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Machinery Costs on Typical Wheat Farms in Central South Dakota: Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

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July 1968

Machinery Costs on Typical Wheat Farms

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

In Central
South
Dakota

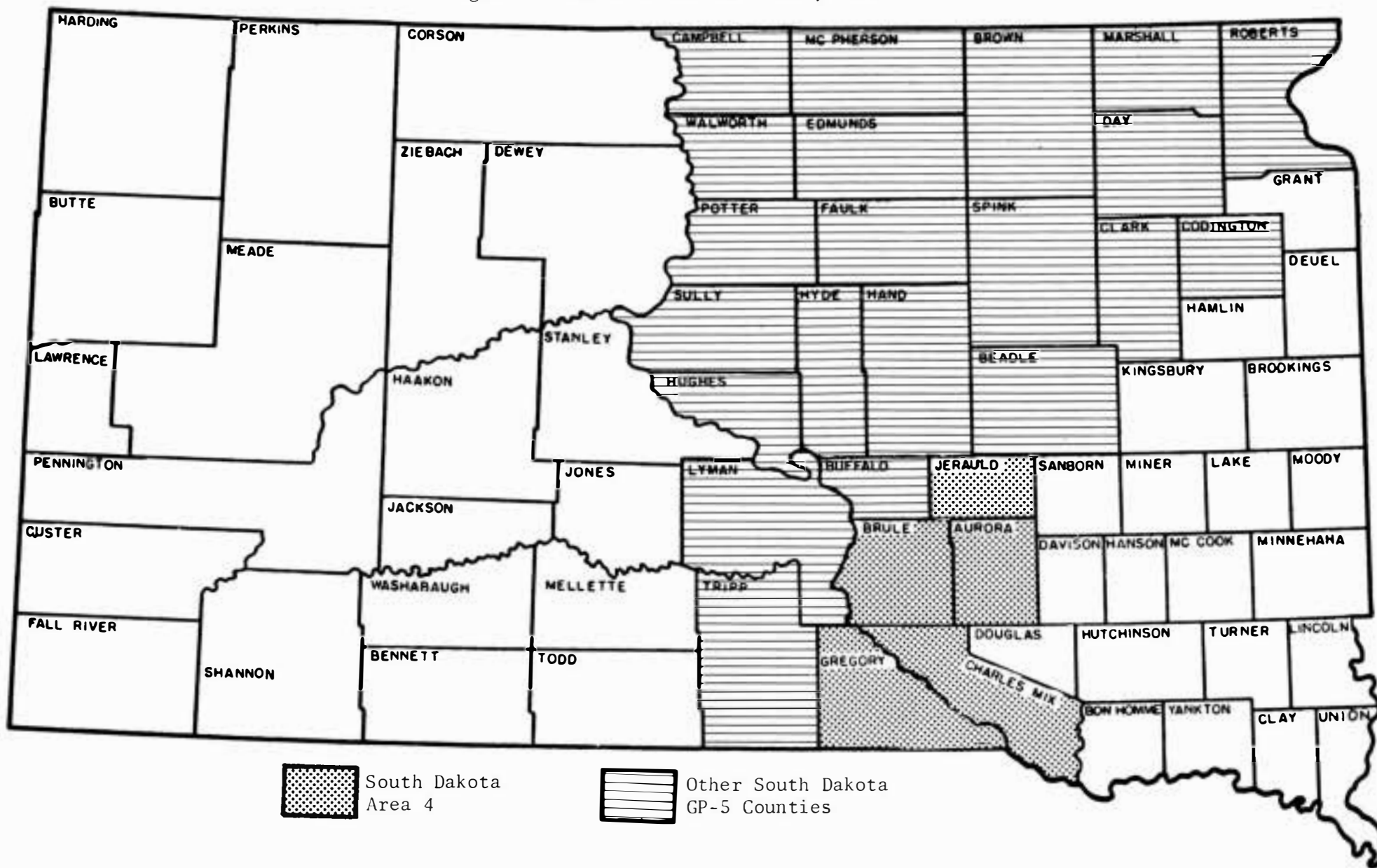
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*Department of Economics in Cooperation With
Farm Production Economics Division,
Economic Research Service
U. S. Department of Agriculture*

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Figure 1. South Dakota GP-5 Study Area



PREFACE

The data presented in this report were gathered and compiled in 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 and to make 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 are simultaneously being conducted in most of the other Great Plains States. Specific objectives as stated in the regional research project are:

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.
4. To estimate wheat supply potentials for non-domestic wheat producers under varying economic and political conditions in international areas.

The South Dakota study area included 26 counties in Central South Dakota (Figure 1). This area normally accounts for about 68 per cent of the state's wheat acreage, 43 per cent of the feed grain acreage, 60 per cent of the flax acreage and about 55 per cent 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, from the South Dakota State University Economics Department, and actual cost data from machine dealers and insurance agents.

HOW THIS DATA MAY BE USED

Information gathered on machine costs for the model farm in Area 4 (Figure 1) for this publication should prove useful in planning and budgeting work and should be helpful in other production and farm management studies.

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DESCRIPTION OF AREA 4

AURORA, BRULE, CHARLES MIX, GREGORY, AND JERAULD COUNTIES

SOILS

The soils of this five-county area are both Chernozem and Chestnut soils. The Chestnut soils, found in a part of Brule County and the western half of Jerauld County, have darker soil surface colors than those in the southern plains areas.

One of the two Chestnut soils in this five-county area is a small area of Pierre-Promise in northwestern Brule County. The Pierre soils are undulating to steep and are well to excessively drained. The major problems associated with Pierre soils are: (1) maintenance of organic matter and nitrogen supply, (2) moisture conservation, (3) control of water erosion or run-off, and (4) maintenance of stock water. The major soil uses are cash grain farming and ranching.

Raber-Eakin soils, in western Jerauld County, the other Chestnut group in the five-county area, are undulating grayish-brown loams, clay loams, and

silt loams. The Raber soils developed from clay loam till and the Eakin soils developed from loess over till. Major soil and water problems of Raber-Eakin soils are: (1) maintenance of organic matter and the supply of nitrogen, (2) maintenance of soil fertility, (3) moisture conservation, and (4) control of run-off and water erosion. Cash grain farming and ranching are best suited to the Raber-Eakin soils with the specific land use restricted by land topography.

Boyd-Hamill soils are undulating to steep and are well to excessively drained. These grayish-brown clays are developed from Cretaceous marine clays. The Holt-Valentine series, also undulating and well drained, are dark grayish-brown to grayish-brown loamy and sandy soils. These soils are developed from calcareous loamy and sandy beds of Tertiary age and are medium to high in natural fertility. The Boyd and the Holt soils are Chernozems. Major problems are: (1) maintenance of organic matter and nitrogen, (2) moisture conservation, and (3) control of wind erosion. The major uses are general farming and livestock.

The Houdek-Bonilla series, also Chernozem soils, are undulating to nearly level and are moderately well drained. Developed from calcareous loam till, these loams are dark grayish-brown and 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.

Reliance soils, found in Brule and Charles Mix Counties, are sloping, well drained, dark grayish-brown, slightly acid, silty clay loams. These Chernozem soils developed from moderately fine textured calcareous loess. Major problems are: (1) maintenance of organic matter and nitrogen supply, and (2) moisture conservation. Major soil use for Reliance soils is general farming.

The Bonilla-Cavour soils of Aurora County respond to nitrogen. These Chernozem soils are nearly level, moderately well drained, very dark grayish-brown, and slightly acidic. Major problems in soil and water management are: (1) moisture conservation and (2) slow permeability and seasonal ponding in low lying areas. The major soil use, similar to Reliance soils, is general farming.

TYPE OF FARMING CHARACTERISTICS

The average size farm in this five-county area was approximately 668 acres (varying from an average of 540 acres in Charles Mix County to 956 acres in Brule). There were 3,869 farms in the five-county area, according to the 1964 census, of which 70.6 per cent were classified as livestock farms (including ranches). Of the remaining, 8.8 per cent were cash grain, 7.5 per cent were general farms, and 13.1 per cent were poultry, dairy, and miscellaneous farms.

The Aurora, Brule, Charles Mix, Gregory and Jerauld County area was a

major cash crop producing region.. Wheat, flax, rye and soybeans accounted for about 10 per cent of the land allocated to cultivated cash crops in 1964 (wheat occupied 9.0 per cent of the cropland and the other three crops slightly less than 1.3 per cent). Corn grain, grain sorghum and oats were of major importance as cash crops. In 1964, 75.9 per cent of the corn acreage was harvested as grain. Of this production, 30.2 per cent was sold. Oats also was important--36.8 per cent of what was harvested was sold. This five-county area accounted for 36.7 per cent of the state's grain sorghum production in 1964. Almost 46 per cent of the grain sorghum harvested was sold off the farm.

