the rate of increase in per capita income.

Exports of wheat, cereal grains, and other agricultural commodities are often looked upon as a possible solution for American agricultural problems of oversupply. However, American exports compete in the world market with other exporting nations and world demand fluctuates with crop failures and bumper crops. The long-term future of American agricultural exports is uncertain, considering such factors as increased world food production through increased mechanization and technical assistance programs, changes in attitudes towards birth control and in traditions concerning types of foods used.

The problem of farm adjustment thus centers around the changing demand for farm products and the continually changing technology.

The nature of desirable farm adjustment in the Great Plains becomes somewhat complicated by the limited number of feasible alternatives available due to relatively low rainfall and extreme variability of climatic conditions. Considering climatological and other related factors, there exists a comparative advantage in production of small grain (particularly in either hard red spring or winter wheat), depending upon the region of the Great Plains. Wheat, having a comparative advantage over other crops, means that the ratio of costs to yield favors wheat. Thus, wheat would be the most profitable crop alternative.

Thorough appraisals of adjustment opportunities on typical farms are needed to evaluate probable effects of farm programs and other external factors, and to guide farmers in making adjustment decisions.

## TYPE OF AGRICULTURE IN AREA

The average farm size in this five-county area was about 668 acres in 1964, the individual county average size varied from 540 acres in Charles Mix County to 956 acres in Brule County. Average farm size is increasing annually and this trend is expected to continue. From 1959 to 1964, the U. S. Census of Agriculture shows an 89.9 to 84.5% decline in farms in the area under 500 acres. In contrast, farms between 500 and 999 acres increased from 9.1 to 13.9% and farms of 1,000 acres or more increased from 1.0 to 1.6%.

Nearly 9% of the area's 3,869 farms were classified as cash grain and 70% as livestock farms and ranches. General farms, poultry, dairy, and miscellaneous farms made up the remaining 21% of the area's farms.

The major cash crops produced in this area are corn grain, oats, and grain sorghum. Wheat, flax, rye, and soybeans accounted for about 10% of the land allocated to cultivated cash crops in 1964. About 30% of the corn grain was sold off the farm, nearly 37% of the oats and 46% of the grain sorghum harvested in 1964 were also sold off the farm. Feed grains which were not sold were fed to livestock on the farm.

Table 1 shows the number and percentage of farms in the five-county area on which the major grain crops were raised and harvested in 1964.

*Agricultural economist, Farm Production Economics Division, Economic Research Service, U. S. Department of Agriculture, and assistant professor of economics, respectively, SDSU.

[1]Source: Farm Income Situation, July 1968.

Table 1. Number and Percentage of Farms on Which the Major Grain Crops Were Harvested in 1964, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Crop | Number of Farms | Percentage of Farms | Acres harvested Number | Acres harvested Per Cent |
|---|---|---|---|---|
| Corn* | 3,091 | 79.9 | 351,540 | 49.6 |
| All Wheat† | 1,180 | 30.5 | 63,966 | 9.0 |
| Oats | 2,465 | 63.7 | 175,674 | 24.8 |
| Barley | 270 | 7.0 | 12,335 | 1.7 |
| Sorghum‡ | 1,723 | 44.5 | 96,131 | 13.6 |
| Other§ | | | 9,492 | 1.3 |

*Includes corn harvested for grain, silage, and other purposes.
†Includes 28,311 acres of winter wheat and 889 acres of durum.
‡Includes sorghum harvested for grain, silage, and other purposes.
§Includes emmer and speltz, flax, proso, rye ,and soybeans.
Source: U. S. Census of Agriculture, 1964.

Livestock were found on over 90% of the area's farms. Beef-cow herds with from 30 to 75 cows were common and cattle feeding was far more common than in the other study areas. Dairy enterprises were common also, but the average herd size was small; the 1964 census showed the average herd size slightly less than 8 cows.

Sow herds, which averaged 17 head, were found on 46% of the area's farms. Nearly 40% of the herds contained 20 or more sows.

Ewe flocks, maintained on 14% of the area's farms, averaged 83 head per farm in 1964.

## MODEL WHEAT FARMS

### Description

A farm sample, drawn in 1962, provided the basis for determining the model farms. Farms were stratified on the basis of various characteristics, such as farm size, proportion of cropland to native hay and rangeland, land use, and farm organization. Farms which differed greatly, such as those which did not have a wheat allotment or those which had either an unusually high or low proportion of cropland to total farmland, were not used to determine the model farm.

Two model farms were selected for Brule, Aurora, Gregory and Charles Mix counties. One was a 640-acre farm with 351 acres of cropland, 255 acres of native hay and pasture, and 34 acres of farmstead, roads, and wasteland. The other, a 1,280-acre farm, had 617 acres of cropland, 613 acres of native hay and pasture, and 50 acres of farmstead, roads, and wasteland. The size of the model farms chosen does not represent an arithmetic average—rather it is intended to represent a dominant size (or sizes) of wheat farm which will exist in the 1970s. About 85% of the farms in this five-county area had fewer than 500 acres in 1964. Many of these farms will be enlarged by land rental or purchase. The nature of farm adjustment and farm organization would not differ significantly for farms larger than either 640-acre or 1,280-acre farm, provided the ratios of farmland, cropland, labor, and capital resources were about the same as for the model farms.

The crops and crop acreages on the model farms were as follows:

| Crop | Model farm 640 Acres | Model farm 1,280 Acres |
|---|---|---|
| All wheat | 48 | 46 |
| Oats | 63 | 89 |
| Corn Grain | 84 | 142 |
| Corn Silage | 51 | 58 |
| Sorghum Grain | 7 | 14 |
| Sorghum Silage | 6 | 27 |
| Other Crops | 5 | 27 |
| Summer Fallow | 14 | 19 |
| Alfalfa | 50 | 170 |
| Other Tame Hay and Pasture | 23 | 25 |
| Native Hay | 89 | 225 |
| Native Pasture | 166 | 388 |

### Soils

A number of major soil associations are found in this five-county area. The Pierre-Promise Association soils are found in Brule County. These soils are undulating to steep and are well to excessively drained. The major problems associated with these soils are: (1) Maintenance of organic matter and nitrogen, (2) Moisture conservation, (3) Control of water erosion or runoff, and (4) Maintenance of stock water. Cash grain farming and ranching are the major soil uses.

The Raber-Eakin Association soils are undulating grayish-brown loams, clay loams and silt loams. Maintenance of organic matter and nitrogen supply, maintenance of soil fertility, conservation of moisture, and control of runoff and water erosion are the major soil and water problems of these soils. Cash grain farming and ranching are best suited to these soils, with the specific land use restricted by land topography.

The Boyd-Hamill Association soils are undulating to steep and are well to excessively drained. The Holt-Valentine Association soils are also undulating and are well drained. Major problems with these soils are: (1) Maintenance of organic matter and nitrogen supply, (2) Conservation of moisture, and (3) Control of wind erosion. The major uses are general farming and livestock.

Houdek-Bonilla Association soils are undulating to nearly level and are moderately well drained. These dark grayish-brown loams are slightly acid. Major problems in soil and water management are the maintenance of organic matter and the conservation of moisture. Major soil uses include: (1) Cash grain production, (2) Livestock farming, and (3) General farming.

The Reliance Association soils, found in Brule and Charles Mix Counties, are sloping, well drained, dark grayish-brown, slightly acid, silty clay loams. The major problems are: (1) Maintenance of organic matter and nitrogen supply, and (2) Moisture conservation. Bonilla-Cavour Association soils of Aurora County respond to nitrogen and are nearly level, moderately well drained and slightly acidic. The major soil and water management problems are: (1) Moisture conservation and (2) Slow permeability and seasonal ponding in low lying areas. The major use of the Reliance and Bonilla-Cavour Association soils is general farming.

Each soil series and soil type, within the soils association found in the five-county area, was classified into one of four groups on the basis of: (1) Land use, (2) Topography, (3) Potential soil hazards and problems, and (4) Management practices needed. Yield projections were developed under assumptions of normal weather conditions, recommended fertilizer usage, and specific management and rotation practices recommended for the productive capability of the soils (see Table 2). In cases where the soils of a particular group comprised less than 10% of the area's cropland, the soils of that group were combined with those of a second group and the yields were weighted accordingly.

**Table 2. Crop Yields and Fertilizer Usage per Planted Acre by Soil Group, 640- and 1,280-Acre Model Farms, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties**

| Crop and rotation | Group I-II Soils Projected Fertilizer* Yield | Nitrogen | $P_2O_5$ | Group III—IV Soils Projected Fertilizer* Yield | Nitrogen | $P_2O_5$ |
|---|---|---|---|---|---|---|
| | bushels | pounds | pounds | bushels | pounds | pounds |
| Winter Wheat on Fallow | 29.4 | | 19.5 | 21.7 | | 14.5 |
| Spring Wheat on Fallow | 26.6 | | 18.0 | 20.8 | | 14.0 |
| Spring Wheat After Corn | 19.8 | 22.5 | 13.5 | 14.7 | 16.5 | 10.0 |
| Spring Wheat After Small Grain | 12.9 | 15.0 | 9.0 | 7.7 | | |
| Oats, Continuous Crop | 34.1 | 15.0 | 11.5 | 25.1 | 11.0 | 8.5 |
| Corn Grain After Small Grain | 32.7 | 33.5 | 10.5 | 22.9 | 23.0 | 7.0 |
| Corn Silage After Small Grain | 6.30* | 37.0 | 11.5 | 4.40 | 25.5 | 7.5 |
| Grain Sorghum, Continuous Crop | 40.3 | 42.0 | 13.0 | 31.2 | 31.0 | 10.0 |
| Forage Sorghum, Continuous Crop | 8.50* | 46.0 | 14.5 | 6.60 | 34.4 | 11.0 |
| Alfalfa | 1.80* | | | 1.25* | | |
| Native Hay‡ | .7 | | | | | |

*Unit is in tons.
†Native hay is harvested from noncropland.
‡Actual pounds applied per acre.

A total of 20 crop rotations or sequences, including continuous corn and sorghum, were selected for the two soil groups—15 rotations for Soil Group I-II and 8 for Soil Group III-IV (appendix Table 1). These rotations, chosen from a wide range of alternatives, were within the requirements of the various soils within each group.

The 640-acre model farm contained 298 acres of Group I-II soils and 53 acres in soils Group III-IV. The 1,280-acre farm contained 524 acres of Group I-II soils and 93 acres in Soils Group III-IV.

## Crop Alternatives

Cash grains, feed grains, and forage crops were considered as crop alternatives in this five-county area. The small grains included were: Hard winter wheat and spring wheat and oats. The other crops considered as alternatives included corn grain and silage, grain sorghum and forage sorghum, alfalfa, and grass and legume seeding for permanent pasture on cropland.

The small grain and row crops which would be harvested as grain could either be used as livestock feed or sold off the farm. The corn silage, forage sorghum, and alfalfa which may be produced on these farms would have to be fed to livestock and could not be sold off the farm. Native hay and pasture could either be used by the farm operator for cattle or be left unused.

A cost summary of the crop enterprise budgets considered is shown in Table 3. Costs included in the budgets were: Seed, fertilizer and spray materials, all fixed and variable machine costs, custom harvest costs (when applicable), crop hauling to storage, and interest on operating capital. Interest charge on land was not included.

## Livestock Alternatives

The livestock activities allowed included :(1) A cow-calf operation, (2) Raising calves to be sold as stockers, and (3) Buying calves to raise and sell as stockers. Fattening activities such as cattle feeding or raising hogs were excluded as enterprise alternatives; these livestock activities are not primarily land based and are somewhat independent of wheat production.

Feeding systems which were allowed as alternatives included: (1) A stocker ration with corn silage and (2) a stocker ration without corn silage.

