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Machinery Costs on Typical Wheat Farms in North Central South Dakota: Brown and Spink Counties

E. O. Ullrich
South Dakota State University

J. T. Sanderson
South Dakota State University

W. G. Aanderud

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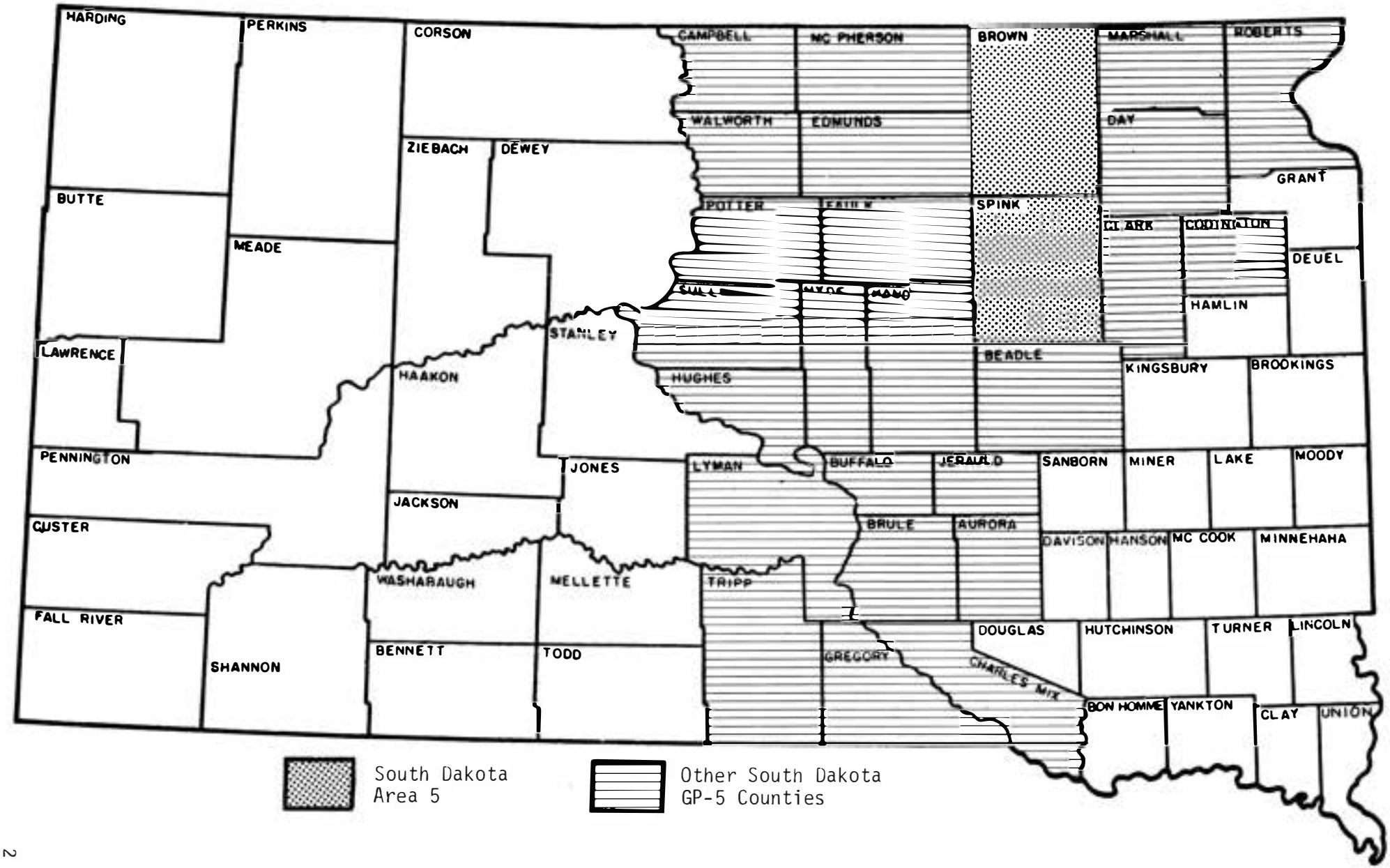
Counties