Table 1 shows the number of farmers in the five-county area that raised and harvested the major crops in 1964.

Table 1. Number and Per Cent of Farms That Raised and Harvested Major Grain Crops in 1964 in Aurora, Brule, Charles Mix, Gregory and Jerauld Counties

	No. of Farms	Percentage of Farms	Number of Acres Harvested	Percentage of Acres Harvested
Corn ^{1/}	3,091	79.9	351,540	49.6
All Wheat ^{2/}	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 ^{3/}	1,723	44.5	96,131	13.6
Other ^{4/}			9,492	1.3

^{1/} Includes corn harvested for grain, silage and other purposes.

^{2/} Includes 28,311 acres of winter wheat and 889 acres of durum.

^{3/} Includes sorghum harvested for grain, silage and other purposes.

^{4/} Includes emmer and speltz, flax, proso, rye and soybeans.

Source: U.S. Census of Agriculture, 1964.

Livestock was important in this area, particularly with the large acreages of corn and oats. Over 90 per cent of the farms in this area kept livestock, although some of the livestock enterprises produced strictly for home consumption.

Cattle feeding was far more common than in the other study areas. Beef-cow herds with from 30 to 75 cows also were common. Dairy enterprises were common too, although herds were relatively small (the 1964 census showed the herd size to average slightly less than 8 cows, including dairy cows kept strictly for home consumption).

Sow numbers in 1964, which included those that had farrowed or were to have farrowed, averaged 17 head per farm. Thirty-four per cent of the farms, which reported they had sows in 1964, farrowed between 10 and 19 litters-- 37 per cent farrowed 20 or more litters. Forty-six per cent of the farms in the five-county area maintained a sow herd.

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

MODEL WHEAT FARMS AND BASIS FOR MACHINERY COSTS

Two farms were selected as being wheat farms in the Aurora, Brule, Charles Mix, Gregory and Jerauld County area. One was a 640-acre farm with 351 acres of cropland and 255 acres of native hay and pasture. The other, a 1,280-acre farm, had 617 acres of cropland and 613 acres of native hay and pasture. The average farm size for this five-county area was calculated at 667.5 acres. The 1964 Census of Agriculture showed 84 per cent of the area's farms were less than 1,000 acres in size (20.2 per cent of the farms were below 260 acres in farmland, 30.4 per cent were between 260 and 499 acres, 33.4 per cent were between 500 and 999 acres, 16 per cent were 1,000 acres or more and only 3.5 per cent were 2,000 acres or more).

The model farms, serving as the basis for determining machine costs and labor use had the following crops:

Crop	Model Farm		Crop	Model Farm	
	640	1280		640	1280
	Acres			Acres	
Hard Wheat	48	46	Summer Fallow	14	19
Oats and Other			Alfalfa	50	170
Small Grain	63	89	Other Tame Hay		
Corn Grain	84	142	and Pasture	23	25
Corn Silage	51	58	Native Hay	89	225
Sorghum Grain	7	14	Native Pasture	166	388
Sorghum Silage	6	27			

The machinery and implements listed in Tables 2 and 3 represent those most frequently found on the group of farms from which the models or representative farms were determined. Occasionally, in this study, an arbitrary judgment was necessary in selecting the size or type of machinery or implement.

PURCHASE PRICE

The purchase price of machinery (in Tables 2 and 3) represents the "average" price of major models of the particular implement or machine listed. The price listed assumes only standard equipment was used. Extras or optional features such as power steering on tractors were not included.

USEFUL LIFE

The standard depreciation schedule (see 1964 Agricultural Engineers Year-book), widely used as a guide by agricultural engineers and others, served as a base in determining depreciation costs.

Since depreciation is a function of use, obsolescence, or a combination of both, depreciation costs were determined either on the hours of use or the useful life in years, whichever was least.

MACHINE COSTS

Farm operators and others concerned with the development of farm budgets must consider two important aspects of machine costs: (1) total annual machine costs and, (2) machine costs per unit of production of the various individual crop enterprises.

Total annual machine costs represent a major portion of the total annual farm expenses, and thus are of primary importance in determining net farm income. Annual machine costs include fixed costs (often termed ownership costs) and variable costs. Fixed costs are those which remain relatively constant from year to year, regardless of the amount of use of the machine; variable costs depend directly upon the amount of use.

The allocation of machine costs to individual enterprises requires that these costs be expressed in terms of costs per hour or per acre for the types of machine operations used. Machine costs per unit of individual enterprises are necessary considerations in determining the most profitable organization of the farm business.

Total annual costs for each machine assumed for the 640-acre model farm, as well as per acre and per hour machine operations costs are presented in Tables 4 through 9. Tables 10 through 15 contain similar machine cost data for the 1,280-acre model farm. The costs shown in these tables were determined on the basis of the model farms having specific crop acreages. The 640-acre farm was assumed to have had 111 acres of small grain, 148 acres of row crops, 14 acres of summer fallow, two cuttings of hay from 50 acres of alfalfa, and one cutting on 89 acres of native hay. The 1,280-acre farm had 135 acres of small grain, 241 acres of row crops, 19 acres of summer fallow, two cuttings from 170 acres of alfalfa, and one cutting on 225 acres of native hay.

FIXED COSTS

Fixed machine costs include depreciation, interest on investment, insurance, and taxes. Total annual fixed costs are constant for any given year, without regard to the amount of use during that year. However, when this fixed sum is charged as a cost against crops, the cost per hour, per acre, or unit of output may show a variation with the amount of use.

Depreciation--Depreciation in this study is recognized as a cost since "wear and tear" due to use necessitates eventual replacement. New innovations

Table 2. Size, Purchase Price, Expected Useful Life, and Annual Use of Machinery on a Hypothetical 640-Acre Model Farm in the Aurora, Brule, Charles Mix, Gregory, and Jerauld County Area^{1/}

Machine	Size	Purchase Price ^{2/}	Useful Life ^{3/}		Annual Use	
		Dollars	Years	Hours	Acres	Hours
Tractor	2-Plow	\$2,830	25	12,000	1,348	246
Tractor	3-Plow	3,475	20	12,000	1,581	604
Moldboard Plow	3-14-Inch	480	19	2,500	210	130
Single Disc	15-Foot	560	25	2,500	298	54
Spring Tooth Harrow	4-Sect.	400	30	2,000	57	11
Drag Harrow	5-Sect.	150	30	2,500	399	40
Drill	12-Foot	1,900	30	1,200	48	11
Endgate Seeder		150	30	800	63	6
Swather PTO	12-Foot	1,075	20	1,200	111	22
Combine PTO	6-Foot	2,565	15	2,000	118	59
Corn Planter	4-Row	1,200	25	1,200	96	19
Corn Lister	2-Row	605	25	1,200	52	22
Corn Tender	2-Row	250	20	2,500	52	17
Corn Cultivator	2-Row	250	20	2,500	296	98
Cornpicker	2-Row	2,675	15	2,000	84	50
Forage Harvester	1-Row	2,474	15	2,000	57	60
Mower	7-Foot	475	20	2,000	208	62
Dump Rake	10-Foot	270	30	2,500	208	40
Two Trailers or Wagons		600	25		146	73
Farmhand & Attachments		800	25		167	50
Sprayer	30-Foot	450	30	1,500	259	26

^{1/} Representative farm size is 640 acres with 351 acres of cropland.

^{2/} Approximate new cost in 1964.

^{3/} Agricultural Engineers Yearbook.

and methods of tillage, planting, or harvesting also necessitate replacement of outmoded or obsolete machinery.

Interest--Interest often is not easily recognized or understood as a cost, unless funds are borrowed and an interest rate actually is charged for the use of borrowed money. In this study, a 7 per cent interest rate was charged on the "average annual investment" as a cost of machine ownership. Even if a farm operator has full equity in an implement or machine, and thus pays no direct interest charge, his capital is frozen. Normally, there are alternative uses for these funds, either in other farm enterprises or in non-farm investments, which may yield an even greater rate of return. This could be especially true with respect to harvesting equipment, particularly if the harvested acreage is relatively small and custom harvesting can be obtained when needed. For example, the investment in the forage harvester assumed for the model farm (Table 2) freezes the purchase cost of \$2,474. If placed in a savings account, this would return about \$111 per year at an interest rate of 4½ per cent. Perhaps, after adding up the earned interest and costs of the forage harvest operation (including the prorated tractor costs) the farm operator will find it more economical to hire the job done.