## Prices Received

Optimal farm plans were determined for various combinations of crop and livestock prices. The market prices were held constant for feeder calves at $25.28/cwt. and stocker cattle at $23.08/cwt. Wheat prices were varied from zero to over $3 per bushel at corn price levels of 71 cents, 85 cents, and $1.12 per bushel. Oat prices were converted to a corn equivalent based on feed value.

The cattle prices are those predicted to occur in 1970 under certain assumed supply and demand conditions. The assumed grain prices are received at local elevators while the livestock prices are those received at the Sioux City Terminal Market.

**Table 3. Total Man-Hours and per Acre Costs for the Crop Alternatives Budgeted for the 640- and 1,280-Acre Model Farms by Soils Groups, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties***

| Crop | Total Man-Hours† | 640-Acre Farm Costs per Acre for Soil Groups: I-II | III-IV | Total Man-Hours† | 1,280-Acre Farm Costs per Acre for Soil Groups I-II | III-IV |
|---|---|---|---|---|---|---|
| Summer Fallow | 1.47 | $ 5.03 | $ 5.03 | 1.24 | $ 3.87 | $ 3.87 |
| Winter Wheat after Fallow | 1.64 | 13.01 | 12.54 | 1.40 | 14.15 | 13.68 |
| Spring Wheat after Fallow | 1.64 | 12.76 | 12.39 | 1.40 | 13.90 | 13.53 |
| Spring Wheat after Corn | 2.51 | 15.00 | 14.09 | 2.15 | 15.07 | 14.08 |
| Spring Wheat after Small Grain | 2.39 | 15.50 | 12.94 | 2.05 | 16.54 | 13.98 |
| Oats | 2.39 | 13.33 | 12.59 | 1.89 | 14.18 | 13.44 |
| Corn Grain | 3.18 | 22.62 | 20.89 | 2.77 | 21.62 | 19.89 |
| Sorghum Grain | 3.01 | 18.43 | 16.88 | 2.43 | 17.82 | 16.27 |
| Corn Silage | 4.21 | 29.29 | 26.71 | 3.20 | 26.30 | 23.70 |
| Sorghum Silage | 4.17 | 27.35 | 24.82 | 3.20 | 24.35 | 21.82 |
| Alfalfa | 1.64 | 10.85 | 9.73 | 2.22 | 10.52 | 9.77 |
| Native Hay | .95 | 3.21 | 3.21 | .95 | 3.00 | 3.00 |

*Excludes a charge for land.
†Excludes hauling and storing.

**Table 4. A Summary of Budget Items for the Cow-Calf Herd and Stocker Calf Alternatives Considered for the 640- and 1,280-Acre Model Farms**

| Item | Cow-Calf Herd | Stocker Calves Wintered and Grazed with silage | without silage |
|---|---|---|---|
| Per Cent Calf Crop | 92.0% | | |
| Purchase Weight | | 430 lbs. | 430 lbs. |
| Sales Weight | 430 lbs. | 700 lbs. | 700 lbs. |
| Purchase Cost | | $108.70 | $108.70 |
| Pasture | 6.5 aum | 3.25 aum | 3.25 aum |
| Hay Equivalent | 2.60 ton | .40 ton | .64 ton |
| Corn Silage | | 1.20 ton | |
| Corn Grain Equivalent | 2.70 cwt | | 3.60 cwt. |
| Variable Cash Costs* | $40.87 | $ 25.94 | $ 25.76 |
| Allocable Fixed Costs† | $11.40 | $ 6.90 | $ 6.90 |
| Labor per head | 12.0 hrs. | 5.3 hrs. | 5.3 hrs. |

*Includes: Salt and minerals, protein supplement, veterinary and drugs, taxes, insurance, marketing, machinery and equipment cash expenses.
†Includes: Depreciation, insurance, taxes, and investment interest on machinery, buildings, and facilities used for enterprise.

## Labor

The available labor supply was determined from data obtained in several recent farm surveys. Operator and family labor were combined and classified as resident labor. Hired labor, as a category, included regular and part-time help.

The work year was divided into five labor periods, each identified with a season or type of work usually expected to be performed in that period. However, the type of work performed in each period is not as clear-cut as the dates for each period since there is usually some overlapping of tillage, planting, and harvesting from one labor period to another.

The resident labor used for livestock and field crops could not exceed the number of hours allotted to each period. The hours by labor period are as follows:

| | Model Farm 640 Acres | 1,280 Acres |
|---|---|---|
| November 16 to March 15 | 802 hours | 1079 hours |
| March 16 to April 30 | 409 | 567 |
| May 1 to July 15 | 837 | 1092 |
| July 16 to September 30 | 847 | 1110 |
| October 1 to November 15 | 351 | 418 |

Labor could be hired in any or all periods but was restricted to the amounts used on sample farms. The hired labor wage rate was $1.25 per hour.

## OPTIMUM FARM PLANS AT VARYING WHEAT AND FEED GRAIN PRICES

Linear programming is a method of analysis used to determine the farm plans which provides maximum net returns, given input factors such as crop and livestock enterprise costs, amount of available land, amount of available labor, capital requirements and availability, price and income factors. This method of analysis was used to determine probable wheat and feed grain production which would maximize net income at various price combinations. Because linear programming solutions were obtained for a wide range of wheat prices, a large number of optimum farm plans resulted. Many of the optimum farm plans indicated insignificant changes in production or net income.

Tables 5 through 10 show only major changes in crop acreages, crop and livestock production, labor, capital and net returns at constant feed grain and cattle prices with increasing wheat prices.[2] Since minor changes in farm plans were not shown, breaks in the wheat prices are shown in the tables. The wheat prices are shown as a range over which the farm plans, crop and livestock production, and other such factors remain constant.

[2]The net returns referred to are to land, labor, and management.

Table 5. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Item | Price of Wheat $.36 to $.59 | $.60 to $.96 | $.97 to $.98 | $1.02 to $1.28 | $1.49 to $1.83 | $3.26 to $3.31 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 21 |
| Winter Wheat | 36 | 31 | 114 | 139 | 155 | 158 |
| Summer Fallow | 36 | 31 | 114 | 139 | 155 | 158 |
| Oats | 36 | 31 | 7 | — | 7 | 11 |
| Sorghum | 12 | 48 | 29 | 21 | 2 | 3 |
| Corn | 36 | 31 | 7 | — | 7 | — |
| Tame Hay or Pasture | 195 | 178 | 81 | 53 | 27 | — |
| **Crop Production (in bushels):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 140 |
| Winter Wheat | 1,027* | 901 | 3,232 | 3,937 | 4,340 | 4,415 |
| Feed Grain (corn equivalent) | 1,726 | 1,513 | 333 | 38 | 228 | 118 |
| Sorghum Silage (in tons): | 107 | 406 | 249 | 167 | 18 | 22 |
| Tame Hay | 80 | 39 | — | — | 31 | — |
| Native Hay | 62 | 62 | 62 | 62 | 62 | 62 |
| **Livestock (head):** | | | | | | |
| Beef Cows | — | — | — | 8 | 31 | 21 |
| Stockers Sold† | 247 | 254 | 156 | 104 | 24 | 16 |
| Total Labor Use (hours) | 2,014 | 2,210 | 1,569 | 1,355 | 1,214 | 1,052 |
| Total Capital Used | $50,167 | $52,448 | $36,585 | $30,550 | $24,578 | $20,837 |
| Net Returns‡ | $ 2,942 | $ 2,940 | $ 3,281 | $ 3,452 | $ 5,377 | $13,137 |

*Wheat fed to livestock.
†Includes calves raised and purchased.
‡The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

Table 6. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Item | Price of Wheat $.36 to $.37 | $.53 to $.62 | $.96 to $1.09 | $1.20 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Winter Wheat | 42 | 55 | 92 | 252 | 264 | 274 |
| Summer Fallow | 42 | 55 | 92 | 252 | 264 | 274 |
| Oats | 69 | 67 | 54 | 10 | 8 | 13 |
| Sorghum | — | — | 19 | 11 | 11 | 2 |
| Corn | 123 | 92 | 54 | 10 | 10 | 13 |
| Tame Hay or Pasture | 341 | 349 | 307 | 82 | 59 | 40 |
| **Crop Production (in bushels):** | | | | | | |
| Winter Wheat | 1,202* | 1,572† | 2,624 | 7,119 | 7,437 | 7,685 |
| Feed Grain (corn equivalent) | 5,106 | 4,057 | 2,592 | 375 | 353 | 456 |
| Sorghum Silage (in tons): | — | — | 163 | 95 | 89 | 21 |
| Tame Hay | 259 | 264 | 218 | 55 | 42 | 50 |
| Native Hay | 171 | 171 | 171 | 171 | 171 | 171 |
| **Livestock (head):** | | | | | | |
| Beef Cows | 139 | 141 | 134 | 78 | 74 | 81 |
| Stockers Sold‡ | 106 | 107 | 102 | 59 | 56 | 24 |
| Feeder Calves Sold | — | — | — | — | — | 38 |
| Total Labor Use (hours) | 3,720 | 3,715 | 3,614 | 2,359 | 2,275 | 2,195 |
| Total Capital Used | $77,259 | $77,754 | $75,107 | $53,238 | $51,622 | $48,833 |
| Net Returns§ | $ 6,904 | $ 6,949 | $ 7,466 | $ 8,499 | $ 8,809 | $16,965 |

*Wheat fed to livestock.
†1,218 bushels of wheat were fed to livestock.
‡Includes calves raised and purchased.
§The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

**Table 7. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Item | Price of Wheat $.36 to $.61 | $.90 to $1 | $1.08 to $1.20 | $1.21 to $1.28 | $1.59 to $1.83 | $3.26 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 21 |
| Winter Wheat | 10 | 11 | 56 | 139 | 155 | 158 |
| Summer Fallow | 10 | 11 | 56 | 139 | 155 | 158 |
| Oats | 10 | 9 | — | — | 7 | 11 |
| Sorghum | 217 | 223 | 186 | 21 | 2 | 3 |
| Corn | 10 | 9 | — | — | 7 | — |
| Tame Hay or Pasture | 93 | 89 | 53 | 53 | 27 | — |
| **Crop Production (in bushels):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 140 |
| Winter Wheat | 291* | 315† | 1,587 | 3,937 | 4,340 | 4,415 |
| Feed Grain (corn equivalent) | 7,827 | 7,844 | 5,708 | 38 | 228 | 118 |
| Sorghum Silage (in tons): | 25 | 53 | 167 | 167 | 18 | 22 |
| Tame Hay | 70 | 64 | — | — | 30 | — |
| Native Hay | 62 | 62 | 62 | 62 | 62 | 62 |
| **Livestock (head):** | | | | | | |
| Beef Cows | 44 | 44 | 8 | 8 | 31 | 21 |
| Stockers Sold‡ | 34 | 33 | 104 | 104 | 24 | 16 |
| Total Labor Use (hours) | 1,773 | 1,779 | 1,660 | 1,355 | 1,214 | 1,052 |
| Total Capital Used | $31,652 | $31,531 | $32,273 | $30,550 | $24,578 | $20,837 |
| Net Returns§ | $ 3,879 | $ 3,904 | $ 3,990 | $ 4,195 | $ 5,799 | $13,137 |

*Wheat fed to livestock.
†188 bushels of wheat was fed.
‡Includes calves raised and purchased.
§The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