By
Erwin O. Ullrich Jr.
John T. Sanderson
Wallace G. Aanderud

SOUTH DAKOTA STATE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
BROOKINGS, SOUTH DAKOTA

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

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 state's 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 5 (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 5

BROWN AND SPINK COUNTIES

SOILS

The soils in this two-county area are Chernozems. The first major soils series are the Houdek-Bonilla soils which are undulating to nearly level and are well to moderately well drained. Developed from calcareous loam till, these loams are dark grayish-brown and slightly acid. The major problems in soil and water management are the maintenance of organic matter and the conservation of moisture. Major soil uses are: (1) cash grain production, (2) livestock farming, and (3) general farming.

The Beotia-Aberdeen soils are nearly level, well to imperfectly drained, dark grayish-brown silt loams, and silty clay loams. The Beotia soils developed from lacustrine silts of the Lake Dakota plain. The Aberdeen soils are solodized solonetz soils which also developed from these materials. The major problems in soil and water management are: (1) the maintenance of soil fertility, (2) moisture conservation, and (3) seasonal ponding and drainage of low areas due to slow permeability. The major soil uses are cash grain and general farming.

The Hecla-Ulen Chernozems are nearly level to hummocky and somewhat

excessively to moderately well drained. These grayish-brown soils, which developed from sandy fluvial-eolian materials, are slightly acid sandy loams. Hecla-Ulen soils are low in organic matter, subject to wind erosion and subject to seasonal ponding and drainage problems in low areas due to slow permeability. The major soil uses are for livestock and general farming.

TYPE OF FARMING CHARACTERISTICS

The average farm in Brown County was about 764 acres compared with 803 acres in Spink County, according to the 1964 census. There were 2,569 farms in the two counties in 1964, of which 29.5 per cent were classified as cash grain, 47.8 per cent were livestock, and 9.5 per cent were general farms. The remaining 13.2 per cent were poultry, dairy, and miscellaneous farms.

Farms in Brown and Spink Counties are fairly well diversified with cash grains, feed grains and livestock, but wheat remained the most important crop. Other crops grown strictly as cash crops were flax and rye (accounting for about 7 per cent of the harvested acreage). In addition to the cash crops, substantial amounts of corn grain, oats and barley were sold.

About 72 per cent of the corn harvested was picked for grain and nearly 46 per cent of the corn grain harvested was sold in 1964. Almost 43 per cent of the oats and 69 per cent of the barley harvested were sold off the farm. The remainder of all the feed grains were fed to livestock on the farm.

Table 1 shows the number and per cent of farms in the two-county area that raised and harvested major crops in 1964.

Livestock were very important in this the Brown and Spink County area. Some type of livestock enterprise were found on 90 to 95 per cent of the farms, either for home consumption or commercial production. Beef cow herds were kept on about 80 per cent or more of the farms (most herds ranged between 30 and 75 cows). Some of the area's farmers also engaged in cattle or calf feeding enterprises.

Milk cows were kept on less than a third of the farms (averaging about 8 cows per farm). Many of the milk cows were kept for home consumption. Cream producers outnumbered farms selling whole milk more than 2 to 1.

Although only 1 in 3 farms kept sows to farrow in 1964, hog production was important in this area. Sow numbers farrowed or to be farrowed averaged 20 per farm. Records show spring litters usually outnumbered fall litters by 2 to 1.

Ewe flocks were maintained by slightly less than a third of the farms in the area, although the average number in the flock was slightly larger than flocks in some of the other areas. The average flock consisted of 66 ewes in 1964.