Insurance and Taxes--Insurance and personal property taxes are cash costs which do not vary with the amount a machine is used during the year, and thus are considered fixed costs. Insurance, as such, is not a required expenditure.

However, since losses do occasionally occur, and if insurance is not actually carried, an amount sufficient to cover the expected annual rate of loss must be included as a cost.

Allocation of Fixed Costs--Each category of fixed costs can be allocated to individual enterprises in the same manner. The allocation of annual depreciation costs, for example, among individual enterprises requires a conversion of the annual cost to an hourly depreciation cost, which is based upon the expected number of hours of use of the machine during the year. Hourly depreciation charges, coupled with machine time requirements per acre, are then used to establish depreciation charges per acre for each crop enterprise.

Fixed Costs on the Model Farm--Fixed costs, with few exceptions, are considerably higher than variable costs for individual machines and implements. This may be illustrated by the examples in the following tabulation:

FIXED COSTS EXAMPLES

Implement	Purchase Price	Number of Acres Covered	Per Cent of Total Costs Per Acre	
			Fixed	Variable
Moldboard Plow	\$ 520	310	29.3%	70.7%
Single Disc	560	298	59.8	40.2
Spring Tooth Harrow	500	116	84.6	15.4
Corn Planter	1,200	96	87.9	12.1
Combine	2,565	118	80.9	19.1
Combine	5,890	149	83.6	16.4
Cornpicker	2,675	84	83.3	16.7
Cornpicker	2,675	142	74.6	25.4
Forage Harvester	2,474	57	77.2	22.8
Forage Harvester	2,755	85	80.6	19.4

Recovering fixed machine costs to insure a profitable long run operation is not important over the short-run. It is important in the long run, however, that fixed costs be covered from the standpoint of replacing worn-out and obsolete machinery. In an era of increasing costs and rapidly changing technology it becomes increasingly important to reduce machine costs as much as possible; particularly so, for machine items which have a high original cost such as tractors and harvesting equipment. Since total annual fixed costs remain the same, fixed-machine costs can effectively be reduced per acre or per unit of production by spreading these costs over as many acres as possible.

To own and use machinery with a capacity greater than is actually needed, on a given acreage, will needlessly raise both the fixed and variable costs. Whether or not the reduction in the amount of labor and machine time will offset the increase in machine costs is questionable. To illustrate the increase in per acre machine costs which results when larger machines are used without an increase in acreage, the following tabulation contains machine costs for selected sizes of tractors and combines:

EXAMPLES

Machine	Acres Covered	Machine Costs ^{1/}		Per Cent Increase
		Annual	Per Acre	
Tractor, 3-Plow	1,256	\$ 563.74	\$0.45	%
Tractor, 4-Plow	1,256	715.89	.57	26.7
Tractor, 5-Plow	1,256	890.92	.71	57.8
Combine, 6-Foot	187	350.98	1.88	
Combine, 9-Foot	187	483.09	2.58	37.2
Combine, 12-Foot	187	790.01	4.22	124.5
Combine, 14-Foot S.P.	187	1,158.76	6.20	229.8

^{1/} Includes depreciation, interest, taxes, insurance, and repairs.

VARIABLE COSTS

In contrast to fixed costs, annual variable costs depend directly upon the amount of use during the year. When machine use increases from, 800 acres to 1,000 acres, the variable costs per acre will remain the same but total annual variable costs will increase by 25 per cent. This is in contrast to fixed costs which are reduced 20 per cent on the per acre basis while total annual fixed costs remain the same.

Variable machine costs include repairs, fuel, oil, and lubricants. These costs have been first expressed as hourly costs for each machine or type of operation. Time requirements for each operation and machine are then used to convert the variable costs of each enterprise into per acre costs and total annual variable costs.

MACHINE COSTS BY CROPS

The cost-data and machine-time requirements can be used to determine the costs per acre (or unit of production) for each crop.

The costs for the 640-acre farm (Tables 5 through 9), and those for the 1,280-acre farm (Tables 11 through 15) were used in preparation of Tables 16 and 17. These costs are subject to change as the acreage of small grains, row crops, summer fallow, and hay changes. With only a small change in acreage, there will be only a negligible increase or decrease in the fixed costs and hence the cost data will still be reasonably accurate.

Tables 16 and 17 were produced using specific assumptions with regard to tillage practices. A governing assumption was one of "minimum tillage," which included fall or spring plowing and a tandem discing for small grains and row crops, and two cultivations on row crops. Other assumptions included a discing for row crops harvested for grain and fall plowing of alfalfa.

SUMMARY

Machine costs for these "representative wheat farms" were developed under assumptions which included specific crop acreages, tillage practices, and purchase costs of new machinery. Significant changes in fixed costs per acre will result from a significant change in cropland acreage, number of tillage operations, or machinery prices. Consequently, the machine costs presented cannot be construed as being representative of all 640-acre or 1,280-acre farms in this five-county area, although they should be somewhat similar. However, the usefulness of these costs need not be impaired since they provide a basis for estimating machine costs and, also, offer a basis for comparing costs of operating varying sizes and types of machines and implements.

Table 3. Size, Purchase Price, Expected Useful Life, and Annual Use of Machinery on a Hypothetical 1,280-Acre Model Farm in the Aurora, Brule, Charles Mix, Gregory, and Jerauld County Area^{1/}

Machine	Size	Purchase Price ^{2/}	Useful Life ^{3/}		Annual Use	
		Dollars	Years	Hours	Acres	Hours
Tractor	2-Plow	\$2,830	25	12,000	1,747	401
Tractor	3-Plow	3,475	25	12,000	1,791	463
Tractor	4-Plow	4,500	18	12,000	1,967	647
Moldboard Plow	3-16-Inch	520	15	2,500	301	163
Single Disc	15-Foot	560	25	2,500	397	71
Spring Tooth Harrow	5-Sect.	500	30	2,000	116	19
Drag Harrow	6-Sect.	175	30	2,500	555	44
Drill	12-Foot	1,900	30	1,200	61	14
Endgate Seeder		150	30	800	74	7
Swather PTO	12-Foot	1,075	20	1,200	135	27
Combine PTO	12-Foot	5,890	15	2,000	149	48
Corn Planter	4-Row	1,200	25	1,200	121	24
Corn Lister	2-Row	605	23	1,200	120	52
Corn Tender	2-Row	250	20	2,500	120	40
Corn Cultivator	4-Row	450	20	2,500	482	96
Cornpicker	2-Row	2,675	15	2,000	142	85
Forage Harvester	2-Row	2,755	15	2,000	85	47
Mower	7-Foot	475	12	2,000	569	171
Dump Rake	19-Foot	270	30	2,500	204	39
Side Rake		550	25	2,500	365	66
Baler		2,025	15	2,500	365	128
Farmhand & Attachments		800	25		261	78
Three Trailers or Wagons		900	25		507	254
Sprayer	30-Foot	450	30	1,500	376	38

^{1/} Representative farm size is 1,280 acres with 617 acres of cropland.

^{2/} Approximate new cost in 1964.

^{3/} Agricultural Engineers Yearbook.

Table 4. Annual Machine Cost by Machine or Implement Used on the 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine	Size	Annual Use		Dollar Cost Per Hour					Total
		Acres	Hours	Depre- ciation	Insurance & Taxes	Interest	Repairs	Fuel, Oil, & Lubricant	
Tractor	2-Plow	1,348	246	\$ 101.88	\$ 49.03	\$108.95	\$ 65.52	\$ 20.91 ^{1/}	\$ 346.29
Tractor	3-Plow	1,581	604	156.40	59.84	133.77	205.80	42.28 ^{1/}	598.09
Moldboard Plow	3-14-Inch	210	130	22.74	8.31	18.48	24.70	83.20	157.43
Single Disc	15-Foot	298	54	20.16	9.70	21.56	4.32	30.24	85.98
Spring Tooth Harrow	4-Sect.	57	11	12.00	6.94	15.40	.88	4.40	39.62
Drag Harrow ^{2/}	5-Sect.	399	40	4.50	2.59	5.78	.80	20.00	33.67
Press Drill	12-Foot	48	11	57.00	32.91	73.15	4.40	4.29	171.75
Endgate Seeder ^{2/}		63	6	4.50	6.94	5.78	.36	2.40	19.98
Swather PTO ^{2/}	12-Foot	111	22	48.35	18.64	41.39	5.06	11.00	124.44
Combine PTO	6-Foot	118	59	153.87	44.45	98.75	30.09	40.12	367.28
Corn Planter	4-Row	96	19	43.20	20.80	46.20	5.70	9.50	125.40
Corn Lister	2-Row	52	22	21.76	10.46	23.29	4.62	12.32	72.45
Corn Tender	2-Row	52	17	11.25	4.87	9.63	.68	9.35	35.78
Corn Cultivator	2-Row	296	98	11.25	4.87	9.63	3.92	53.90	83.57
Cornpicker	2-Row	84	50	160.47	46.38	102.99	27.00	35.00	371.84
Forage Harvester	1-Row	57	60	148.47	42.48	95.25	44.40	40.20	370.80
Mower ^{2/}	7-Foot	208	62	21.35	8.25	18.32	11.16	20.46	79.54
Dump Rake ^{2/}	10-Foot	208	40	8.10	4.67	10.40	2.00	10.40	35.57
Farmhand & Attachments		167	50	28.80	13.86	30.80	8.00	30.00	111.46
Two Trailers or Wagons ^{3/}		146	73	21.60	10.40	23.10	7.88	39.13	102.11
Sprayer ^{2/}	30-Foot	259	26	13.50	7.81	17.33	2.34	10.40	51.38
Total Costs				\$1,071.15	\$414.20	\$909.95	\$459.63	\$529.50	\$3,384.43

^{1/} Overhead maintenance.