**Table 8. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Item | Price of Wheat $.36 to $.76 | $.81 to $.83 | $1.04 to $1.16 | $1.29 to $1.30 | $1.31 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Winter Wheat | 25 | 50 | 92 | 252 | 264 | 274 |
| Summer Fallow | 25 | 50 | 92 | 252 | 264 | 274 |
| Oats | 71 | 64 | 54 | 10 | 8 | 13 |
| Sorghum | 6 | 27 | 19 | 11 | 11 | 2 |
| Corn | 162 | 92 | 54 | 10 | 10 | 13 |
| Tame Hay or Pasture | 329 | 334 | 307 | 82 | 59 | 40 |
| **Crop Production (in bushels):** | | | | | | |
| Winter Wheat | 709* | 1,431† | 2,624 | 7,119 | 7,437 | 7,685 |
| Feed Grain (corn equivalent) | 6,409 | 4,250 | 2,592 | 375 | 353 | 456 |
| Sorghum Silage (in tons) | 47 | 172 | 163 | 95 | 89 | 21 |
| Tame Hay | 270 | 239 | 218 | 55 | 42 | 50 |
| Native Hay | 171 | 171 | 171 | 171 | 171 | 171 |
| **Livestock (head):** | | | | | | |
| Beef Cows | 165 | 141 | 134 | 78 | 74 | 81 |
| Stockers Sold‡ | 29 | 107 | 102 | 59 | 56 | 24 |
| Feeder Calves Sold | 96 | — | — | — | — | 38 |
| Total Labor Use (hours) | 3,798 | 3,800 | 3,614 | 2,359 | 2,275 | 2,195 |
| Total Capital Used | $73,323 | $78,437 | $75,107 | $53,238 | $51,622 | $48,833 |
| Net Returns§ | $ 7,631 | $ 7,649 | $ 7,950 | $ 9,134 | $ 9,255 | $16,965 |

*Wheat fed to livestock.
†606 bushels were fed to livestock.
‡Includes calves raised and purchased.
§The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

**Table 9. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Item | Price of Wheat $.36 to $.49 | $.94 to $1.11 | $1.50 to $1.63 | $1.73 to $1.85 | $1.90 to $2.43 | $3.26 to $3.41 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 21 |
| Winter Wheat | 9 | 27 | 34 | 51 | 155 | 158 |
| Summer Fallow | 9 | 27 | 34 | 51 | 155 | 158 |
| Oats | 15 | 8 | 11 | 10 | 10 | 11 |
| Sorghum | 228 | 247 | 245 | 212 | 4 | 3 |
| Corn | 15 | 8 | 5 | 7 | 7 | — |
| Tame Hay or Pasture | 7 | 34 | 20 | 20 | 20 | — |
| **Crop Production (in bushels):** | | | | | | |
| Spring Wheat | — | — | — | — | — | 140 |
| Winter Wheat | 224* | 715† | 917 | 1,392 | 4,342 | 4,415 |
| Feed Grain (corn equivalent) | 8,577 | 8,767 | 8,503 | 7,381 | 264 | 118 |
| Sorghum Silage (in tons): | — | — | 37 | 37 | 37 | 22 |
| Tame Hay | 74 | 46 | 26 | 26 | 26 | — |
| Native Hay | 62 | 62 | 62 | 62 | 62 | 62 |
| **Livestock (head):** | | | | | | |
| Beef Cows | 52 | 42 | 30 | 30 | 30 | 21 |
| Stockers Sold‡ | — | — | 23 | 23 | 23 | 16 |
| Feeder Calves Sold | 40 | 32 | — | — | — | — |
| Total Labor Use (hours) | 1,754 | 1,643 | 1,618 | 1,594 | 1,212 | 1,052 |
| Total Capital Used | $29,247 | $26,563 | $26,981 | $26,606 | $24,442 | $20,837 |
| Net Returns§ | $ 6,112 | $ 6,192 | $ 6,604 | $ 6,814 | $ 7,167 | $13,137 |

*Wheat fed to livestock.
†179 bushels of wheat were fed to livestock.
‡Includes calves raised and purchased.
§The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

**Table 10. Crop and Livestock Production, Labor, Capital, and Net Returns for the Optimum Farm Plan at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Item | Price of Wheat $.36 to $.53 | $.54 to $.97 | $1.06 to $1.33 | $1.57 to $1.64 | $1.92 to $2.31 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Crops (in acres):** | | | | | | |
| Winter Wheat | 23 | 38 | 110 | 132 | 273 | 274 |
| Summer Fallow | 23 | 38 | 110 | 132 | 273 | 274 |
| Oats | 79 | 38 | 13 | 12 | 12 | 13 |
| Sorghum | 143 | 221 | 319 | 283 | 3 | 2 |
| Corn | 79 | 38 | 13 | 12 | 12 | 13 |
| Tame Hay or Pasture | 270 | 244 | 52 | 47 | 45 | 40 |
| **Crop Production (in bushels):** | | | | | | |
| Winter Wheat | 666* | 1,089† | 3,025‡ | 3,657 | 7,654 | 7,685 |
| Feed Grain (corn equivalent) | 9,163 | 9,416 | 11,411 | 10,035 | 411 | 456 |
| Sorghum Silage (in tons) | — | — | — | 19 | 22 | 21 |
| Tame Hay | 232 | 210 | 69 | 59 | 57 | 50 |
| Native Hay | 171 | 171 | 171 | 171 | 171 | 171 |
| **Livestock (head):** | | | | | | |
| Beef Cows | 155 | 147 | 92 | 87 | 86 | 81 |
| Stockers Sold§ | — | — | — | 12 | 14 | 24 |
| Feeder Calves Sold | 118 | 112 | 70 | 54 | 52 | 38 |
| Total Labor Use (hours) | 3,737 | 3,436 | 2,716 | 2,670 | 2,209 | 2,195 |
| Total Capital Used | $69,130 | $67,144 | $54,850 | $54,241 | $48,636 | $48,833 |
| Net Returns¶ | $ 9,777 | $ 9,777 | $10,078 | $11,576 | $13,837 | $16,965 |

*Wheat fed to livestock.
†630 bushels of wheat were fed to livestock.
‡397 bushels of wheat were fed to livestock.
§Includes calves raised and purchased.
¶The net returns refers to the lowest wheat prices and includes returns to land and the operator's labor.

## Farm Plans with Corn Priced at 71 Cents

Results of the linear programming indicate net returns would be greatest with a farm plan somewhat balanced between the production of cash grains and livestock at wheat prices below $1.50 per bushel. As wheat prices rose above $1.50, the emphasis in production leaned heavily toward wheat as a cash grain with livestock becoming a supplementary enterprise. At low wheat prices, the feed grain production was sold and wheat produced, was fed. As the wheat prices rose, winter wheat and summer fallow increasingly replaced corn, sorghum, and oats as a cash crop. A substantial number of calves were purchased for the 640-acre farm at the low wheat price levels, while a large stock-cow herd was maintained on the 1,280-acre farm.

In general, wheat acreage and production increased substantially as the wheat price rose to around $1 and above. At wheat prices of less than $1, the two main sources of income were the sales of feed grains[3] and stocker cattle. But wheat became increasingly competitive as a cash grain when the wheat price rose, while the other crop and livestock prices remained constant. The adjustment taking place as the wheat price increased was a gradual shift from feed grains and livestock feed crops to an increasing acreage in winter wheat and summer fallow.

The livestock enterprise gradually diminished in importance until it reached the status of a supplementary enterprise. This change occurred at different price ratios for each of the model farms because each farm had a different set of costs for the same crop enterprise. The change in crop rotations by soil group at the various wheat price levels are shown in Tables 11 and 12 for both model farms.

**Crop Production—Soils Group I-II.** Winter wheat, spring wheat, oats, corn grain, grain sorghum, corn silage, forage sorghum, alfalfa (including a pasture-type alfalfa) and summer fallow in a combination of 15 crop rotations were the cropping alternatives. Continuous small grain was not allowed; continuous corn and sorghum were allowed. Although only corn is shown in the crop rotations, sorghum could substitute for corn if it were more profitable.

The two most profitable crops were grain sorghum and corn, with wheat priced below $1. With a corn or corn equivalent price of 71 cents, continuous corn returned a net of 60 cents per acre on the 640-acre farm and $1.60 on the 1,280-acre farm; continuous grain sorghum returned $4.47 per acre on the 640-acre farm and $5.08 on the 1,280-acre farm. With the relatively low wheat and feed grain prices, the main source of farm income came from the sale of livestock with the sales of feed grain being a secondary income source; wheat production was used as livestock feed. Cash receipts from the sales of feed grain were much more important on the 1,280-acre farm compared with the 640-acre farm. Thus, at wheat prices of 96 cents and less, crop production on both model farms was mainly oriented toward feed production as shown by the crop rotations in Tables 11 and 12.

As wheat advanced in price to a range of 97 to 98 cents, summer fallow-winter wheat, on the 640-acre model farm, became more competitive with livestock and feed grain production, both in respect to return per acre and in the amount of capital and labor needed for the enterprises. Summer fallow-winter wheat returned $4.90 per acre with wheat priced at 98 cents compared with $4.47 from grain sorghum. Spring wheat-summer fallow returned about $1.25 per acre less than winter wheat-summer fallow, due to the difference in yield. At the 97 to 98 cent wheat price, about 206 acres of cropland in Soils Group I-II shifted to summer fallow-winter wheat from corn, forage sorghum, oats, and alfalfa.

With wheat priced below 96 cents and corn at 71 cents, the two crop rotations shown in Table 12 represented the best land use on the 1,280-acre model farm with livestock prices relatively high. Alfalfa and wheat were produced for feed and the corn and oats were sold. But as wheat advanced to prices of 96 cents to $1.09, winter wheat-fallow returned a net of $4.62 to $6.47 per acre, which was beginning to become

**Table 11. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Crop Rotation | Cropland at the Following Wheat Prices $.36 to $.59 | $.60 to $.96 | $.97 to $.98 | $1.02 to $1.28 | $1.49 to $1.83 | $3.26 to $3.31 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 285.4 | 250.3 | 55.1 | | | |
| Sorghum | 12.6 | 47.7 | 29.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow, Winter Wheat | | | 213.7 | 277.3 | 295.9 | 295.5 |
| **Soil Group III-IV** | | | | | | |
| Grass | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | | | | | 53.0 | |
| Summer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | | | | | | 53.0 |

[3]Continuous corn and corn sorghum were allowed as crop enterprise activities. However, to reduce duplicating crop enterprises activities, only corn was used in crop rotations with the assumption that corn would be replaced by grain sorghum if it were the more profitable grain crop.

competitive with grain sorghum and returns from crop rotations with three and four years of alfalfa. Thus, the corn-corn-corn-oats-alfalfa (3-years) rotation was replaced primarily by summer fallow-winter wheat and 19 acres of forage sorghum for feed.

With wheat at $1.02 and above, summer fallow-winter wheat became the dominant crop rotation on the 640-acre farm, returning $5.46 per acre at a price of $1.02, and $9.16 with wheat priced at $1.28. About 21 acres of forage sorghum provided cattle feed. At a wheat price of $1.49, winter wheat-summer fallow returned $12.14 per acre, and at that price, the rotation reached its maximum acreage of 99.3% of the Soils Group I-II cropland. The balance of the acreage, 2.1 to 2.6 acres, was used for forage sorghum.

The livestock enterprise change came about with a change in crop rotations on the Soils Group III-IV cropland. Summer fallow-spring wheat was the second best crop alternative, returning about $5 per acre less than winter wheat at prices of $3.26 to $3.31.