Table 1. Number and Per Cent of Farms That Raised and Harvested Major Grain Crops in 1964 in Brown and Spink Counties

	Number of Farms	Percentage of Farms	Number of Acres Harvested	Percentage of Acres Harvested
Corn[1/]	1,950	75.9	238,123	28.0
All Wheat[2/]	2,112	82.2	324,321	38.1
Oats	1,869	72.8	154,961	18.2
Barley	714	27.8	46,762	5.5
Flax	543	21.1	35,442	4.2
Rye	435	16.9	25,140	2.9
Other[3/]	---	----	26,803	3.1

1/ Includes corn harvested for grain, silage and other purposes.
2/ Includes 5,728 acres of winter wheat and 19,044 acres of durum.
3/ Includes proso, emmer and speltz, soybeans and sorghum.
Source: U.S. Census of Agriculture, 1964.

MODEL WHEAT FARM AND BASIS FOR MACHINERY COSTS

The farm selected as being a typical wheat farm was 640 acres (448 acres of cropland and 159 acres of native hay and pasture). The average farm size for this two-county area was calculated at 781 acres; however, some 35.9 per cent of the area's farms, as shown in the 1964 Census of Agriculture, were below 500 acres, 39.7 per cent of the farms were between 500 and 999 acres, 20.6 per cent were between 1,000 and 1,999 acres, and only 3.8 per cent of the farms were 2,000 acres or over.

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

Crop	Acres	Crop	Acres
Hard Spring Wheat	95	Summer Fallow	43
Flax	18	Alfalfa	68
Oats and Other Small Grain	111	Other Tame Pasture	7
Corn Grain	73	Native Hay	53
Corn Silage	33	Native Pasture	106

The machinery and implements, listed in Table 2, represent those most frequently found on the group of farms from which the model or representative farm was 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 Table 2) represents an "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.

Table 2. Size, Purchase Cost, Expected Useful Life, and Annual Use of Machinery on a Hypothetical 640-Acre Model Farm in the Brown and Spink County Area[1/]

Machine	Size	Purchase Price[2/]	Useful Life[3/]		Annual Use	
		Dollars	Years	Hours	Acres	Hours
Tractor	3-Plow	$3,510	25	12,000	1,944	406
Tractor	4-Plow	4,545	15	12,000	1,946	738
Moldboard Plow	4-14-Inch	808	15	2,500	354	170
Tandem Disc	10-Foot	757	20	2,500	397	127
Field Cultivator	12-Foot	505	20	2,000	190	38
Drag Harrow	6-Sect.	177	30	2,500	467	37
Pony Press Drill	5-Foot	596	20	1,200	106	59
Press Drill	12-Foot	1,920	26	1,200	205	47
Swather PTO	12-Foot	1,086	19	1,200	311	62
Combine	9-Foot	3,636	15	2,000	311	124
Corn Planter	4-Row	1,210	25	1,200	106	21
Corn Cultivator	4-Row	455	20	2,500	212	42
Cornpicker	2-Row	2,701	15	2,000	73	44
Forage Harvester	1-Row	2,474	15	2,000	33	35
Mower	7-Foot	480	20	2,000	189	57
Side Rake		555	25	2,500	136	24
Dump Rake	10-Foot	273	30	2,500	53	10
Baler		2,045	15	2,500	136	48
Three Trailers or Wagons		910	25		209	104
Farmhand & Attachments		808	25		72	22
Sprayer	30-Foot	455	30	1,500	330	33

1/ Representative farm size is 640 acres with 448 acres of cropland.
2/ Approximate new cost in 1964.
3/ Agricultural Engineers Yearbook.