^{2/} Two-plow tractor--all other machines and implements pulled with a 3-plow tractor.

^{3/} Used part time with 2-plow and part time with 3-plow tractor.

Table 5. Machine Costs Per Hour of Use by Machine and Implement Used, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Annual Use Hours	Dollar Cost Per Hour ^{1/}					Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs		
Moldboard Plow	3-14-Inch	130	\$0.17	\$0.06	\$0.14	\$0.19	\$0.56	
Single Disc	15-Foot	54	.37	.18	.40	.08	1.03	
Spring Tooth Harrow	4-Sect.	11	1.09	.63	1.40	.08	3.20	
Drag Harrow	5-Sect.	40	.11	.06	.14	.02	.33	
Press Drill	12-Foot	11	5.18	2.99	6.65	.40	15.22	
Endgate Seeder		6	.75	1.16	.96	.06	2.93	
Swather PTO	12-Foot	22	2.20	.85	1.88	.23	5.16	
Combine PTO	6-Foot	59	2.61	.75	1.67	.51	5.54	
Corn Planter	4-Row	19	2.27	1.09	2.43	.30	6.09	
Corn Lister	2-Row	22	.99	.48	1.06	.21	2.74	
Corn Tender	2-Row	17	.66	.29	.57	.04	1.56	
Corn Cultivator	2-Row	98	.11	.05	.10	.04	.30	
Cornpicker	2-Row	50	3.21	.93	2.06	.54	6.74	
Forage Harvester	1-Row	60	2.47	.71	1.59	.74	5.51	
Mower	7-Foot	62	.34	.13	.30	.18	.95	
Dump Rake	10-Foot	40	.20	.12	.26	.05	.63	
Farmhand & Attachments		50	.58	.28	.62	.16	1.64	
Two Trailers or Wagons		73	.30	.14	.32	.11	.87	
Sprayer	30-Foot	26	.52	.30	.67	.09	1.58	

^{1/} Costs include only machine or implement.

Table 6. Tractor, Machine and Implement Costs Per Hour of Use, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties^{1/}

Machine or Implement	Size	Dollar Cost Per Hour					Total
		Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-14-Inch	\$0.43	\$0.16	\$0.36	\$0.53	\$0.71	\$2.19
Single Disc	15-Foot	.63	.28	.62	.42	.63	2.58
Spring Tooth Harrow	4-Sect.	1.35	.73	1.62	.42	.47	4.59
Drag Harrow ^{2/}	5-Sect.	.52	.26	.58	.29	.59	2.24
Press Drill	12-Foot	5.44	3.09	6.87	.74	.46	16.60
Endgate Seeder ^{2/}		1.16	1.36	1.40	.33	.49	4.74
Swather PTO ^{2/}	12-Foot	2.61	1.05	2.32	.50	.59	7.07
Combine PTO	6-Foot	2.87	.85	1.89	.85	.75	7.21
Corn Planter	4-Row	2.53	1.19	2.65	.64	.57	7.58
Corn Lister	2-Row	1.25	.58	1.28	.55	.63	4.29
Corn Tender	2-Row	.92	.39	.79	.38	.62	3.10
Corn Cultivator	2-Row	.37	.15	.32	.38	.62	1.84
Cornpicker	2-Row	3.47	1.03	2.28	.88	.77	8.43
Forage Harvester	1-Row	2.73	.81	1.81	1.08	.74	7.17
Mower ^{1/}	7-Foot	.75	.33	.74	.45	.42	2.69
Dump Rake ^{2/}	10-Foot	.61	.32	.70	.32	.35	2.30
Farmhand & Attachments		.84	.38	.84	.50	.67	3.23
Trailer or Wagon		.56	.24	.54	.45	.62	2.41
Trailer or Wagon ^{2/}		.71	.34	.76	.38	.62	2.81
Sprayer ^{2/}	30-Foot	.93	.50	1.11	.36	.49	3.39

^{1/} All costs include tractor costs.

^{2/} Two-plow tractor--all other implements and machines pulled with a 3-plow tractor.

Table 7. Tractor Costs Per Acre of Use for Specific Machines and Implements, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Dollar Cost Per Acre					Total
		Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-14-Inch	\$0.161	\$0.061	\$0.137	\$0.211	\$0.043	\$0.613
Single Disc	15-Foot	.047	.018	.040	.061	.013	.179
Spring Tooth Harrow	4-Sect.	.052	.020	.044	.068	.014	.198
Drag Harrow ^{1/}	5-Sect.	.041	.020	.044	.027	.009	.141
Press Drill	12-Foot	.060	.023	.051	.078	.061	.273
Endgate Seeder ^{1/}		.041	.020	.044	.027	.009	.141
Swather PTO ^{1/}	12-Foot	.083	.040	.089	.053	.017	.282
Combine PTO	6-Foot	.130	.050	.111	.171	.035	.497
Corn Planter	4-Row	.052	.020	.044	.068	.014	.198
Corn Lister	2-Row	.111	.043	.095	.147	.030	.426
Corn Tender	2-Row	.085	.033	.073	.113	.023	.327
Corn Cultivator	2-Row	.085	.033	.073	.113	.023	.327
Cornpicker	2-Row	.155	.059	.133	.205	.042	.594
Forage Harvester	1-Row	.272	.104	.232	.358	.074	1.040
Mower ^{1/}	7-Foot	.124	.060	.133	.080	.026	.423
Dump Rake ^{1/}	10-Foot	.079	.038	.084	.051	.016	.268
Farmhand & Attachments		.078	.030	.066	.102	.021	.297
Trailer or Wagon		.130	.050	.111	.171	.035	.497
Trailer or Wagon ^{1/}		.207	.100	.222	.133	.043	.705
Sprayer ^{1/}	30-Foot	.041	.020	.044	.027	.009	.141

^{1/} Two-plow tractor--all other implements and machines pulled with a 3-plow tractor.

Table 8. Costs Per Acre by Machine and Implement Used, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-14-Inch	210	\$0.108	\$0.040	\$0.088	\$0.118	\$0.396	\$0.750
Single Disc	15-Foot	298	.068	.033	.072	.015	.101	.289
Spring Tooth Harrow	4-Sect.	57	.211	.122	.270	.015	.077	.695
Drag Harrow	5-Sect.	399	.011	.006	.015	.002	.050	.084
Press Drill	12-Foot	48	1.187	.686	1.524	.092	.089	3.578
Endgate Seeder		63	.071	.110	.092	.006	.038	.317
Swather PTO	12-Foot	111	.435	.168	.373	.046	.099	1.121
Combine PTO	6-Foot	118	1.304	.377	.837	.255	.340	3.113
Corn Planter	4-Row	96	.450	.217	.481	.059	.099	1.306
Corn Lister	2-Row	52	.418	.201	.448	.089	.237	1.393
Corn Tender	2-Row	52	.216	.094	.185	.013	.180	.688
Corn Cultivator	2-Row	296	.038	.016	.033	.013	.182	.282
Cornpicker	2-Row	84	1.910	.552	1.226	.321	.417	4.426
Forage Harvester	1-Row	57	2.605	.745	1.671	.779	.705	6.505
Mower	7-Foot	208	.103	.040	.088	.054	.098	.383
Dump Rake	10-Foot	208	.039	.022	.050	.010	.050	.171
Farmhand & Attachments		167	.172	.083	.184	.048	.180	.667
Two Trailers or Wagons		146	.148	.071	.158	.054	.268	.699
Sprayer	30-Foot	259	.052	.030	.067	.009	.040	.198