The crop rotational changes on the 1,280-acre farm, as wheat prices rose, were only slightly different from those on the 640-acre farm. At a price of $1.20, all but 27 of the 429 acres in an eight-year rotation of summer fallow-winter wheat-corn-oats-alfalfa (Table 12) shifted to summer fallow-winter wheat. Forage sorghum acreage was reduced from 19 to 11 acres with a commensurate reduction in the stock-cow herd. Summer fallow-winter wheat became the most profitable crop rotation, returning a net of $8.03 per acre at a price of $1.20 compared with $5.08 from grain sorghum and $6.48 from spring wheat-fallow. A price increase of 5 cents for wheat induced a shift of an additional 26 acres of summer fallow and winter wheat, leaving 13.5 acres in corn and sorghum for cattle feed. At a wheat price of $1.25, 97.6% of the cropland in Soils Group I-II was devoted to summer fallow and winter wheat. This percentage increased to 99.5% with an increase in wheat price to $2.32 at which point the summer fallow-winter wheat rotation returned $23.94 per acre. Net returns from crops nearly reached the maximum, since only 2.4 acres of Soils Group I-II cropland were devoted to sorghum to be used as livestock feed. Even with the wheat price rising to $3.60, and net returns of $42.11 per acre from winter wheat-fallow, the crop acreage remained the same. Thus, the maximum returns to the farm depends upon all of the resources. The additional $50 which could be obtained from the 2.4 acres of sorghum shifting to summer fallow-winter wheat is considerably less than the income from those acres used as livestock feed.

The maximum wheat acreage and production on Group I-II soils was reached on the 640-acre farm at a wheat price of $3.26 and $2.32 on the 1,280-acre farm. Wheat acreage and production would remain unchanged at these prices unless feed grain prices rose enough to become a competitive factor, assuming no change in the costs of production.

**Table 12. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties**

| Crop Rotation | Cropland at the Following Wheat Prices $.36 to $.37 | $.53 to $.62 | $.96 to $1.09 | $1.20 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn, Corn, Corn, Oats, Alfalfa (3 years) | 190.2 | 87.3 | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 333.8 | 436.7 | 428.7 | 27.4 | | |
| Sorghum | | | 19.2 | 11.2 | 10.5 | 2.4 |
| Summer Fallow, Winter Wheat | | | 76.1 | 485.5 | 511.5 | 521.6 |
| Corn | | | | | 2.0 | |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Summer Fallow, Winter Wheat, Oats, Alfalfa, Corn, Oats, Alfalfa (4 years) | | | | 48.8 | 66.9 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | | | 93.0 |

**Crop Production—Soils Group III-IV.** Most of the crop alternatives were the same as on Group I-II soils, except for a permanent grass and legume seeding for pasture which was added as a crop alternative. However, since these soils were less productive, lower crop yields and higher costs of production, the minimum length of crop rotation allowed was four years. Group III-IV soils comprised about 15% of the cropland and could not figure prominently in cash grain production.

The entire acreage of Group III-IV soils was seeded as tame pasture at wheat prices which ranged up to $1.28 for the 640-acre farm and $1.09 per bushel for the 1,280-acre model farm. Since livestock prices were relatively higher than wheat and feed grain prices, tame pasture returned more income than if it were used for cash crop production.

A rise in wheat price on the 640-acre farm, to a range of $1.49 to $1.83, resulted in a shift of the entire 53 acres from tame pasture to a summer fallow-winter wheat-corn-oats-alfalfa (4-years) rotation. Cash returns from this rotation were negative; in other words, cash receipts from wheat and feed grains were considerably less than the expenses. But, this excludes the value of the alfalfa produced. Hence, with a market value of $15 per ton, the net returns to that rotation would be about $4.55 per acre—far better than any other rotation allowed on this soils group.

With a further rise in wheat price, to $3.26, the crop rotation on the 640-acre farm again shifted—to one which allowed the maximum wheat acreage and production. At this wheat price, the maximum farm profit came from crops. With this shift to a rotation of summer fallow-winter wheat-spring wheat-spring wheat-oats, came a decrease in feed production with a commensurate reduction in the stock-cow herd. This rotation returned a net of $12.79 per acre compared with the second most profitable rotation of summer fallow-winter wheat-oats-oats which returned $10.24 per acre. The other crop rotations all returned between $9 and $10 per acre when an allowance of $15 per ton was given for alfalfa.

Similarly, increases in the wheat price affected the cropping system on the 1,280-acre farm, but not quite in the same way as on the 640-acre farm, nor at the same wheat price levels. As the wheat price rose from $1.09 to $1.20, about 49 acres of tame pasture shifted to a rotation of summer fallow-winter wheat-corn-oats-alfalfa (4-years). This decrease in tame pasture affected the farm in several ways: (1 )Cash grain was now produced, (2) the beef-cow herd was reduced by 56 head, and (3) the capital and labor requirements were reduced by nearly one-third. As wheat went up another 5 cents in price, to $1.25, another 18 acres shifted from tame pasture to eight-year crop rotation with only a slight decrease in beef-cow herd, capital and labor requirements. Net returns also increased slightly. This eight-year crop rotation, after giving a $15 per ton allowance for alfalfa, was the most profitable crop rotation allowed on this soils group. The entire 93 acres shifted from tame pasture to a seven-year rotation of summer fallow-winter wheat-corn-oats-alfalfa (3-years) when wheat rose to $2.32, and remained unchanged through a price of $3.60 per bushel. The maximum wheat acreage possible on this soils group is 55.8 acres from a rotation which allowed one year of winter wheat and two years of spring wheat; maximum production would be 878 bushels. Wheat acreage from the seven-year rotation amounted to 13.6 acres or only one-fourth of the maximum potential. With a $15 per ton allowance for alfalfa, the returns from this rotation amounted to approximately $7 per acre or 75 cents less than the most profitable crop rotation on these soils. However, total farm income is dependent upon all the resources, so the income lost from the additional 493 bushels of wheat which could have been marketed was more than made up by the livestock enterprise.

The wheat acreage and production attained would remain unchanged at these wheat prices unless feed grain prices rose enough to become a competitive factor, assuming no changes in the costs of production.

**Livestock Production.** The livestock enterprise in the optimum farm plan mainly was one of raising calves to 700-pound weights. The calves which were purchased were purchased in the fall; some calves were raised from a stock-cow herd.

The livestock enterprise contributed significantly to total farm income on both farms at the lower wheat prices, but as wheat rose in price, the livestock enterprise became supplementary in nature. Without any livestock, some resources would remain idle. No provision was made to sell or rent out native hay or range. In most real situations, native hay or rangeland probably would not remain idle—if not used by the farm operator, it would be leased out.

With $25.28 and $23.08 prices used for feeder and stocker calves, respectively, both were profitable, particularly at a corn price of 71 cents. In reality, such a large disparity between grain and livestock prices probably would not occur, or if it did, it would not remain for long, since the demand for corn for livestock feeding would force corn prices to rise. However, the size and nature of the livestock enterprise was influenced by the increase in wheat price as cropland shifted to a larger wheat acreage and fewer acres in feed crops. The cattle enterprise became relatively less profitable and was reduced to a supplementary enterprise which existed to utilize native hay and range. At the higher wheat prices only a few acres of Soils Group I-II cropland were used to produce livestock feed.

The livestock enterprise on the 640-acre model farm consisted entirely of fall purchased calves when wheat price was below $1. This enterprise gradually shifted from purchased calves to a beef-cow herd as wheat advanced in price. In contrast, the livestock enterprise on the 1,280-acre farm, at wheat prices below $1.20, consisted of a relatively large beef-cow herd which was reduced in size as wheat prices continued to advance. As cropland acres increasingly shifted over to wheat, due to the higher prices, the grains and roughages fed also changed.

Fall-purchased calves raised to stocker cattle weights were relatively more profitable than maintaining a herd of stock cows. In addition, more labor is needed to maintain a stock-cow and more of the labor would be needed at a time when it would compete with crops. Less short-term capital is required to maintain a stock-cow herd than to purchase feeder calves, but if owned capital or credit is ample there then is no problem.

While calves were purchased for the 640-acre model farm at wheat prices through $1.28, a beef-cow herd was maintained on the 1,280-acre farm at all wheat prices. The main differences between the two model farms lies in ratio of the amount of available labor, cropland, native hay, and rangeland. Although cropland on the 1,280-acre farm was 76% greater than that of the 640-acre farm and native hay and rangeland was 140% greater, total family and operator labor available was only 31% more. Labor could be hired at $1.25 an hour, but hired labor must return an amount at least equal to that which can be earned by the operator while operator labor is still available. In addition, the costs of borrowed capital must be considered when determining the profitability of alternative enterprises.

Feed, other than minerals, feed additives, and salt was homegrown and consisted of hay, sorghum silage, and some grain. The grains used for feed depended upon the price of wheat in relation to corn, since cash grain production was a main enterprise and crop rotations changed as wheat increased in price. The wheat grown on the 640-acre farm was fed to livestock at wheat prices of 59 cents and below and on the 1,280-acre farm at 36 and 37 cent prices. As the wheat price increased, wheat and tame hay were replaced by feed grain and sorghum silage as feed.

Cropland used for feed production on the 640-acre farm varied from about 79% at the low wheat price to 4% at the highest programmed wheat price. On the 1,280-acre farm, the percentage of cropland used for feed production varied from 69% at wheat prices of 36 and 37 cents to 11% when wheat reached prices of $2.32 to $3.60 per bushel.

## Farm Plans with Corn Priced at 85 Cents

Differences in farm plans occurred on both model farms, at the low wheat prices, when the corn price was raised to 85 cents from a 71-cent price level. Crop production was shifted from wheat and forage crops to grain sorghum. Livestock became a supplementary enterprise on the 640-acre farm at the low wheat prices, with the purchased feeder calves replaced by a beef-cow herd. The main source of income was now derived from sales of feed grain.

Net returns were higher on both farms due to a 14-cent increase in corn price and an increased volume of feed grain sold. Net returns became the same as when corn was priced at 71 cents, on the 640-acre farm at wheat prices of $1.21, and at $1.23 on the 1,280-acre farm, as the farm plans at these prices became identical.

The change in crop rotations by soil group at the various wheat price levels are shown in Tables 13 and 14 for both model farms.

**Crop Production—Soils Group I-II.** Crop production on the 640-acre farm was oriented toward feed grain production at wheat prices of $1 or less. Grain sorghum, which returned a net of $8.98 per acre, was the most profitable crop at wheat prices up to $1, and it accounted for 223 acres, or about 75% of Group I-II soils. The balance of the acreage, about 75 acres, was in summer fallow, winter wheat, corn, oats, and alfalfa. The feed grains, oats, and some wheat were sold while some wheat, sorghum silage, and alfalfa hay were fed.

An increase in wheat price to $1.08 resulted in a shift in 53 acres of corn, oats, and alfalfa and 36 acres of sorghum to summer fallow and winter wheat. Associated with the change in crop acreage was a change from beef-cow herd to an enterprise of purchased calves to be raised as stockers. The net result of this crop and livestock enterprise change was a slight increase in net returns and a decrease in the annual labor used.

As the wheat price increased to a range of $1.21 to $1.28, the acreage in sorghum shifted to summer fallow-winter wheat, as this became the most profitable crop rotation. From this price range and higher, the cropping pattern on Group I-II soils became the same as when the corn price was 71 cents and wheat was priced at $1.02 and higher.