USEFUL LIFE

The standard depreciation schedule (see 1964 Agricultural Engineers Yearbook), 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 on the hours of use or the useful life in years, which ever 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 the various individual 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 to be used on the model farm, as well as per-acre and per-hour machine-operations costs are presented in Tables 3 through 8. The costs shown in these tables were determined on the basis of the model farm having 224 acres of small grain, 106 acres of corn, 43 acres of summer fallow, two cuttings of hay from 68 acres of alfalfa, and one cutting on 53 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 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 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 nonfarm 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 forage harvesting 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	$ 808	354	36.9%	63.1%
Field Cultivator	505	190	60.3	39.7
Pony Press Drill	596	106	48.8	51.2
Press Drill	1,920	205	83.1	16.9
Swather	1,086	311	72.6	27.4
Combine	3,636	311	62.8	37.2
Corn Planter	1,210	106	87.6	12.4
Cornpicker	2,701	73	85.9	14.1
Forage Harvester	2,474	33	85.7	14.3
Baler	2,045	136	78.8	21.2

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 tabulation on the next page contains machine costs for selected sizes of tractors and combines:

EXAMPLES

Machine	Acres Covered	Machine Costs 1/ Annual	Machine Costs 1/ Per Acre	Per Cent Increase
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 remains 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 shown in Tables 4 through 8 were used in preparation of Table 9. With only a small change in acreage, there will only be a negligible increase or decrease in the fixed costs and hence the cost data will still be reasonably accurate.

Table 9 was produced using specific assumptions with regard to tillage practices. A governing assumption was one of "minimum tillage," which included pony plow and drilling on summer fallow as well as on small grain stubble, 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 corn stalks and fall plowing of alfalfa.

SUMMARY

Machine costs for this "representative wheat farm" were developed under assumptions which included specific crop acreages, tillage practices and prices paid for 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 farms in the two-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. Annual Machine Costs by Machine or Implement Used on the 640-Acre Model Farm; Brown and Spink Counties

Machine	Size	Annual Use		Depre-ciation	Insurance & Taxes	Interest	Repairs	Fuel, Oil, & Lubricant	Total
		Acres	Hours						
Tractor	3-Plow	1,944	406	$ 126.36	$ 59.84	$ 135.13	$102.55	$ 26.39[1]	$ 450.27
Tractor	4-Plow	1,946	738	272.67	77.97	175.00	361.80	38.56[1]	926.00
Moldboard Plow	4-14-Inch	354	170	48.47	13.86	31.11	54.40	105.40	253.24
Tandem Disc	10-Foot	397	127	34.05	12.96	29.14	13.97	48.46	138.58
Field Cultivator	12-Foot	190	38	22.75	8.69	19.44	3.04	30.40	84.32
Drag Harrow[2]	6-Sect.	467	37	5.33	3.03	6.81	.74	14.06	29.97
Pony Press Drill	5-Foot	106	59	26.80	10.22	22.95	14.16	48.76	122.89
Press Drill[3]	12-Foot	205	47	66.46	32.91	73.92	18.80	16.45	208.54
Swather PTO[2]	12-Foot	311	62	51.42	18.64	41.81	14.26	27.90	154.03
Combine PTO	9-Foot	311	124	218.13	62.40	139.99	90.52	158.72	669.76
Corn Planter[2]	4-Row	106	21	43.56	20.80	46.59	6.30	9.45	126.70
Corn Cultivator	4-Row	212	42	20.50	7.81	17.52	2.94	21.00	69.77
Cornpicker[2]	2-Row	73	44	162.07	46.38	103.99	23.76	27.72	363.92
Forage Harvester	1-Row	33	35	148.47	42.48	95.29	25.90	21.70	333.84
Mower[2]	7-Foot	189	57	21.60	8.25	18.48	10.26	17.10	75.69
Side Rake[2]		136	24	40.00	9.61	21.37	4.32	5.28	80.58
Dump Rake[2]	10-Foot	53	10	8.20	4.67	10.51	.50	2.60	26.48
Baler		136	48	122.67	41.59	78.73	15.84	49.44	308.27
Front End Loader & Attachments[2]		72	22	29.08	13.86	31.11	3.52	8.80	86.37
Three Trailers or Wagons[3]		209	104	32.76	15.63	35.04	17.04	56.01	156.48
Sprayer[2]	30-Foot	330	33	13.67	7.81	17.52	2.97	9.90	51.87
Total Costs				$1,515.02	$519.41	$1,151.45	$787.59	$744.10	$4,717.57

[1] Overhead maintenance.
[2] Used with a 3-plow tractor.
[3] Used half time with each tractor size.