Table 9. Tractor, Machine, and Implement Costs Per Acre of Use, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties^{1/}

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-14-Inch	210	\$0.269	\$0.101	\$0.225	\$0.329	\$0.439	\$1.363
Single Disc	15-Foot	298	.115	.051	.112	.076	.114	.468
Spring Tooth Harrow	4-Sect.	57	.263	.142	.314	.083	.091	.893
Drag Harrow ^{2/}	5-Sect.	399	.052	.026	.059	.029	.059	.225
Press Drill	12-Foot	48	1.247	.709	1.575	.170	.105	3.806
Endgate Seeder ^{2/}		63	.112	.130	.136	.033	.047	.458
Swather PTO ^{2/}	12-Foot	111	.518	.208	.462	.099	.116	1.403
Combine PTO	6-Foot	118	1.434	.427	.948	.426	.375	3.610
Corn Planter	4-Row	96	.502	.237	.525	.127	.113	1.504
Corn Lister	2-Row	52	.529	.244	.543	.236	.267	1.819
Corn Tender	2-Row	52	.301	.127	.258	.126	.203	1.015
Corn Cultivator	2-Row	296	.123	.049	.106	.126	.205	.609
Cornpicker	2-Row	84	2.065	.611	1.359	.526	.459	5.020
Forage Harvester	1-Row	57	2.877	.849	1.903	1.137	.779	7.545
Mower ^{2/}	7-Foot	208	.227	.100	.221	.134	.124	.806
Dump Rake ^{2/}	10-Foot	208	.118	.060	.134	.061	.066	.439
Farmhand & Attachments		167	.250	.113	.250	.150	.201	.964
Trailer or Wagon		46	.278	.121	.269	.225	.311	1.204
Trailer or Wagon ^{2/}		100	.355	.171	.380	.187	.307	1.400
Sprayer ^{2/}	30-Foot	259	.093	.050	.111	.036	.049	.339

^{1/} All costs include tractor costs.

^{2/} Two-plow tractor--all other implements and machines pulled with a 3-plow tractor.

Table 10. Annual Machine Cost by Machines or Implements Used on the 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine	Size	Annual Use		Depre- ciation	Insurance & Taxes	Interest	Fuel, Oil, &		Total
		Acres	Hours				Repairs	Lubricant	
Tractor	2-Plow	1,747	401	\$ 101.88	\$ 49.03	\$ 108.95	\$ 95.48	\$ 32.08 ^{1/}	387.42
Tractor	3-Plow	1,791	463	125.08	59.84	133.77	138.95	34.72 ^{1/}	492.36
Tractor	4-Plow	1,967	647	225.00	77.97	173.25	291.15	36.23 ^{1/}	803.60
Moldboard Plow	3-16-Inch	301	163	31.20	9.02	20.02	34.23	110.84	205.31
Single Disc	15-Foot	397	71	20.16	9.70	21.56	5.68	39.76	96.86
Spring Tooth Harrow ^{2/}	5-Sect.	116	19	15.00	8.69	19.25	1.90	5.89	50.73
Drag Harrow ^{2/}	6-Sect.	555	44	5.23	3.03	6.74	.88	22.00	37.88
Press Drill ^{2/}	12-Foot	61	14	57.00	32.91	73.15	5.60	5.46	174.12
Endgate Seeder ^{3/}		74	7	4.50	6.94	5.78	.42	2.80	20.44
Swather PTO ^{2/}	12-Foot	135	27	48.35	18.64	41.39	6.21	13.50	128.09
Combine PTO	12-Foot	149	48	353.40	102.10	226.76	56.64	76.80	815.70
Corn Planter ^{2/}	4-Row	121	24	43.20	20.80	46.20	7.20	12.00	129.40
Corn Lister ^{2/}	2-Row	120	52	23.65	10.46	23.29	10.92	29.12	97.44
Corn Tender ^{2/}	2-Row	120	40	11.25	4.87	9.63	1.60	22.00	49.35
Corn Cultivator	4-Row	482	96	20.25	7.81	17.33	6.72	86.40	138.51
Cornpicker ^{2/}	2-Row	142	85	160.47	46.38	102.99	45.90	59.50	415.24
Forage Harvester	2-Row	85	47	165.27	47.75	106.07	39.01	37.60	395.70
Mower ^{3/}	7-Foot	569	171	35.58	8.25	18.29	30.78	56.43	149.33
Dump Rake ^{3/}	10-Foot	204	39	8.10	4.67	10.40	1.95	10.14	35.26
Side Rake ^{3/}		365	66	19.80	9.61	21.18	11.88	17.16	79.63
Baler		365	128	121.47	41.59	77.96	46.08	44.80	331.90
Farmhand & Attachments ^{2/}		261	78	28.80	13.86	30.80	12.48	46.80	132.74
Three trailers or Wagons ^{4/}		507	254	32.40	15.63	34.65	41.15	145.66	269.49
Sprayer ^{3/}	30-Foot	376	38	13.50	7.81	17.33	3.42	15.20	57.26
Total Costs				\$1,670.54	\$617.36	\$1,346.74	\$896.23	\$962.89	\$5,493.76

^{1/} Overhead maintenance.

^{2/} Used with a 3-plow tractor.

^{3/} Used with a 2-plow tractor.

^{4/} Used part time with a 2-, 3-, and 4-plow tractor.

Table 11. Machine Costs Per Hour of Use by Machine and Implement Used, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Annual Use in Hours	Dollar Cost Per Hour ^{1/}				Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs	
Moldboard Plow	3-16-Inch	163	\$0.19	\$0.06	\$0.12	\$0.21	\$0.58
Single Disc	15-Foot	71	.28	.14	.30	.08	.80
Spring Tooth Harrow	5-Sect.	19	.79	.46	1.01	.10	2.36
Drag Harrow	6-Sect.	44	.12	.07	.15	.02	.36
Press Drill	12-Foot	14	4.07	2.35	5.23	.40	12.05
Endgate Seeder		7	.64	.99	.83	.06	2.52
Swather PTO	12-Foot	27	1.79	.69	1.53	.23	4.24
Combine PTO	12-Foot	48	7.36	2.13	4.72	1.18	15.39
Corn Planter	4-Row	24	1.80	.87	1.93	.30	4.90
Corn Lister	2-Row	52	.45	.20	.45	.21	1.31
Corn Tender	2-Row	40	.28	.12	.24	.04	.68
Corn Cultivator	4-Row	96	.21	.08	.18	.07	.54
Cornpicker	2-Row	85	1.89	.55	1.21	.54	4.19
Forage Harvester	2-Row	47	3.52	1.02	2.26	.83	7.63
Mower	7-Foot	171	.21	.05	.11	.18	.55
Dump Rake	10-Foot	39	.21	.12	.27	.05	.65
Side Rake		66	.30	.15	.32	.18	.95
Baler		128	.95	.32	.61	.36	2.24
Farmhand & Attachments		78	.37	.18	.39	.16	1.10
Three Trailers or Wagons		254	.13	.06	.14	.16	.49
Sprayer	30-Foot	38	.36	.21	.46	.09	1.12

^{1/} Costs include only machine or implement.

Table 12. Tractor, Machine, and Implement Costs Per Hour of Use, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties^{1/}

Machine or Implement	Size	Dollar Cost Per Hour					Total
		Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-16-Inch	\$0.54	\$0.18	\$0.39	\$0.66	\$0.74	\$2.51
Single Disc	15-Foot	.63	.26	.57	.53	.62	2.61
Spring Tooth Harrow ^{2/}	5-Sect.	1.06	.59	1.30	.40	.39	3.74
Drag Harrow ^{2/}	6-Sect.	.39	.20	.44	.32	.58	1.93
Press Drill ^{2/}	12-Foot	4.34	2.48	5.52	.70	.47	13.51
Endgate Seeder ^{3/}		.89	1.11	1.10	.30	.48	3.88
Swather PTO ^{2/}	12-Foot	2.06	.82	1.82	.53	.58	5.81
Combine PTO	12-Foot	7.71	2.25	4.99	1.63	1.66	18.24
Corn Planter ^{2/}	4-Row	2.07	1.00	2.22	.60	.58	6.47
Corn Lister ^{2/}	2-Row	.72	.33	.74	.51	.64	2.94
Corn Tender ^{2/}	2-Row	.55	.25	.53	.34	.63	2.30
Corn Cultivator	4-Row	.56	.20	.45	.52	.96	2.69
Cornpicker ^{2/}	2-Row	2.16	.68	1.50	.84	.78	5.96
Forage Harvester	2-Row	3.87	1.14	2.53	1.28	.86	9.68
Mower ^{3/}	7-Foot	.46	.17	.38	.42	.41	1.84
Dump Rake ^{3/}	10-Foot	.46	.24	.54	.29	.34	1.87
Side Rake ^{3/}		.55	.27	.59	.42	.34	2.17
Baler		1.30	.44	.88	.81	.41	3.84
Farmhand & Attachments ^{2/}		.64	.31	.68	.46	.68	2.77
Trailer or Wagon		.48	.18	.41	.61	.63	2.31
Trailer or Wagon ^{3/}		.38	.18	.41	.40	.65	2.02
Trailer or Wagon ^{2/}		.40	.19	.43	.46	.65	2.13
Sprayer ^{3/}	30-Foot	.61	.33	.73	.33	.48	2.48

^{1/} All costs include tractor costs.