Crop production on the 1,280-acre farm was also oriented toward feed grain production, but to a much lesser degree than on the 640-acre farm. The livestock enterprise was a commercial beef-cow herd consisting

**Table 13. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Crop Rotation | Cropland Acres at the Following Wheat Prices $.36 to $.61 | $.90 to $1 | $1.08 to $1.20 | $1.21 to $1.28 | $1.59 to $1.83 | $3.26 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 80.8 | 71.2 | | | | |
| Sorghum | 217.2 | 222.6 | 186.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow, Winter Wheat | | 4.2 | 111.7 | 277.3 | 295.9 | 295.5 |
| **Soil Group III-IV** | | | | | | |
| Grass | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | | | | | 53.0 | |
| Sumer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | | | | | | 53.0 |

of 165 cows at a wheat price of 76 cents and 141 cows when wheat was increased to 81 cents. Grain sorghum was the most profitable crop with net returns of $9.59 per acre. Two crop rotations, one with three years of corn, one year of oats, and three years of alfalfa and the other with one year each in summer fallow, winter wheat, corn, oats and four years of alfalfa were nearly as profitable when crediting alfalfa with a market value of $15 per ton. Thus, with the narrow difference in absolute profitability between the crop rotations and grain sorghum, the relative profitability of cattle on a larger farm and the limits on family labor availability in periods 1 and 5, the cropping pattern at wheat prices of $1 or less was oriented more toward feed production than cash grain.

As the wheat price increased to a range of $1.04 to $1.16, and wheat became more competitive with feed grains and livestock, a total of 84 acres shifted from corn, oats, sorghum, and alfalfa to summer fallow and winter wheat. Net income increased $300 with this change in crop acreages and wheat price, the beef-cow herd decreased by seven cows, and the labor requirements were reduced by nearly 200 hours. Thus, at a wheat price of $1.04, the cropping pattern and crop acreages became the same as when corn was priced at 71 cents and wheat at 96 cents and higher.

**Crop Production—Soils Group III-IV.** A 14-cent increase in the price of corn did not increase the profitability of corn as a cash grain on these soils to the point where it would be competitive with the livestock. The answer to this lies in the productivity of these soils and the relative profitability of the cattle enterprise. Hence, as when corn was priced at 71 cents, these soils were more profitable as tame pasture on the 640-acre farm at wheat prices of $1.28 and less and at $1.16 and less on the 1,280-acre farm. At wheat prices higher than $1.16 or $1.28, the crop rotations and production became identical to that when corn was priced at 71 cents per bushel.

**Livestock Production.** The change in the livestock enterprise on the 640-acre farm at wheat prices of $1 and less was one which substituted a beef-cow herd for purchased calves. The change on the 1,280-acre farm was one of adding 26 cows to the beef-cow herd and selling about 77% of the calves as feeders; the balance of the calves being raised and sold at 700-pound weights. Above the wheat price of 76 cents, the livestock enterprise became the same as at a corn price of 71 cents.

The only change in land use which came about with a 14-cent rise in corn price involved number of acres planted. The total feed supply, of course, changed with the changing number of animal units in the livestock enterprise.

**Table 14. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties**

| Crop Rotation | Cropland Acres at the Following Wheat Prices $.36 to $.76 | $.81 to $.83 | $1.04 to $1.16 | $1.29 to $1.30 | $1.31 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn, Corn, Corn, Oats, Alfalfa (3 years) | 321.4 | 99.8 | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 197.1 | 397.4 | 428.7 | 27.4 | | |
| Sorghum | 5.5 | 26.8 | 19.2 | 11.2 | 10.5 | 2.4 |
| Summer Fallow, Winter Wheat | | | 76.1 | 485.5 | 511.5 | 521.6 |
| Corn | | | | | 2.0 | |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | | | | 48.8 | 66.9 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | | | 93.0 |

## Farm Plans with Corn Priced at $1.12

The competitive position and relative profitability of corn was further enhanced with an increase in corn price to $1.12. This would force a rise in the price of wheat if it were to remain on a competitive level with corn for the use of cropland.

Crop rotations by soil groups at the various levels of wheat prices are shown in Tables 15 and 16 for the two model farms.

**Crop Production—Soils Group I-II.** With a price of $1.12 per bushel, continuous grain sorghum was the most profitable crop, with a return of $17.69 per acre on the 640-acre farm and $18.30 on the 1,280-acre farm. Corn grain returned $12 and $13, respectively, on the 640- and 1,280-acre model farms. Thus, grain sorghum and corn were the first and second most profitable crops on both model farms. Summer fallow-winter wheat could not compete with grain sorghum for cropland use until wheat reached a price of $1.86 on the 640-acre farm and $1.92 per bushel on the 1,280-acre model farm.

Cash feed grain production became more profitable than either wheat or livestock production with the increase in corn price—feed production increased by about 10% and wheat production decreased slightly. The beef-cow herd was increased slightly, but the calves were sold as feeders rather than being raised to 700-pound weights. Thus, on the 640-acre farm, with wheat prices of 49 cents, grain sorghum was grown on about 76% of the cropland in Soils Group I-II. The balance of the cropland, about 70 acres, was devoted to summer fallow, winter wheat, corn, oats, and alfalfa. The corn and oats were sold on the cash market; wheat and the alfalfa hay were fed to cattle. All cropland in this soils group was not used for sorghum due to the following combination of factors: The family labor distribution during the year, the costs of hired labor and borrowed capital and the need for a supplementary feed supply.

As the wheat price increased to 94 cents per bushel, about 26 acres of corn and alfalfa shifted to summer fallow and winter wheat. Although wheat became more competitive with these crops, the main reason for this change was to allow labor to be shifted so that an additional 18 acres of sorghum could be grown. Some of the loss of feed production for the livestock enterprise was provided for by a change in the cropping system on the Group III-IV soils.

**Table 15. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Crop Rotation | Cropland Acres at the Following Wheat Prices $.36 to $.49 | $.94 to $1.11 | $1.50 to $1.63 | $1.73 to $1.85 | $1.86 to $2.43 | $3.26 to $3.41 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 46.1 | 14.2 | | | | |
| Sorghum | 228.4 | 246.8 | 245.4 | 212.1 | 4.3 | 2.6 |
| Summer Fallow, Winter Wheat | | 37.0 | 52.6 | 85.9 | 293.7 | 295.5 |
| Corn, Oats, Corn, Oats, Alfalfa (3 years) | 23.5 | | | | | |
| **Soil Group III-IV** | | | | | | |
| Grass | 30.6 | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 22.4 | 53.0 | 40.5 | | | |
| Summer Fallow, Winter Wheat, Oats, Oats | | | 12.5 | 5.8 | 5.8 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | 47.2 | 47.2 | |
| Summer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | | | | | | 53.0 |

At a wheat price of $1.50 per bushel, winter wheat on fallow returned $12.28 per acre, and thus became more profitable than corn on the 640-acre farm. As a result, a few additional acres of corn, oats, and alfalfa, in addition to 0.6 acre of grain sorghum, was shifted to summer fallow and winter wheat at wheat prices of $1.50 to $1.63 per bushel. As winter wheat became more profitable, returning $15.55 and $17.25 per acre at wheat prices of $1.73 and $1.85 per bushel, respectively, about 33 acres shifted from sorghum to summer fallow and winter wheat. But, with an increase to $1.86 per bushel for wheat, grain sorghum returned only 30 cents per acre more than winter wheat. A shift of almost 208 acres of grain sorghum, at this price, greatly reduced annual capital and credit use, as well as reducing annual labor use by 24%. Thus, at wheat prices of $1.86 to $2.43 per bushel, the crop distribution on Group I-II soils was 4.3 acres of forage sorghum and 146.85 acres in winter wheat and 146.85 acres summer fallow. An increase in price, to a range of $3.26 to $3.41 per bushel increased wheat and summer fallow acreage by only three-fourths of an acre each. Since summer fallow and winter wheat occupied 99% of the cropland, wheat production was almost at its maximum potential. The cropping pattern would remain constant unless the price of feed grains or livestock would increase enough to alter the relative profitability between feed grains and wheat, assuming the costs of production would remain the same. Winter wheat on fallow returned a net of $37.27 per acre at a price of $3.26 per bushel, compared with the returns from spring wheat of $32.83 per acre at the same price.

Farm plans were significantly different, on the 1,280-acre model farm, when the price of corn was raised to $1.12 from 85 cents per bushel. Feed grain production (for the cash market) increased by 43%, in contrast to the 10% increase on the 640-acre farm. Grain sorghum, returning $18.30 per acre, occupied 27.2% of the cropland of Soils Group I-II. Corn for grain, with net returns of $13, occupied 15% of the cropland, as did oats. Thus, at the lowest wheat prices, cash grain acreage amounted to 57.2% of the cropland; alfalfa hayland, 33.7%; and the remaining 9% was summer fallow and winter wheat. Wheat and the alfalfa hay were used as feed for a beef-cow herd of 155 cows.

With wheat rising in price, to the 54 to 97-cent range, the 196 acres in a seven-year rotation of corn, oats, and alfalfa shifted to an eight-year rotation, which included winter wheat and summer fallow, and continuous grain sorghum. Winter wheat-summer fallow became competitive with oats and thus induced this shift in crop acreage. However, net returns did not increase until the wheat price rose above 54 cents, but at this price, the capital requirements decreased, as did the annual labor needs which decreased by 9%. The increased income from wheat and feed grain sales were offset by the decrease in the beef-cow herd.

Summer fallow and winter wheat acreage increased by about 117 acres when wheat rose in price to $1.06 per bushel, and grain sorghum also increased by 98 acres. Thus, at a price of $1.06, wheat became half as profitable as corn grain and almost twice as profitable as oats. The shift in acreage, from the eight-year rotation, increased net returns, since acreage of the most profitable crop (grain sorghum) was increased. Grain sorghum acreage had been restricted by a labor limitation and could only be increased profitably by a shifting in crop acreage which also freed labor in the labor-limited periods. The shift in crop acreage, at the $1.06 per bushel wheat price, helped to increase net returns and lower the need for capital by 18.3% and labor use by 21%. A reduction in the beef-cow herd occurred as a result of increased production of cash grain. However, some of the loss in feed crop production was offset by a shift of tame pasture to an eight-year crop rotation on Group III-IV soils.

Raising the wheat price to $1.57 per bushel resulted in an increase of 44.6 acres of summer fallow and winter wheat, but when wheat reached a price of $1.92, all but 2.7 acres of sorghum shifted to summer fallow and winter wheat. At the $1.92 price, summer fallow-winter wheat returned $18.25 per acre, compared with $18.30 from grain sorghum. In addition to the increased net returns, capital requirements were reduced by 10% and labor use by about 17%. Thus, at this wheat price, over 99% of Group I-II soils was devoted to summer fallow-winter wheat, with most of the supplementary livestock being produced on Group III-IV soils. Wheat production, at this point, could be increased by only 38 bushels. Further increases in production beyond the one which occurred at the $2.32 wheat price would probably result in reduced farm income, since some of the cropland was used for the livestock enterprise, which otherwise would have to be reduced.

**Table 16. Crop Rotations by Soil Groups at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties**

| Crop Rotation | Cropland Acres at the Following Wheat Prices $.36 to $.53 | $.54 to $.97 | $1.06 to $1.33 | $1.57 to $1.64 | $1.95 to $2.31 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 185.0 | 302.5 | 11.6 | | | |
| Corn, Oats, Corn, Oats, Alfalfa (3 years) | 196.3 | | | | | |
| Sorghum | 142.7 | 221.5 | 319.4 | 283.5 | 2.7 | 2.4 |
| Summer Fallow, Winter Wheat | | | 193.0 | 240.5 | 521.3 | 521.6 |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | | | 93.0 | 93.0 | 93.0 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | | | 93.0 |

**Crop Production—Soils Group III-IV.** Livestock became a supplementary enterprise on the 640-acre farm, as cash grain production became the dominant farm enterprise when the corn price rose to $1.12 per bushel. Group III-IV soils, which provided tame pasture at the lower corn prices, now produced grain and hay for the cattle enterprise. About 58% of the acreage was devoted to tame pasture at wheat prices of 36 to 49 cents, but as the price was increased to 94 cents the tame pasture shifted to summer fallow-winter wheat-corn-oats-alfalfa (4-years). With a further rise in the wheat price, to $1.50 per bushel, wheat became more competitive with livestock and feed production. The result was a slight shift in production from alfalfa to wheat and oats and a reduction in the beef-cow herd.