Table 4. Machine Costs Per Hour os Use by Machine or Implement Used, 640-Acre Model Farm; Brown and Spink Counties

Machine or Implement	Size	Annual Use Hours	Dollar Cost Per Hour[1/] Depreciation	Insurance & Taxes	Int.	Repairs	Total
Moldboard Plow	4-14-Inch	170	$0.29	$0.08	$0.18	$0.32	$0.87
Tandem Disc	10-Foot	127	.27	.10	.23	.11	.71
Field Cultivator	12-Foot	38	.60	.23	.51	.08	1.42
Drag Harrow	6-Sect.	37	.14	.08	.18	.02	.42
Pony Press Drill	5-Foot	59	.45	.17	.39	.24	1.25
Press Drill	12-Foot	47	1.41	.70	1.57	.40	4.08
Swather PTO	12-Foot	62	.83	.30	.67	.23	2.03
Combine PTO	9-Foot	124	1.76	.50	1.13	.73	4.12
Corn Planter	4-Row	21	2.07	.10	2.22	.30	4.69
Corn Cultivator	4-Row	42	.49	.18	.42	.07	1.16
Cornpicker	2-Row	44	3.68	1.05	2.36	.54	7.63
Forage Harvester	1-Row	35	4.24	1.21	2.72	.74	8.91
Mower	7-Foot	57	.38	.14	.32	.18	1.02
Side Rake		24	1.67	.40	.89	.18	3.14
Dump Rake	10-Foot	10	.82	.47	1.05	.05	2.39
Baler		48	2.56	.87	1.64	.33	5.40
Front End Loader & Attachments		22	1.32	.63	1.41	.16	3.52
Three Trailers or Wagons		104	.32	.15	.34	.16	.97
Sprayer	30-Foot	33	.41	.24	.53	.09	1.27

[1/] Costs include only machine or implement.

Table 5. Tractor, Machine and Implement Costs Per Hour of Use, 640-Acre Model Farm; Brown and Spink Counties

Machine or Implement	Size	Dollar Cost Per Hour Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	4-14-Inch	$0.66	$0.19	$0.42	$0.81	$0.67	$2.75
Tandem Disc	10-Foot	.64	.21	.47	.60	.43	2.35
Field Cultivator	12-Foot	.97	.34	.75	.57	.85	3.48
Drag Harrow[1/]	6-Sect.	.45	.23	.51	.27	.45	1.91
Pony Press Drill	5-Foot	.82	.28	.63	.73	.51	2.97
Press Drill	12-Foot	1.78	.81	1.81	.89	.42	5.71
Press Drill[1/]	12-Foot	1.72	.85	1.90	.65	.40	5.52
Swather PTO[1/]	12-Foot	1.14	.98	1.00	.48	.52	4.12
Combine PTO	9-Foot	2.03	.61	1.37	1.22	1.33	6.56
Corn Planter[1/]	4-Row	2.38	.25	2.55	.55	.52	6.25
Corn Cultivator	4-Row	.86	.29	.66	.56	.55	2.92
Cornpicker[1/]	2-Row	3.69	1.20	2.69	.79	.70	9.07
Forage Harvester	1-Row	4.61	1.32	2.96	1.23	.67	10.79
Mower[1/]	7-Foot	.69	.29	.65	.43	.37	2.43
Side Rake[1/]		1.98	.55	1.22	.43	.29	4.47
Dump Rake[1/]	10-Foot	1.13	.62	1.38	.30	.33	3.76
Baler		2.93	.98	1.86	.82	1.08	7.67
Front End Loader & Attachments[1/]		1.63	.78	1.72	.41	.47	5.01
Wagon or Trailer		.69	.26	.58	.65	.61	2.79
Wagon or Trailer[1/]		.63	.30	.67	.41	.59	2.60
Sprayer[1/]	30-Foot	.72	.39	.86	.34	.37	2.68

[1/] Used with a 3-plow tractor--all other implements or machines pulled with a 4-plow tractor.