^{2/} Three-plow tractor--all other machines and implements pulled by a 4-plow tractor.

^{3/} Two-plow tractor.

Table 13. Tractor Costs Per Acre of Use for Specific Machines and Implements, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Dollar Cost Per Acre					Total
		Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-16-Inch	\$0.188	\$0.065	\$0.145	\$0.243	\$0.030	\$0.671
Single Disc	15-Foot	.063	.022	.048	.031	.010	.224
Spring Tooth Harrow ^{1/}	5-Sect.	.043	.021	.046	.048	.012	.170
Drag Harrow ^{1/}	6-Sect.	.022	.010	.023	.024	.006	.085
Press Drill ^{1/}	12-Foot	.062	.030	.066	.069	.017	.244
Endgate Seeder ^{2/}		.025	.012	.027	.024	.008	.096
Swather PTO ^{1/}	12-Foot	.054	.026	.058	.060	.015	.213
Combine PTO	12-Foot	.111	.039	.086	.144	.018	.398
Corn Planter ^{1/}	4-Row	.054	.026	.058	.060	.015	.213
Corn Lister ^{1/}	2-Row	.116	.055	.124	.129	.032	.456
Corn Tender ^{1/}	2-Row	.089	.043	.095	.099	.025	.351
Corn Cultivator	4-Row	.070	.024	.054	.090	.011	.249
Cornpicker ^{1/}	2-Row	.162	.077	.173	.180	.045	.637
Forage Harvester	2-Row	.191	.067	.147	.248	.031	.684
Mower ^{2/}	7-Foot	.076	.037	.082	.071	.024	.290
Dump Rake ^{2/}	10-Foot	.048	.023	.052	.045	.015	.183
Side Rake ^{2/}		.046	.022	.049	.043	.014	.174
Baler		.122	.042	.094	.158	.020	.436
Farmhand & Attachments ^{1/}		.081	.039	.087	.090	.023	.320
Trailer or Wagon		.174	.061	.134	.225	.028	.622
Trailer or Wagon ^{2/}		.127	.061	.136	.119	.040	.483
Three-Trailers or Wagons ^{1/}		.135	.065	.145	.150	.038	.533
Sprayer ^{2/}	30-Foot	.025	.012	.027	.024	.008	.096

^{1/} Three-plow tractor--all other implements and machines pulled with a 4-plow tractor.

^{2/} Two-plow tractor.

Table 14. Costs Per Acre by Machine and Implement Used, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-16-Inch	301	\$0.104	\$0.030	\$0.066	\$0.114	\$0.368	\$0.682
Single Disc	15-Foot	397	.051	.025	.054	.014	.100	.244
Spring Tooth Harrow	5-Sect.	116	.129	.075	.166	.016	.051	.437
Drag Harrow	6-Sect.	555	.009	.005	.012	.002	.040	.058
Press Drill	12-Foot	61	.934	.540	1.199	.092	.089	2.854
Endgate Seeder		74	.061	.094	.078	.006	.038	.277
Swather PTO	12-Foot	135	.358	.138	.307	.046	.100	.949
Combine PTO	12-Foot	149	2.372	.685	1.522	.380	.515	5.474
Corn Planter	4-Row	121	.357	.172	.382	.059	.099	1.069
Corn Lister	2-Row	120	.197	.087	.194	.091	.243	.812
Corn Tender	2-Row	120	.094	.041	.080	.013	.183	.411
Corn Cultivator	4-Row	482	.042	.016	.036	.014	.179	.287
Cornpicker	2-Row	142	1.130	.327	.725	.323	.419	2.924
Forage Harvester	2-Row	85	1.944	.562	1.248	.459	.442	4.655
Mower	7-Foot	569	.063	.014	.032	.054	.099	.262
Dump Rake	10-Foot	204	.040	.023	.051	.009	.050	.173
Side Rake		365	.054	.026	.058	.033	.047	.218
Baler		365	.333	.114	.213	.126	.123	.909
Farmhand & Attachments		261	.110	.053	.118	.048	.179	.508
Three-Trailers or Wagons		507	.064	.031	.068	.081	.287	.531
Sprayer	30-Foot	376	.036	.021	.046	.009	.040	.152

Table 15. Tractor, Machine, and Implement Costs Per Acre of Use, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					Total
			Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Moldboard Plow	3-16-Inch	301	\$0.292	\$0.095	\$0.211	\$0.357	\$0.398	\$1.353
Single Disc	15-Foot	397	.114	.047	.102	.095	.110	.468
Spring Tooth Harrow ^{1/}	5-Sect.	116	.172	.036	.212	.064	.063	.607
Drag Harrow ^{1/}	6-Sect.	555	.031	.015	.035	.026	.046	.153
Press Drill ^{1/}	12-Foot	61	.936	.570	1.265	.161	.105	3.038
Endgate Seeder ^{2/}		74	.086	.106	.105	.030	.046	.373
Swather PTO ^{1/}	12-Foot	135	.412	.164	.365	.106	.115	1.162
Combine PTO	12-Foot	149	2.483	.724	1.608	.524	.533	5.872
Corn Planter ^{1/}	4-Row	121	.411	.198	.440	.119	.114	1.282
Corn Lister ^{1/}	2-Row	120	.313	.142	.318	.220	.275	1.268
Corn Tender ^{1/}	2-Row	120	.183	.084	.175	.112	.208	.762
Corn Cultivator	4-Row	482	.112	.040	.090	.104	.190	.536
Cornpicker ^{1/}	2-Row	142	1.292	.404	.898	.503	.464	3.561
Forage Harvester	2-Row	85	2.135	.629	1.395	.707	.473	5.339
Mower ^{2/}	7-Foot	569	.139	.051	.114	.125	.123	.552
Dump Rake ^{2/}	10-Foot	204	.088	.046	.103	.054	.065	.356
Side Rake ^{2/}		365	.100	.048	.107	.076	.061	.392
Baler		365	.455	.156	.307	.284	.143	1.345
Farmhand & Attachments ^{1/}		261	.191	.092	.205	.138	.202	.828
Trailer or Wagon		188	.238	.092	.202	.306	.332	1.170
Trailer or Wagon ^{2/}		159	.191	.092	.204	.200	.312	.999
Trailer ^{2/} or Wagon ^{1/}		160	.199	.096	.213	.231	.321	1.060
Sprayer ^{2/}	30-Foot	376	.061	.033	.073	.033	.048	.248

^{1/} Three-plow tractor--all other implements and machines pulled with a 4-plow tractor.
^{2/} Two-plow tractor.