With a wheat price increase to $1.73 per bushel, a shift in crop rotations occurred, but with only a minor effect on individual crop acreages (See Table 15). Winter wheat and alfalfa acreage and production remained about the same; corn acreage increased by about one and two-thirds acres and oats acreage decreased by the same amount. This cropping pattern remained constant on the 640-acre farm as wheat increased in price. But when wheat reached a price of $3.26 per bushel, the entire acreage of Group III-IV soils shifted to a rotation of summer fallow-winter wheat-spring wheat-spring wheat-oats. This crop rotation returned a net of $13.58 per acre, compared with continuous grain sorghum which returned $12.82 per acre.

Livestock was a much more important contributor to farm income on the 1,280-acre farm than on the 640-acre farm. Group III-IV soils were used as tame pasture at wheat prices up to 97 cents per bushel, as the grain and hay to be fed was produced on the Group I-II soils. As the wheat price continued to move up to $1.06, and to as high as $2.31, crop production on the Group I-II soils gradually shifted from cash feed grain production to cash wheat. Wheat and grain sorghum were now becoming more competitive with livestock. The result was that fewer acres of Group I-II soils were being used to produce livestock feed, so tame pasture was shifted to production of alfalfa hay. The shift of tame pasture was to an eight-year rotation of summer fallow-winter wheat-corn-oats-alfalfa (4-years). One year of alfalfa was eliminated when wheat reached a price of $2.32, thus making it a seven-year rotation. This, in effect, increased the acreage of summer fallow, winter wheat, corn, and oats on this soils group. Total livestock feed production, on both soils groups, was slightly reduced and, accordingly, the beef-cow herd was reduced by three cows.

The seven-year crop rotation was the most profitable rotation at the $2.32 wheat price. Wheat production could be increased by about 130% by using a five-year crop rotation of summer fallow-winter wheat-spring wheat- spring wheat-oats. However, the cost of producing a bushel of spring wheat in a rotation where spring wheat follows a small grain is $1.93 and the average yield on this soils group is only 6.7 bushels. However, as the wheat price rose beyond $2.32, the five-year rotation became more profitable. For example, when wheat was $3 per bushel, the five-year rotation returned $11.70 per acre, about the same as the eight-year rotation when grain sorghum was substituted for corn and alfalfa hay was credited with a market value of $15 per ton. With wheat at the highest price programmed, $3.60 per bushel, the five-year rotation returned over $2 per acre more than any other rotation allowed on this soils group. The rotation increased cash receipts by $1,294 and net income by $718.

**Livestock production.** The effect of an increase in corn price, without an increase in livestock price, is one of reduced net returns on the grain which is fed. Consequently, cash grain production increased in importance on both model farms and, as a result, slightly fewer cropland acres were used for feed crops at the lower wheat prices. Thus, some changes in the livestock enterprise occurred on both farms.

A beef-cow herd was maintained on both model farms at all wheat prices. Feeder calves were sold, farms at all wheat prices. Feeder calves were sold from the 640-acre farm at wheat prices of $1.11 and pound calves were sold.

The beef-cow herd size on the 1,280-acre farm was slightly reduced as the corn price rose from 85 cents to $1.12. Feeder calves were sold as a result of reduced feed production. As wheat increased in price, the size of the cow herd was gradually decreased. However, income from the cow herd decreased less slowly as an increasing number of calves were carried to the heavier 700-pound weights.

Little difference occurred in grains and roughages fed. Wheat was still fed at the lower wheat prices, but the forage sorghum, which was fed when corn was priced at 85 cents, was shifted to grain sorghum when the corn price was increased by 27 cents. Sorghum silage was not fed to cattle until wheat increased enough in price to become competitive with oats, corn, and grain sorghum.

## Labor

Labor was not expected to be a limited resource on either 640-acre or the 1,280-acre model farm. As farms increase in size and become more intensively farmed, capital substitutes for labor at an increasing rate. In addition, farmers work longer days as well as on Sundays to make up for labor lost due to wet or otherwise inclement weather. Often, some family labor is available, other than the operator himself, if only for emergency needs.

Results showed that total annual labor needs were neither a crucial nor a limiting factor—total labor was in surplus. The minimum annual labor requirements, on the 640-acre farm, amounted to 32% of the labor available and 51.5% on the 1,280-acre model farm. The maximum labor on the small farm was 68% of the available labor and 89% on the 1,280-acre farm.

The labor available during the planting and harvesting seasons was generally adequate to meet the needs. The minimum labor needed during these periods on the 640-acre farm was 36% of that available compared with 66% for the maximum use. The minimum labor needed for planting and harvesting on the 1,280-acre farm was 51%, compared with 85.4% for the maximum.

A relatively small amount of labor was hired on the 1,280-acre farm during the October 1 to November 15 and November 16 to March 15 labor periods. The maximum labor hired at the 71-cent corn price level was 51 hours, compared with 53 hours at a corn price of 85 cents. The labor was hired at the lower wheat prices when all available family labor had been used.

Labor restrictions did affect the cropping system. At relatively low wheat prices, continuous grain sorghum was the most profitable crop alternative at all three corn price levels. Thus, if labor were free and unlimited, only grain sorghum would be expected to be grown until the break even prices of the other crop alternatives were reached. However, since labor was neither free nor unlimited, the second best crop alternatives were selected after the maximum acreage of grain sorghum was planted.

Labor use by periods for the various wheat and feed grain price levels for each model farm is shown in Tables 17 and 18.

## Capital

Short-term capital and credit was assumed to be ample, and thus, was not a critical factor. The annual capital requirements varied between a low of $20,837 and a high of $52,448 on the 640-acre farm and between $48,833 and $77,754 on the larger farm when corn was priced at 71 cents.

The maximum capital requirements were reduced to $32,273, 38%, on the 640-acre farm as corn increased to a price of 85 cents, because purchased feeder calves were replaced by a beef-cow herd. The maximum capital requirements were again reduced as the corn price was increased to $1.12, but only by 9.4%.

The maximum capital requirements varied by less than 1% on the 1,280-acre farm when the price of corn was raised from 71 to 85 cents. With an increase to $1.12, however, the maximum capital required decreased by about 12%.

**Table 17. Resident Labor Use by Periods for the Optimum Farm Plan at Specified Wheat and Corn Prices, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Labor Periods | Corn Price per Bushel | Hours of Labor Available | Resident Labor Use at the Following Range of Wheat Prices $.36 to $.59 | $.60 to $.96 | $.97 to $.98 | $1.02 to $1.28 | $1.49 to $1.83 | $3.26 to $3.31 |
|---|---|---|---|---|---|---|---|---|
| | | | | | Hours | | | |
| Nov. 16 to March 15 | 71c | 802 | 583.0 | 598.3 | 367.2 | 295.5 | 249.2 | 170.9 |
| March 16 to April 30 | 71c | 409 | 221.2 | 222.8 | 126.9 | 99.4 | 94.5 | 88.7 |
| May 1 to July 15 | 71c | 837 | 381.8 | 383.7 | 271.1 | 248.0 | 273.8 | 208.9 |
| July 16 to Sept. 30 | 71c | 847 | 507.4 | 683.4 | 624.7 | 588.0 | 528.6 | 541.4 |
| Oct. 1 to Nov. 15 | 71c | 351 | 320.7 | 321.5 | 179.5 | 124.2 | 67.7 | 41.8 |
| | | | | | Hours | | | |
| **Total Annual** | **71c** | **3246** | **2014.1** | **2209.7** | **1569.4** | **1355.1** | **1213.8** | **1051.7** |
| | | | Resident Labor Use at the Following Range of Wheat Prices $.36 to $.61 | $.90 to $1 | $1.08 to $1.20 | $1.21 to $1.28 | $1.59 to $1.83 | $3.26 |
| | | | | | Hours | | | |
| Nov. 16 to March 15 | 85c | 802 | 355.6 | 350.4 | 295.5 | 295.5 | 249.2 | 170.9 |
| March 16 to April 30 | 85c | 409 | 135.4 | 132.5 | 99.4 | 99.4 | 94.5 | 88.7 |
| May 1 to July 15 | 85c | 837 | 631.6 | 630.8 | 486.4 | 248.0 | 273.8 | 208.9 |
| July 16 to Sept. 30 | 85c | 847 | 299.2 | 314.2 | 427.4 | 588.0 | 528.6 | 541.4 |
| Oct. 1 to Nov. 15 | 85c | 351 | 351.0 | 351.0 | 351.0 | 124.2 | 67.7 | 41.8 |
| | | | | | Hours | | | |
| **Total Annual** | 85c | 3246 | 1772.8 | 1778.9 | 1659.7 | 1355.1 | 1213.8 | **1051.7** |
| | | | Resident Labor Use at the Following Range of Wheat Prices $.36 to $.49 | $.94 to $1.11 | $1.50 to $1.63 | $1.73 to $1.85 | $1.90 to $2.43 | $3.26 to $3.41 |
| | | | | | Hours | | | |
| Nov. 16 to March 15 | $1.12 | 802 | 327.3 | 261.0 | 243.3 | 243.3 | 243.3 | 170.9 |
| March 16 to April 30 | 1.12 | 409 | 132.0 | 102.2 | 96.2 | 94.6 | 94.6 | 88.7 |
| May 1 to July 15 | 1.12 | 837 | 661.9 | 648.4 | 615.3 | 570.4 | 271.3 | 208.9 |
| July 16 to Sept. 30 | 1.12 | 847 | 281.9 | 280.2 | 312.6 | 334.9 | 536.4 | 541.4 |
| Oct. 1 to Nov. 15 | 1.12 | 351 | 351.0 | 351.0 | 351.0 | 351.0 | 66.3 | 41.8 |
| | | | | | Hours | | | |
| **Total Annual** | 1.12 | 3246 | 1754.1 | 1642.8 | 1618.4 | 1594.2 | 1211.9 | 1051.7 |