Table 6. Tractor Costs Per Acre of Use for Specific Machines and Implements, 640-Acre Model Farm; Brown and Spink Counties

Machine or Implement	Size	Dollar Cost Per Acre					
		Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	4-14-Inch	$0.177	$0.051	$0.114	$0.235	$0.025	$0.602
Tandem Disc	10-Foot	.118	.034	.076	.157	.017	.402
Field Cultivator	12-Foot	.074	.021	.047	.098	.010	.250
Drag Harrow[1/]	6-Sect.	.025	.012	.027	.020	.010	.094
Pony Press Drill	5-Foot	.207	.059	.133	.275	.029	.703
Press Drill	12-Foot	.085	.024	.055	.113	.012	.289
Press Drill[1/]	12-Foot	.072	.034	.076	.058	.014	.254
Swather PTO	12-Foot	.062	.029	.066	.050	.013	.220
Combine PTO	9-Foot	.148	.042	.095	.196	.021	.502
Corn Planter[1/]	4-Row	.062	.029	.066	.050	.013	.220
Corn Cultivator	4-Row	.074	.021	.047	.098	.010	.250
Cornpicker[1/]	2-Row	.187	.088	.200	.151	.024	.650
Forage Harvester	1-Row	.388	.111	.249	.051	.055	.854
Mower[1/]	7-Foot	.093	.044	.100	.076	.016	.329
Side Rake[1/]		.056	.027	.060	.045	.013	.201
Dump Rake[1/]	10-Foot	.059	.028	.063	.048	.013	.211
Baler		.129	.037	.083	.172	.018	.439
Front End Loader & Attachments[1/]		.093	.044	.100	.076	.016	.329
Wagon or Trailer		.185	.053	.118	.245	.026	.627
Wagon or Trailer[1/]		.156	.074	.166	.126	.022	.544
Sprayer[1/]	30-Foot	.031	.015	.033	.025	.011	.115

[1/] Three-plow tractor--all other implements and machines pulled with a 4-plow tractor.

Table 7. Costs Per Acre by Machine and Implement Used, 640-Acre Model Farm; Brown and Spink Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					
			Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	4-14-Inch	354	$0.137	$0.039	$0.038	$0.154	$0.298	$0.716
Tandem Disc	10-Foot	397	.086	.033	.073	.035	.122	.349
Field Cultivator	12-Foot	190	.120	.046	.102	.016	.160	.444
Drag Harrow	6-Sect.	467	.011	.005	.015	.002	.030	.064
Pony Press Drill	5-Foot	106	.253	.096	.216	.134	.460	1.159
Press Drill	12-Foot	205	.324	.160	.361	.092	.080	1.017
Swather PTO	12-Foot	311	.165	.060	.134	.046	.090	.495
Combine PTO	9-Foot	311	.701	.201	.450	.291	.510	2.153
Corn Planter	4-Row	105	.411	.196	.440	.059	.089	1.195
Corn Cultivator	4-Row	212	.097	.037	.082	.014	.099	.329
Cornpicker	2-Row	73	2.220	.635	1.425	.325	.380	4.985
Forage Harvester	1-Row	33	4.499	1.287	2.886	.785	.658	10.115
Mower	7-Foot	189	.114	.044	.098	.054	.090	.400
Side Rake		136	.294	.070	.157	.032	.039	.592
Dump Rake	10-Foot	53	.155	.088	.198	.010	.049	.500
Baler		136	.902	.306	.579	.116	.364	2.267
Front End Loader & Attachments		72	.404	.193	.432	.049	.122	1.200
Wagons or Trailers		209	.157	.075	.168	.081	.268	.749
Sprayer	30-Foot	330	.041	.024	.053	.009	.030	.157