Table 16. Machine Costs Per Acre by Crop and Type of Operation, 640-Acre Model Farm, Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Crop	Type of Operation	Dollar Cost Per Acre						Total
		Machine Time Hours Per Acre	Depre- ciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	
Summer Fallow	Tillage	1.42	\$1.32	\$0.67	\$1.48	\$0.66	\$0.80	\$ 4.93
Wheat After Summer Fallow	Tillage	.28	.17	.08	.17	.11	.17	.70
	Planting (drill)	.23	1.25	.71	1.57	.17	.11	3.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	1.11	3.46	1.48	3.26	.81	.82	9.87
Other Small Grain After Summer Fallow	Tillage	.28	.17	.08	.17	.11	.17	.70
	Planting (endgate seeder)	.10	.11	.13	.14	.03	.05	.46
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	1.18	2.32	.90	3.83	.71	.76	6.52
Wheat After Small Grain	Tillage	.90	.44	.18	.40	.43	.61	2.05
	Planting (drill)	.23	1.25	.71	1.57	.17	.11	3.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	1.91	3.73	1.58	3.49	1.17	1.26	11.23
Other Small Grain After Small Grain	Tillage	.90	.44	.18	.40	.43	.61	2.05
	Planting (endgate seeder)	.10	.11	.13	.14	.03	.05	.46
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	1.80	2.59	1.00	2.06	1.03	1.20	7.88
Wheat After Row Crop Harvested As Silage	Tillage	1.00	.49	.20	.46	.46	.67	2.28
	Planting (drill)	.23	1.25	.71	1.57	.17	.11	3.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	2.03	3.78	1.60	3.55	1.20	1.32	11.45
Other Small Grain After Row Crop Harvested As Silage	Tillage	1.00	.49	.20	.46	.46	.67	2.28
	Planting (endgate seeder)	.10	.11	.13	.14	.03	.05	.46
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	1.90	2.64	1.02	2.12	1.06	1.26	8.10
Wheat After Row Crops Harvested As Grain	Tillage	1.18	.60	.26	.57	.54	.79	2.76
	Planting (drill)	.23	1.25	.71	1.57	.17	.11	3.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	2.21	3.89	1.66	3.66	1.28	1.44	11.43
Other Small Grain After Row Crop Harvested as Grain	Tillage	1.18	.60	.26	.57	.54	.79	2.76
	Planting (endgate seeder)	.10	.11	.13	.14	.03	.05	.46
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	2.08	2.75	1.08	2.23	1.14	1.28	8.58
Wheat After Alfalfa	Tillage	1.28	.65	.28	.63	.57	.84	2.97
	Planting (drill)	.23	1.25	.71	1.57	.17	.11	3.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	2.31	3.94	1.68	3.72	1.31	1.49	12.14
Other Small Grain After Alfalfa	Tillage	1.28	.65	.28	.63	.57	.84	2.97
	Planting (endgate seeder)	.10	.11	.13	.14	.03	.05	.46
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Harvest	.70	1.95	.64	1.41	.51	.49	5.02
	Total	2.18	2.80	1.10	2.29	1.17	1.42	8.79
Row Crop After Summer Fallow	Tillage	1.04	.47	.20	.44	.39	.64	2.14
	Planting (corn planter)	.20	.50	.24	.52	.13	.11	1.50
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Subtotal	1.34	1.06	.49	1.07	.56	.80	3.98
Corn Grain	Harvest	.60	2.07	.61	1.36	.53	.46	5.03
	Total	1.94	3.13	1.10	2.43	1.09	1.26	9.01
Sorghum Grain	Harvest	.50	1.43	.43	.95	.43	.37	3.61
	Total	1.84	2.49	.92	2.02	.99	1.17	7.59
Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	2.39	3.94	1.34	2.97	1.70	1.58	11.53
Row Crop After Summer Fallow	Tillage	1.37	.77	.33	.70	.51	.85	3.16
	Planting (lister)	.43	.53	.24	.54	.23	.27	1.81
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Subtotal	1.90	1.39	.62	1.35	.78	1.17	5.31
Corn Grain	Harvest	.60	2.07	.61	1.36	.53	.46	5.03
	Total	2.50	3.46	1.23	2.71	1.31	1.63	10.34
Corn Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	2.95	4.27	1.47	3.25	1.92	1.95	12.86
Row Crop After Small Grain	Tillage	1.66	.73	.30	.67	.72	1.08	3.50
	Planting (corn planter)	.20	.50	.24	.52	.13	.11	1.50
	Spraying	.10	.09	.05	.11	.04	.05	.34
	Subtotal	1.96	1.32	.59	1.30	.89	1.24	5.34
Corn Grain	Harvest	.60	2.07	.61	1.36	.53	.46	5.03
	Total	2.56	3.39	1.20	2.66	1.42	1.70	10.37
Sorghum Grain	Harvest	.50	1.43	.43	.95	.43	.37	3.61
	Total	2.46	2.75	1.02	2.25	1.32	1.61	8.95
Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	3.01	4.20	1.44	3.20	1.03	2.02	12.89

(Continued)

Table 16. Machine Costs Per Acre by Crop and Type of Operation, 640-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Crop	Type of Operation	Machine Time Hours Per Acre	Depre- ciation	Insurance & Taxes	Dollar Cost Per Acre			Total
					Int	Repairs	Fuel, Oil, & Lubricant	
Row Crop After Small Grain	Tillage	1.49	\$0.79	\$0.33	\$0.70	\$0.61	\$0.95	\$ 3.38
	Planting (lister)	.43	.53	.24	.54	.23	.27	1.81
	Spraying	.10	.02	.01	.11	.04	.05	.34
	Subtotal	2.02	1.41	.62	1.35	.88	1.27	5.53
Corn Grain	Harvest	.60	2.07	.61	1.36	.33	.46	5.03
	Total	2.62	3.48	1.23	2.71	1.41	1.73	10.56
Corn Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	3.07	4.29	1.47	3.25	2.02	2.02	13.08
Row Crop After Row Crop For Grain	Tillage	1.84	.93	.40	.88	.80	1.18	4.19
	Planting (corn planter)	.20	.50	.24	.52	.13	.11	1.50
	Spraying	.10	.02	.05	.11	.04	.01	.34
	Subtotal	2.14	1.52	.69	1.51	.97	1.34	6.03
Corn Grain	Harvest	.60	2.07	.61	1.36	.33	.46	5.03
	Total	2.74	3.59	1.30	2.87	1.50	1.80	11.06
Sorghum Grain	Harvest	.50	1.43	.43	.95	.43	.37	3.61
	Total	2.64	2.95	1.12	2.46	1.40	1.71	9.64
Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	3.19	4.40	1.54	3.41	2.11	2.12	13.58
Row Crop After Row Crop For Silage	Tillage	1.66	.81	.35	.77	.73	1.07	3.73
	Planting (corn planter)	.20	.50	.24	.52	.13	.11	1.50
	Spraying	.10	.02	.05	.11	.04	.05	.34
	Subtotal	1.96	1.40	.64	1.40	.90	1.23	5.57
Corn Grain	Harvest	.60	2.07	.61	1.36	.33	.46	5.03
	Total	2.56	3.47	1.25	2.76	1.43	1.69	10.60
Sorghum Grain	Harvest	.50	1.43	.43	.95	.43	.37	3.61
	Total	2.46	2.83	1.07	2.35	1.33	1.60	9.18
Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	3.01	4.28	1.49	3.30	2.04	2.01	13.12
Row Crop After Alfalfa	Tillage	1.74	.80	.33	.72	.76	1.14	3.75
	Planting (corn planter)	.20	.50	.24	.52	.13	.11	1.50
	Spraying	.10	.02	.05	.11	.04	.05	.34
	Subtotal	2.04	1.39	.62	1.35	.93	1.30	5.59
Corn Grain	Harvest	.60	2.07	.61	1.36	.53	.46	5.03
	Total	2.64	3.46	1.23	2.71	1.46	1.76	10.62
Sorghum Grain	Harvest	.50	1.43	.43	.95	.43	.37	3.61
	Total	2.54	2.82	1.05	2.30	1.36	1.67	9.20
Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	3.09	4.27	1.47	3.25	2.07	2.08	13.14
Row Crop After Alfalfa	Tillage	2.07	1.10	.45	.98	.89	1.34	4.76
	Planting (lister)	.43	.53	.24	.54	.23	.27	1.81
	Spraying	.10	.02	.05	.11	.04	.01	.34
	Subtotal	2.60	1.72	.74	1.63	1.16	1.66	6.91
Corn Grain	Harvest	.60	2.07	.61	1.36	.53	.46	5.03
	Total	3.20	3.79	1.35	2.99	1.69	2.12	11.94
Corn Silage	Harvest	1.05	2.88	.85	1.90	1.14	.78	7.55
	Total	4.65	4.60	1.59	4.89	2.30	2.44	14.46
Tame Hay ^{1/}	Mow, Rake, Bale	.49	.35	.16	.35	.20	.19	1.25 ^{2/}
	Mow, Rake, Stack	.79	.60	.27	.60	.35	.39	2.21
Native Hay ^{1/}	Mow, Rake, Stack	.79	.60	.27	.60	.35	.39	2.21

^{1/} Per cutting per acre.^{2/} Includes cost of custom baling.