**Table 18. Resident Labor Use by Periods for the Optimum Farm Organization at Specified Wheat and Corn Prices, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Labor Periods | Corn Price per Bushel | Hours of Labor Available | Resident Labor Use at the Following Range of Wheat Prices $.36 to $.37 | $.53 to $.62 | $.96 to $1.09 | $1.20 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|---|---|
| | | | | | Hours | | | |
| Nov. 16 to March 15 | 71c | 1079 | 1079.0 | 1079.0 | 1079.0 | 628.7 | 592.1 | 560.3 |
| March 16 to April 30 | 71c | 567 | 445.3 | 449.8 | 420.5 | 231.2 | 217.3 | 211.4 |
| May 1 to July 15 | 71c | 1092 | 916.1 | 887.8 | 801.3 | 509.3 | 492.9 | 500.7 |
| July 16 to Sept. 30 | 71c | 1110 | 861.8 | 888.0 | 972.5 | 825.2 | 816.7 | 791.2 |
| Oct. 1 to Nov. 15 | 71c | 418 | 418.0 | 410.5 | 341.1 | 164.8 | 156.2 | 131.2 |
| | | | | | Hours | | | |
| **Total Annual** | **71c** | **4266** | **3720.2** | **3715.1** | **3614.4** | **2359.2** | **2275.2** | **2194.8** |
| | | | **Resident Labor Use at the Following Range of Wheat Prices** | | | | | |
| | | | **$.36 to $.76** | **$.81 to $.83** | **$1.04 to $1.16** | **$1.29 to $1.30** | **$1.31 to $1.38** | **$2.32 to $3.60** |
| | | | | | Hours | | | |
| Nov. 16 to March 15 | 85c | 1079 | 1079.0 | 1079.0 | 1079.0 | 628.7 | 592.1 | 560.3 |
| March 16 to April 30 | 85c | 567 | 446.2 | 447.8 | 420.5 | 231.2 | 217.3 | 211.4 |
| May 1 to July 15 | 85c | 1092 | 989.8 | 886.1 | 801.3 | 509.3 | 492.9 | 500.7 |
| July 16 to Sept. 30 | 85c | 1110 | 865.4 | 968.9 | 972.5 | 825.2 | 816.7 | 791.2 |
| Oct. 1 to Nov. 15 | 85c | 418 | 418.0 | 418.0 | 341.1 | 164.8 | 156.2 | 131.2 |
| | | | | | Hours | | | |
| **Total Annual** | 85c | 4266 | 3798.4 | 3799.8 | 3614.4 | 2359.2 | 2275.2 | 2194.8 |
| | | | **Resident Labor Use at the Following Range of Wheat Prices** | | | | | |
| | | | **$.36 to $.53** | **$.54 to $.97** | **$1.06 to $1.33** | **$1.57 to $1.64** | **$1.92 to $2.31** | **$2.32 to $3.60** |
| | | | | | Hours | | | |
| Nov. 16 to March 15 | $1.12 | 1079 | 971.8 | 919.0 | 578.6 | 569.7 | 581.7 | 560.3 |
| March 16 to April 30 | 1.12 | 567 | 409.5 | 360.4 | 220.0 | 214.9 | 215.6 | 211.4 |
| May 1 to July 15 | 1.12 | 1092 | 1065.6 | 999.8 | 885.2 | 827.9 | 510.6 | 500.7 |
| July 16 to Sept. 30 | 1.12 | 1110 | 871.7 | 739.0 | 614.0 | 639.3 | 790.9 | 791.2 |
| Oct. 1 to Nov. 15 | 1.12 | 418 | 418.0 | 418.0 | 418.0 | 418.0 | 123.8 | 131.2 |
| | | | | | Hours | | | |
| **Total Annual** | 1.12 | 4266 | 3736.6 | 3436.2 | 2715.8 | 2669.8 | 2209 | 2194.8 |

## SUMMARY

The purpose of this publication is to provide some results of a research study in which farm plans were determined for a 640-acre and a 1,280-acre model wheat farm in Aurora, Brule, Charles Mix, Gregory and Jerauld Counties.

Variable price and linear programming techniques were used to determine optimal farm plans at alternative price combinations of wheat and feed grains. Optimal farm plans were determined at three levels of corn prices ranging from a low of 71 cents to a high of $1.12 per bushel, while wheat prices were varied from zero to $3.60 per bushel.

Results of the linear programming indicate net returns would be greatest with a farm organization somewhat balanced between the production of cash grains and livestock at wheat prices below $1.50 per bushel. As wheat prices rose above $1.50 per bushel, the emphasis in production leaned more heavily toward wheat as a cash grain, with livestock becoming a supplementary enterprise.

The main cash crops were spring and winter wheat, oats, corn, and grain sorghum, each having a different break even price, depending upon the yield ratios and production costs on the two soils groups. Production costs were about the same or slightly lower on the 1,280-acre model farm; thus, the break even prices of the crop alternatives were similar to those on the 640-acre farm.

**The break even price is the key in knowing which crops are the most profitable at the various price levels. Given the objective to optimize net returns to land, labor, and management, the strategy is then to employ the break-even prices of each crop so as to obtain the maximum acreage of the most profitable crops on each soils group.**

The crops on Soils Group III-IV had a different set of break even prices, as the yields and costs were different. This soils group comprised 15% of the total cropland and could not contribute significantly to total wheat production. This was because rotations were somewhat more stringent than for Group I-II soils where productive capabilities differed.

Corn and grain sorghum were the two competing row crops. Grain sorghum, due to the comparative yield and cost of production, was the more profitable crop and, thus, had a lower break even price.[3] With relatively low wheat and feed grain prices, the main source of farm income came from the sale of livestock. The sale of feed grain became a secondary income source. An increase in feed grain price from 71 to 85 cents per bushel raised the net returns from grain sorghum to a level at which it could successfully compete with the relatively high cattle prices and wheat at medium price levels. Grain sorghum was produced as a cash grain, on the 640-acre model farm, until wheat reached a price of $1.20 per bushel, and on the 1,280-acre farm until wheat reached $1.16 per bushel. As the feed grain price rose to $1.12, grain sorghum could compete for cropland at much higher wheat prices. Grain sorghum was produced at a wheat price as high as $1.85 per bushel on the 640-acre farm, and on the 1,280-acre farm until wheat reached a price of $1.64 per bushel.

The maximum wheat acreage allowable amounted to 53% of the cropland acreage on the 640-acre farm and 51.5% on the 1,280-acre farm. The maximum wheat production possible was 4,595 bushels on the 640-acre farm and 8,077 bushels on the larger model farm. Both spring and winter wheat could be grown on Soils Group I-II and III-IV. About 94% of the potential wheat production was reached on the 640-acre farm at wheat prices of $1.49 to $1.90, depending upon the feed grain price. At wheat prices of $1.25 to $1.92 per bushel, 92 to 95% of the potential wheat production was reached on the 1,280-acre model farm, depending upon the feed grain price level.

Some wheat was produced at all prices, but at low prices it was fed to livestock. Whether corn, sorghum, or wheat is fed depends upon the relative prices. With corn priced at 71 cents per bushel, the total wheat production was fed to livestock at wheat prices of 59 cents per bushel and less on the 640-acre farm. On the 1,280-acre farm, wheat was fed when it was 37 cents per bushel. Some wheat was fed on the 1,280-acre farm at wheat prices as high as 62 cents. As the feed grain price increased to 85 cents per bushel, less wheat was produced at the low wheat prices on both farms. It was fed to livestock at wheat prices as high as $1 per bushel on the 640-acre farm and 83 cents on the 1,280-acre farm. Wheat production on both model farms continued to decline at the low wheat prices as the feed grain price was raised to $1.12 per bushel. Wheat continued to be used as feed at increasingly higher wheat prices as high as $1.11 per bushel on the 640-acre farm and up to $1.33 per bushel on the 1,280-acre model farm.

The livestock enterprise consisted mainly of raising calves to 700-pound weights, but some feeder calves were sold from both farms. Most of the calves were raised from a stock-cow herd; calves were purchased on the 640-acre farm at a feed grain price of 71 cents. Group III-IV soils were seeded for pasture on both farms at all feed grain price levels.

Labor was more fully utilized on the 1,280-acre farm than on the 640-acre farm. Minimum annual labor use on the 640-acre farm amounted to 32% of the available labor, compared with 51.5% on the 1,280-acre farm. Maximum annual labor use on the small farm was 68% compared with 89% on the large farm. Some labor was hired during the fall and early winter months. Labor restrictions affected the cropping system. Under conditions of low wheat prices and unlimited free labor, all or nearly all the cropland acreage would be planted to grain sorghum. However, even with hired labor during the harvesting periods, grain sorghum acreage was limited with the next best crop alternatives sharing some of the cropland.

The optimal farm plans presented herein are the results of computer programming using specific assumptions with regard to farm size, cropland acreage, crop yields, costs, commodity market prices, and other such factors. Consequently, these results cannot be construed as being representative of all 640-acre and 1,280-acre farms or a specific farm in this five-county area. The results, however, do present the most profitable farm plans under the stated assumptions and may serve as a guide for determining profitable farm plans under a similar cost and price structure.

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[3]Corn only was used in crop rotations to reduce the number of allowable alternatives and, thus, facilitate computer programming. An assumption was made that grain sorghum would substitute for corn in rotations which appeared in the farm plans, provided grain sorghum is the more profitable crop. Grain sorghum returned $4.47 on the 640-acre farm and $5.08 on the 1,280-acre farm at a corn price of 71 cents.

# APPENDIX

Appendix Table 1. Crops and Crop Rotations Allowed as Activities by Soils Group, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Rotation | Soil Groups I & II | III & IV |
|---|---|---|
| Corn | | |
| Sorghum | X | |
| Corn-Spring Wheat | X | |
| Corn-Oats | X | |
| Summer Fallow-Spring Wheat | X | |
| Summer Fallow-Winter Wheat | X | |
| Summer Fallow-Spring Wheat-Corn | X | |
| Corn-Oats-Corn-Oats-Alfalfa (2 years) | X | |
| Corn-Spring Wheat-Corn-Oats-Alfalfa (2 years) | X | |
| Summer Fallow-Spring Wheat-Corn-Oats | X | |
| Summer Fallow-Winter Wheat-Oats | X | |
| Corn-Corn-Corn-Oats-Alfalfa (3 years) | X | |
| Summer Fallow-Winter Wheat-Corn-Oats-Alfalfa (4 years) | X | X |
| Summer Fallow-Spring Wheat-Corn-Oats-Alfalfa (3 years) | X | X |
| Summer Fallow-Winter Wheat-Corn-Oats-Alfalfa (3 years) | X | X |
| Summer Fallow-Spring Wheat-Spring Wheat-Oats-Oats | | X |
| Summer Fallow-Spring Wheat-Oats-Oats | | X |
| Summer Fallow-Winter Wheat-Oats-Oats | | X |
| Summer Fallow-Winter Wheat-Spring Wheat-Spring Wheat-Oats | | X |
| Grass | | X |

Appendix Table 2. Cropland Use by Soil Groups at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Crop | Crop Acres at the Following Wheat Prices $.36 to $.59 | $.60 to $.96 | $.97 to $.98 | $1.02 to $1.28 | $1.49 to $1.83 | $3.26 to $3.31 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 35.7 | 31.3 | 6.9 | | | |
| Oats | 35.7 | 31.3 | 6.9 | | | |
| Alfalfa | 142.7 | 125.1 | 27.5 | | | |
| Sorghum | 12.6 | 47.7 | 29.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow | 35.7 | 31.3 | 113.7 | 138.6 | 148.0 | 147.7 |
| Winter Wheat | 35.7 | 31.3 | 113.7 | 138.6 | 148.0 | 147.7 |
| **Total Acres** | **298.1** | **298.0** | **298.0** | **297.9** | **298.1** | **298.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Corn | | | | | 6.6 | |
| Alfalfa | | | | | 26.5 | |
| Oats | | | | | 6.6 | 10.6 |
| Summer Fallow | | | | | 6.6 | 10.6 |
| Winter Wheat | | | | | 6.6 | 10.6 |
| Spring Wheat | | | | | | 21.2 |
| **Total Acres** | **53.0** | **53.0** | **53.0** | **53.0** | **52.9** | **53.0** |

Appendix Table 3. Cropland Use by Soil Groups at Various Levels of Wheat Prices and 71 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Crop | Crop Acres at the Following Wheat Prices $.36 to $.37 | $.53 to $.62 | $.96 to $1.09 | $1.20 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 123.2 | 92.0 | 53.6 | 3.4 | 2.0 | |
| Oats | 68.9 | 67.1 | 53.6 | 3.4 | | |
| Alfalfa | 248.4 | 255.7 | 214.4 | 13.7 | | |
| Summer Fallow | 41.7 | 54.6 | 91.6 | 246.2 | 255.7 | 260.8 |
| Winter Wheat | 41.7 | 54.6 | 91.6 | 246.2 | 255.7 | 260.8 |
| Sorghum | | | 19.2 | 11.2 | 10.5 | 2.4 |
| **Total Acres** | **523.9** | **524.0** | **524.0** | **524.1** | **523.9** | **524.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Corn | | | | 6.1 | 8.4 | 13.3 |
| Oats | | | | 6.1 | 8.4 | 13.3 |
| Alfalfa | | | | 24.4 | 33.4 | 39.8 |
| Summer Fallow | | | | 6.1 | 8.4 | 13.3 |
| Winter Wheat | | | | 6.1 | 8.4 | 13.3 |
| **Total Acres** | **93.0** | **93.0** | **93.0** | **93.0** | **93.1** | **93.0** |