Table 8. Tractor, Machine and Implement Costs Per Acre of Use, 640-Acre Model Farm; Brown and Spink Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre: Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	4-14-Inch	354	$0.314	$0.090	$0.202	$0.389	$0.323	$1.318
Tandem Disc	10-Foot	397	.204	.067	.149	.192	.139	.751
Field Cultivator	12-Foot	190	.194	.067	.149	.114	.170	.694
Drag Harrow[1/]	6-Sect.	467	.036	.018	.042	.022	.040	.158
Pony Press Drill	5-Foot	105	.460	.155	.349	.409	.489	1.862
Press Drill	12-Foot	103	.409	.184	.416	.205	.092	1.305
Press Drill[1/]	12-Foot	102	.396	.194	.437	.150	.094	1.271
Swather PTO	12-Foot	311	.227	.089	.200	.096	.103	.715
Combine PTO	9-Foot	311	.849	.243	.545	.487	.531	2.655
Corn Planter[1/]	4-Row	105	.473	.225	.506	.109	.102	1.415
Corn Cultivator	4-Row	212	.171	.058	.129	.112	.109	.579
Cornpicker[1/]	2-Row	73	2.407	.723	1.625	.476	.404	5.635
Forage Harvester	1-Row	33	4.887	1.398	3.135	.836	.713	10.969
Mower[1/]	7-Foot	189	.207	.088	.198	.130	.106	.729
Side Rake[1/]		136	.350	.097	.217	.077	.052	.793
Dump Rake[1/]	10-Foot	53	.214	.116	.261	.058	.062	.711
Baler		136	1.031	.343	.662	.288	.382	2.706
Front End Loader & Attachments[1/]		72	.497	.237	.532	.125	.138	1.529
Trailer or Wagon		105	.342	.128	.286	.326	.294	1.376
Trailer or Wagon[1/]		104	.313	.149	.334	.207	.290	1.293
Sprayer	30-Foot	330	.072	.039	.086	.034	.041	.272

[1/] Three-plow tractor--all other implements and machines pulled with a 4-plow tractor.

Table 9. Machine Costs Per Acre by Crop and by Type of Operation on 640-Acre Model Farm; Brown and Spink Counties