Table 17. Machine Costs Per Acre by Crop and Type of Operation, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Crop	Type of Operation	Machine Time Hours Per Acre	Depre- ciation	Insurance & Taxes	Dollar Cost Per Acre			Total
					Int.	Repairs	Fuel, Oil, & Lubricant	
Summer Fallow	Tillage	1.18	\$0.98	\$0.48	\$1.06	\$0.61	\$0.65	3.78
Wheat After Summer Fallow	Tillage	.26	.14	.06	.14	.12	.16	.62
	Planting (drill)	.23	1.00	.57	1.26	.16	.11	3.10
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.11	4.10	1.55	3.44	.94	.97	11.00
Other Small Grain After Summer Fallow	Tillage	.26	.14	.06	.14	.12	.16	.62
	Planting (endgate seeder)	.10	.09	.11	.10	.03	.05	.38
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	.98	3.19	1.09	2.28	.81	.91	8.28
Wheat After Small Grain	Tillage	.80	.44	.16	.35	.48	.55	1.98
	Planting (drill)	.23	1.00	.57	1.26	.16	.11	3.10
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.65	4.40	1.62	3.62	1.30	1.36	12.36
Other Small Grain After Small Grain	Tillage	.80	.44	.16	.35	.48	.55	1.98
	Planting (endgate seeder)	.10	.09	.11	.10	.03	.05	.38
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.52	3.49	1.19	2.49	1.17	1.10	9.64
Wheat After Row Crop Harvested As Silage	Tillage	.88	.47	.17	.38	.50	.60	2.12
	Planting (drill)	.23	1.00	.57	1.26	.16	.11	3.10
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.73	4.43	1.66	3.68	1.32	1.41	12.50
Other Small Grain After Row Crop Harvested As Silage	Tillage	.88	.47	.17	.38	.50	.60	2.12
	Planting (endgate seeder)	.10	.09	.11	.10	.03	.05	.38
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.66	3.57	1.20	2.32	1.18	1.15	9.78
Wheat After Row Crop Harvested As Grain	Tillage	1.06	.58	.22	.49	.60	.71	2.60
	Planting (drill)	.23	1.00	.57	1.26	.16	.11	3.10
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.91	4.54	1.71	3.79	1.42	1.52	12.98
Other Small Grain After Row Crop Harvested As Grain	Tillage	1.06	.58	.22	.49	.60	.71	2.60
	Planting (endgate seeder)	.10	.09	.11	.10	.03	.05	.38
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.78	3.63	1.25	2.63	1.29	1.46	10.26
Wheat After Alfalfa	Tillage	1.14	.61	.23	.52	.62	.76	2.74
	Planting (drill)	.23	1.00	.57	1.26	.16	.11	3.10
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.99	4.57	1.72	3.82	1.44	1.57	13.12
Other Small Grain After Alfalfa	Tillage	1.14	.61	.23	.52	.62	.76	2.74
	Planting (endgate seeder)	.10	.09	.11	.10	.03	.05	.38
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Harvest	.52	2.90	.89	1.97	.63	.65	7.04
	Total	1.86	3.66	1.26	2.66	1.31	1.21	10.40
Row Crop After Summer Fallow	Tillage	.74	.40	.16	.35	.36	.58	1.85
	Planting (corn planter)	.20	.41	.20	.44	.12	.11	1.28
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.04	.87	.39	.86	.51	.74	3.37
	Corn Grain	Harvest	.60	1.29	.40	.90	.50	.47
Total	1.64	2.16	.79	1.76	1.01	1.21	6.93	
Sorghum Grain	Harvest	.32	2.48	.72	1.61	.53	.53	5.87
	Total	1.36	3.35	1.11	2.47	1.04	1.27	9.24
Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	1.39	3.01	1.02	2.22	1.22	1.21	8.71
Row Crop After Summer Fallow	Tillage	1.07	.58	.24	.53	.47	.79	2.61
	Planting (lister)	.43	.31	.14	.32	.22	.28	1.27
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.60	.95	.41	.92	.72	1.12	4.12
	Corn Grain	Harvest	.60	1.29	.40	.90	.50	.47
Total	2.20	2.24	.81	1.82	1.22	1.59	7.68	
Corn Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	2.11	3.09	1.04	2.11	1.43	1.19	9.46
Row Crop After Small Grain	Tillage	1.28	.69	.25	.56	.71	.98	3.19
	Planting (corn planter)	.20	.41	.20	.44	.12	.11	1.28
	Spraying	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.58	1.16	.48	1.07	.86	1.14	4.71
	Corn Grain	Harvest	.60	1.29	.40	.90	.50	.47
Total	2.18	2.45	.88	1.97	1.36	1.61	8.27	
Sorghum Grain	Harvest	.32	2.48	.72	1.61	.53	.53	5.87
	Total	1.90	3.64	1.20	2.68	1.39	1.67	10.58
Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	2.13	3.30	1.11	2.46	1.57	1.61	10.05

(Continued)
 Table 17. Machine Costs Per Acre by Crop and Type of Operation, 1,280-Acre Model Farm; Aurora, Brule, Charles Mix, Gregory, and Jerauld Counties

Crop	Type of Operation	Machine Time Hours Per Acre	Depre- ciation	Dollar Cost Per Acre				Total
				Insurance & Taxes	Int	Repairs	Fuel, Oil, & Lubricant	
Row Crop After Small Grain	Tillage	1.17	\$0.64	\$0.25	\$0.55	\$0.57	\$0.89	2.90
	Planting (lister)	.43	.31	.14	.32	.22	.28	1.27
	Strawing	.10	.06	.03	.07	.03	.01	.24
	Subtotal	1.70	1.01	.42	.94	.82	1.22	4.41
Corn Grain	Harvest	.60	.29	.40	.90	.50	.47	3.16
	Total	2.30	1.30	.82	1.84	1.32	1.69	7.97
Corn Silage	Harvest	.55	.14	.61	.39	.71	.47	5.14
	Total	2.25	1.15	1.05	1.33	1.13	1.69	9.75
Row Crop After Row Crop for Grain	Tillage	1.46	.86	.33	.74	.81	1.08	3.82
	Planting (corn planter)	.20	.41	.20	.44	.12	.11	1.28
	Strawing	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.76	1.33	.56	1.25	.96	1.24	5.34
Corn Grain	Harvest	.60	.29	.40	.90	.50	.47	3.56
	Total	2.36	1.62	.96	2.15	1.46	1.71	8.90
Sorghum Grain	Harvest	.32	2.48	.72	1.61	.53	.53	5.87
	Total	2.08	3.81	1.28	2.86	1.49	1.77	11.21
Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	2.31	3.47	1.19	1.64	1.67	1.71	10.68
Row Crop After Row Crop for Silage	Tillage	1.28	.75	.29	.63	.72	.97	3.36
	Planting (corn planter)	.20	.41	.20	.44	.12	.11	1.28
	Strawing	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.58	1.22	.52	1.14	.87	1.13	4.88
Corn Grain	Harvest	.60	.29	.40	.90	.50	.47	3.56
	Total	2.18	1.51	.92	2.04	1.37	1.60	8.44
Sorghum Grain	Harvest	.32	2.48	.72	1.61	.53	.53	5.87
	Total	1.90	3.70	1.24	2.75	1.40	1.48	10.75
Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	2.13	3.16	1.15	1.53	1.58	1.60	10.22
Row Crop After Alfalfa	Tillage	1.38	.78	.28	.63	.78	1.04	3.51
	Planting (corn planter)	.20	.41	.20	.44	.12	.11	1.28
	Strawing	.10	.06	.03	.07	.03	.05	.24
	Subtotal	1.68	1.25	.51	1.14	.93	1.20	5.03
Corn Grain	Harvest	.60	.29	.40	.90	.50	.47	3.16
	Total	2.28	1.54	.91	2.04	1.43	1.67	8.59
Sorghum Grain	Harvest	.32	2.48	.72	1.61	.53	.53	5.87
	Total	2.00	3.73	1.23	2.75	1.46	1.73	10.90
Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.34
	Total	2.21	3.19	1.14	2.51	1.64	1.67	10.37
Row Crop After Alfalfa	Tillage	1.71	.96	.37	.81	.89	1.25	4.28
	Planting (lister)	.43	.31	.14	.32	.22	.28	1.27
	Strawing	.10	.06	.03	.07	.03	.05	.24
	Subtotal	2.24	1.33	.54	1.20	1.14	1.58	5.79
Corn Grain	Harvest	.60	.29	.40	.90	.50	.47	3.16
	Total	2.84	1.62	.94	2.10	1.64	2.05	9.35
Corn Silage	Harvest	.55	2.14	.63	1.39	.71	.47	5.14
	Total	1.79	3.47	1.17	2.59	1.81	2.05	11.13
Tame Hay ^{1/}	Mow, Rake, Bale	.83	.69	.26	.53	.48	.33	2.29
	Mow, Rake, Stack	.79	.68	.19	.42	.32	.39	2.00
Native Hay ^{1/}	Mow, Rake, Stack	.79	.68	.19	.42	.32	.39	2.00

^{1/} Per cutting per acre.