Appendix Table 4. Cropland Use by Soil Groups at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Crop | Crop Acres at the Following Wheat Prices $.36 to $.61 | $.90 to $1 | $1.08 to $1.20 | $1.21 to $1.28 | $1.59 to $1.83 | $3.26 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 10.1 | 8.9 | | | | |
| Oats | 10.1 | 8.9 | | | | |
| Alfalfa | 40.4 | 35.6 | | | | |
| Sorghum | 217.2 | 222.6 | 186.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow | 10.1 | 11.0 | 55.9 | 138.6 | 148.0 | 147.7 |
| Winter Wheat | 10.1 | 11.0 | 55.9 | 138.6 | 148.0 | 147.7 |
| **Total Acres** | **298.0** | **298.0** | **298.1** | **297.9** | **298.1** | **298.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Corn | | | | | 6.6 | |
| Oats | | | | | 6.6 | 10.6 |
| Alfalfa | | | | | 26.6 | |
| Summer Fallow | | | | | 6.6 | 10.6 |
| Winter Wheat | | | | | 6.6 | 10.6 |
| Spring Wheat | | | | | | 21.2 |
| **Total Acres** | **53.0** | **53.0** | **53.0** | **53.0** | **53.0** | **53.0** |

Appendix Table 5. Cropland Use by Soil Groups at Various Levels of Wheat Prices and 85 Cents per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory and Jerauld Counties

| Crop | Crop Acres at the Following Wheat Prices $.36 to $.76 | $.81 to $.83 | $1.04 to $1.16 | $1.23 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 162.4 | 92.5 | 53.6 | 3.4 | 2.0 | |
| Oats | 70.5 | 63.9 | 53.6 | 3.4 | | |
| Alfalfa | 236.3 | 241.5 | 214.4 | 13.7 | | |
| Summer Fallow | 24.6 | 49.7 | 91.6 | 246.2 | 255.7 | 260.8 |
| Winter Wheat | 24.6 | 49.7 | 91.6 | 246.2 | 255.7 | 260.8 |
| Sorghum | 5.5 | 26.8 | 19.2 | 11.2 | 10.5 | 2.4 |
| **Total Acres** | **523.9** | **524.1** | **524.0** | **524.1** | **523.9** | **524.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Corn | | | | 6.1 | 8.4 | 13.3 |
| Oats | | | | 6.1 | 8.4 | 13.3 |
| Alfalfa | | | | 24.4 | 33.4 | 39.8 |
| Summer Fallow | | | | 6.1 | 8.4 | 13.3 |
| Winter Wheat | | | | 6.1 | 8.4 | 13.3 |
| **Total Acres** | **93.0** | **93.0** | **93.0** | **93.0** | **93.1** | **93.0** |

Appendix Table 6. Cropland Use by Soil Groups at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

| Crop | Crop Acres at the Following Wheat Prices $.36 to $.49 | $.94 to $1.11 | $1.50 to $1.63 | $1.73 to $1.85 | $1.86 to $2.43 | $3.26 to $3.41 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 9.7 | 1.8 | | | | |
| Oats | 9.7 | 1.8 | | | | |
| Alfalfa | 34.8 | 7.1 | | | | |
| Sorghum | 228.4 | 246.8 | 245.4 | 212.1 | 4.3 | 2.6 |
| Summer Fallow | 5.8 | 20.3 | 26.3 | 43.0 | 146.8 | 147.7 |
| Winter Wheat | 9.7 | 20.3 | 26.3 | 43.0 | 146.8 | 147.7 |
| **Total Acres** | **298.1** | **298.1** | **298.0** | **298.1** | **297.9** | **298.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 30.6 | | | | | |
| Corn | 2.8 | 6.6 | 5.1 | 6.7 | 6.7 | |
| Oats | 2.8 | 6.6 | 11.3 | 9.6 | 9.6 | 10.6 |
| Alfalfa | 11.2 | 26.5 | 20.2 | 20.2 | 20.2 | |
| Summer Fallow | 2.8 | 6.6 | 8.2 | 8.2 | 8.2 | 10.6 |
| Winter Wheat | 2.8 | 6.6 | 8.2 | 8.2 | 8.2 | 10.6 |
| Spring Wheat | | | | | | 31.2 |
| **Total Acres** | **53.0** | **52.9** | **53.0** | **52.9** | **52.9** | **53.0** |

**Appendix Table 7. Cropland Use by Soil Groups at Various Levels of Wheat Prices and $1.12 per Bushel for Corn, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory and Jerauld Countes**

| Crop | Crop Acres at the Following Wheat Prices: $.36 to $.53 | $.54 to $.97 | $1.06 to $1.33 | $1.57 to $1.64 | $1.92 to $2.32 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|
| **Soil Group I-II** | | | | | | |
| Corn | 79.2 | 37.8 | 1.4 | | | |
| Oats | 79.2 | 37.8 | 1.4 | | | |
| Alfalfa | 176.6 | 151.2 | 5.8 | | | |
| Summer Fallow | 23.1 | 37.8 | 98.0 | 120.3 | 260.7 | 260.8 |
| Winter Wheat | 23.1 | 37.8 | 98.0 | 120.3 | 260.7 | 260.8 |
| Sorghum | 142.7 | 221.5 | 319.4 | 283.5 | 2.6 | 2.4 |
| **Total Acres** | **523.9** | **523.9** | **524.0** | **524.1** | **524.0** | **524.0** |
| **Soil Group III-IV** | | | | | | |
| Grass | 93.0 | 93.0 | | | | |
| Corn | | | 11.6 | 11.6 | 11.9 | 13.3 |
| Oats | | | 11.6 | 11.6 | 11.9 | 13.3 |
| Alfalfa | | | 46.5 | 46.5 | 45.1 | 39.8 |
| Summer Fallow | | | 11.6 | 11.6 | 11.9 | 13.3 |
| Winter Wheat | | | 11.6 | 11.6 | 11.9 | 13.3 |
| **Total Acres** | **93.0** | **93.0** | **92.9** | **92.9** | **92.7** | **93.0** |

**Appendix Table 8. Crop Rotations on All Soil Groups at Specified Wheat and Corn Prices, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Crop Rotation | Corn Price per Bushel | Range of Wheat Prices per Bushel: $.36 to $.59 | $.60 to $.96 | $.97 to $.98 | $1.02 to $1.28 | $1.49 to $1.83 | $3.26 to $3.31 |
|---|---|---|---|---|---|---|---|
| Grass | 71c | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 71c | 285.4 | 250.3 | 55.1 | | 53.0 | |
| Sorghum | 71c | 12.6 | 47.7 | 29.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow, Winter Wheat | 71c | | | 213.7 | 277.3 | 295.9 | 295.5 |
| Summer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | 71c | | | | | | 53.0 |

Appendix Table 8 —

| Crop Rotation | Corn Price per Bushel | Range of Wheat Prices per Bushel: $.36 to $.61 | $.90 to $1 | $1.08 to $1.20 | $1.21 to $1.28 | $1.59 to $1.83 | $3.26 |
|---|---|---|---|---|---|---|---|
| Grass | 85c | 53.0 | 53.0 | 53.0 | 53.0 | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 85c | 80.8 | 71.2 | | | 53.0 | |
| Sorghum | 85c | 217.2 | 222.6 | 186.3 | 20.7 | 2.1 | 2.6 |
| Summer Fallow, Winter Wheat | 85c | | 4.2 | 111.7 | 277.3 | 295.9 | 295.5 |
| Summer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | 85c | | | | | | 53.0 |

| Crop Rotation | Corn Price per Bushel | Range of Wheat Prices per Bushel: $.36 to $.49 | $.94 to $1.11 | $1.50 to $1.63 | $1.73 to $1.85 | $1.86 to $2.43 | $3.26 to $3.41 |
|---|---|---|---|---|---|---|---|
| Grass | $1.12 | 30.6 | | | | | |
| Corn, Oats, Corn, Oats, Alfalfa (3 years) | 1.12 | 23.5 | | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 1.12 | 68.5 | 67.2 | 40.5 | | | |
| Sorghum | 1.12 | 228.4 | 246.8 | 245.4 | 212.1 | 4.3 | 2.6 |
| Summer Fallow, Winter Wheat, Oats, Oats | 1.12 | | | 12.5 | 5.8 | 5.8 | |
| Summer Fallow, Winter Wheat | 1.12 | | 37.0 | 52.6 | 85.9 | 293.7 | 295.5 |
| Summer Fallow, Winter Wheat | 1.12 | | 37.0 | 52.6 | | 293.7 | 295.5 |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | 1.12 | | | | 47.2 | 47.2 | |
| Summer Fallow, Winter Wheat, Spring Wheat, Spring Wheat, Oats | 1.12 | | | | | | 53.0 |

**Appendix Table 9. Crop Rotations on All Soil Groups at Specified Wheat and Corn Prices, 1,280-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties**

| Crop Rotation | Corn Price per Bushel | Range of Wheat Prices per Bushel $.36 to $.37 | $.53 to $.62 | $.96 to $1.09 | $1.20 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|---|
| Corn, Corn, Corn, Oats, Alfalfa (3 years) | 71c | 190.2 | 87.3 | | | | |
| Grass | 71c | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 71c | 333.8 | 436.7 | 428.7 | 76.2 | 66.9 | |
| Sorghum | 71c | | | 19.2 | 11.2 | 10.5 | 2.4 |
| Summer Fallow, Winter Wheat | 71c | | | 76.1 | 485.5 | 511.5 | 521.6 |
| Corn | 71c | | | | | 2.0 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | | | | 93.0 |

| | | Range of Wheat Prices per Bushel $.36 to $.76 | $.81 to $.83 | $1.04 to $1.16 | $1.23 to $1.24 | $1.25 to $1.38 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|---|
| Corn, Corn, Corn, Oats, Alfalfa (3 years) | 85c | 321.4 | 99.8 | | | | |
| Grass | 85c | 93.0 | 93.0 | 93.0 | 44.2 | 26.1 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 85c | 197.1 | 397.4 | 428.7 | 76.2 | 66.9 | |
| Sorghum | 85c | 5.5 | 26.8 | 19.2 | 11.2 | 10.5 | 2.4 |
| Summer Fallow, Winter Wheat | 85c | | | 76.1 | 485.5 | 511.5 | 521.6 |
| Corn | 85c | | | | | 2.0 | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (3 years) | | | | | | | 93.0 |

| | | Range of Wheat Prices per Bushel $.36 to $.53 | $.54 to $.97 | $1.06 to $1.33 | $1.57 to $1.64 | $1.92 to $2.31 | $2.32 to $3.60 |
|---|---|---|---|---|---|---|---|
| Corn, Oats, Corn, Oats, Alfalfa, (3 years) | $1.12 | 196.3 | | | | | |
| Grass | 1.12 | 193.0 | 93.0 | | | | |
| Summer Fallow, Winter Wheat, Corn, Oats, Alfalfa (4 years) | 1.12 | 185.0 | 302.5 | 104.6 | 93.0 | 73.1 | |
| Sorghum | 1.12 | 142.7 | 221.5 | 319.4 | 283.5 | 2.6 | 2.4 |
| Summer Fallow, Winter Wheat | 1.12 | | | 193.0 | 240.5 | 521.5 | 521.6 |
| Summer Fallow, Winter Wheat, Corn, Oats Alfalfa (3 years) | 1.12 | | | | | 19.9 | 93.0 |