Crop	Type of Operation	Machine Time Hours Per Acre	Dollar Cost Per Acre: Depreciation	Insurance & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Summer Fallow	Tillage	1.28	$1.09	$0.36	$0.80	$0.85	$1.00	$ 4.10
Wheat or Flax After Summer Fallow	Pony Plow & Drill	.56	.46	.16	.35	.41	.49	1.87
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.73	.38	.63	3.37
	Total	1.26	1.61	.53	1.19	1.02	1.16	5.51
Wheat or Flax After Small Grain	Pony Plow & Drill (½)	.28	.23	.08	.17	.20	.25	.93
	Tillage (½)	.44	.28	.09	.19	.30	.25	1.11
	Planting (½)	.12	.20	.09	.21	.09	.05	.64
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.75	.58	.63	3.37
	Total	1.14	1.86	.63	1.41	1.20	1.22	6.32
Wheat, Flax, or Other Small Grain After Small Grain	Tillage	.88	.55	.18	.39	.60	.50	2.22
	Planting	.23	.40	.19	.43	.18	.09	1.29
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.73	.38	.63	3.37
	Total	1.81	2.10	.74	1.66	1.19	1.26	7.15
Small Grain After Corn Grain	Tillage	1.24	.78	.27	.56	.81	.66	3.08
	Planting	.23	.40	.19	.43	.18	.09	1.29
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.73	.58	.63	3.37
	Total	2.17	2.33	.83	1.83	1.60	1.42	8.01
Small Grain After Corn Silage	Tillage	.92	.57	.18	.41	.61	.52	3.29
	Planting	.23	.40	.19	.43	.18	.09	1.29
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.73	.38	.63	3.37
	Total	1.85	2.12	.74	1.68	1.40	1.28	7.22
Small Grain After Alfalfa	Tillage	1.28	.79	.26	.58	.82	.68	3.13
	Planting	.23	.40	.19	.43	.18	.09	1.29
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Harvest	.60	1.08	.33	.73	.38	.63	3.37
	Total	2.21	2.34	.82	1.83	1.61	1.44	8.06
Corn After Summer Fallow	Tillage	.88	.62	.22	.49	.46	.44	2.23
	Planting	.20	.47	.22	.51	.11	.10	1.41
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Subtotal	1.18	1.16	.48	1.09	.60	.58	3.91
Corn Grain	Harvest	.60	2.41	.72	1.63	.48	.40	5.64
	Total	1.78	3.57	1.20	2.72	1.08	.98	9.55
Corn Silage	Harvest	1.05	4.89	1.40	3.13	.84	.71	10.97
	Total	2.23	6.05	1.88	4.22	1.44	1.29	14.88
Corn After Small Grain	Tillage	1.36	.93	.31	.69	.85	1.02	3.80
	Planting	.20	.47	.22	.51	.11	.10	1.41
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Subtotal	1.66	1.47	.57	1.29	.99	1.16	5.48
Corn Grain	Harvest	.60	2.41	.72	1.63	.48	.40	5.64
	Total	2.26	3.88	1.29	2.92	1.47	1.56	11.12
Corn Silage	Harvest	1.05	4.89	1.40	3.13	.84	.71	10.97
	Total	2.71	6.36	1.97	4.42	1.83	1.87	16.45
Corn After Corn Grain	Tillage	1.70	1.20	.39	.88	1.08	.94	4.49
	Planting	.20	.47	.22	.51	.11	.10	1.41
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Subtotal	2.00	1.74	.65	1.48	1.22	1.08	6.17
Corn Grain	Harvest	.60	2.41	.72	1.63	.48	.40	5.64
	Total	2.60	4.15	1.37	3.11	1.70	1.48	11.81
Corn Silage	Harvest	1.05	4.89	1.40	3.13	.84	.71	10.97
	Total	3.05	6.67	2.05	4.61	2.06	1.79	17.14
Corn After Corn Silage	Tillage	1.38	.99	.32	.73	.88	.80	3.72
	Planting	.20	.47	.22	.51	.11	.10	1.41
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Subtotal	1.68	1.53	.58	1.33	1.02	.94	5.40
Corn Grain	Harvest	.60	2.41	.72	1.63	.48	.40	5.64
	Total	2.28	3.94	1.30	2.96	1.50	1.34	11.04
Corn Silage	Harvest	1.05	4.89	1.40	3.13	.84	.71	10.97
	Total	2.73	6.42	1.98	4.46	1.86	1.63	16.37
Corn After Alfalfa	Tillage	1.44	1.00	.32	.73	.92	.79	3.76
	Planting	.20	.47	.22	.51	.11	.10	1.41
	Spraying	.10	.07	.04	.09	.03	.04	.27
	Subtotal	1.74	1.54	.58	1.33	1.06	.93	5.44
Corn Grain	Harvest	.60	2.41	.72	1.63	.48	.40	5.64
	Total	2.34	3.95	1.30	2.96	1.54	1.33	11.08
Corn Silage	Harvest	1.05	4.89	1.40	3.13	.84	.71	10.97
	Total	2.79	6.43	1.98	4.46	1.90	1.64	16.41
Tame Hay[1/]	Mow, Rake, Bale	.83	1.59	.53	1.08	.50	.54	4.24
	Mow, Rake, Stack	.79	1.01	.42	.97	.31	.30	3.05
Native Hay[1/]	Mow, Rake, Stack	.79	.92	.44	.99	.31	.31	2.97

1/ Per cutting per acre.