6-1968

Machinery Costs on Typical Wheat Farms in North Central South Dakota: Campbell, Edmunds, McPherson, and Walworth Counties

E. O. Ullrich
South Dakota State University

J. T. Sanderson
South Dakota State University

W. G. Aanderud

Experiment Station Circular No. 193
June 1968

Machinery Costs on Typical Wheat Farms In North Central South Dakota

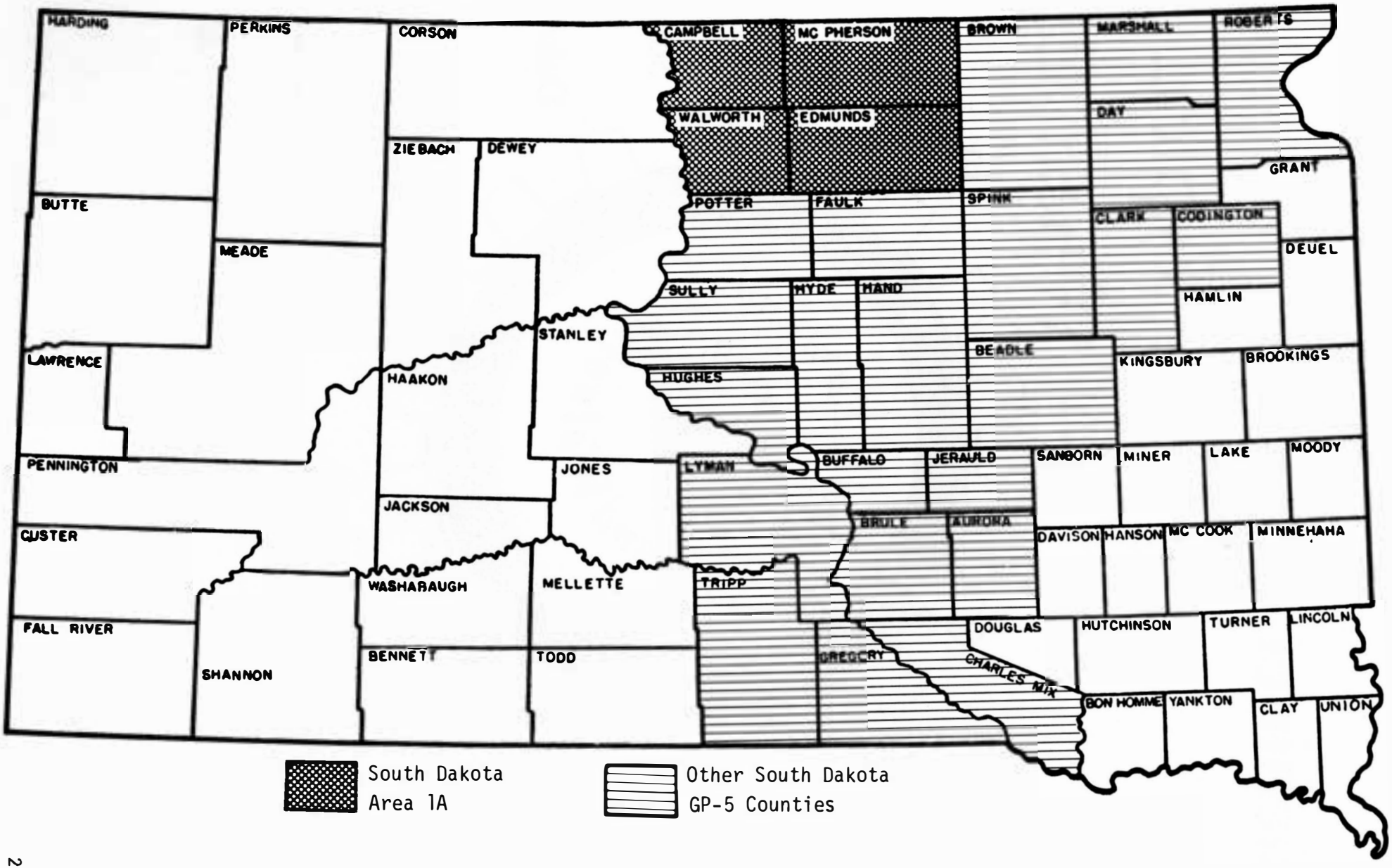
Campbell, Edmunds, McPherson, Counties and Walworth

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 feedgrain 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 1A (Figure 1) for this publication should prove useful in planning and budgeting work and should be helpful in other production and farm management studies.

* * * * * *

DESCRIPTION OF AREA 1A

CAMPBELL, EDMUNDS, McPHERSON, AND WALWORTH COUNTIES

SOILS

The soils of this four-county area are mainly Chestnut. Chestnut soils in the northern Great Plains area have darker soil surface colors than those in southern areas, because in the north oxidation of organic matter is slower.

Three major soil associations are found in the Campbell, Edmunds, McPherson, and Walworth County area. The Agar-Williams Association, in the western part, occurs in undulating or sloping landscapes, formed in glacial till and loess. Agar-Williams Association soils are well-drained soils with grayish brown silt loam and loam surface layers. The major problems associated with the Agar-Williams Association soils are: (1) maintenance of organic matter and nitrogen, (2) moisture conservation, and (3) the control of run-off. Livestock and general types of farming are performed in the Agar-Williams soils area.

Williams-Zahl Association is found in the central portion of this area. Williams-Zahl soils are undulating to steep and are well to excessively drained. These soils have grayish-brown loam surfaces and are developed from calcareous

glacial till. A few minor soils are developed in mixed outwash sediments. The major management problems of these soils are similar to those of the Agar-Williams series, namely: (1) maintenance of organic matter and nitrogen, (2) moisture conservation and, (3) control of run-off and water erosion. The land use depends mainly upon topography and includes cash grain, livestock and general farms as well as ranches.

The Houdek and Bonilla series, classified as Chernozem soils, is the third major soil association and is found in eastern McPherson and Edmunds Counties. These soils are undulating to nearly level and are well to moderately well drained. They are developed from calcareous loam till and have dark grayish-brown slightly acid surface layers. The major problems in soil and water management are the maintenance of organic matter and the conservation of moisture. Major soil uses for this series are cash-grain production, livestock farming and general farming.

TYPE OF FARMING CHARACTERISTICS

The average farm in the Campbell, Edmunds, McPherson, and Walworth County area ranged from about 899 acres (in McPherson County) to 1,025 acres (in Walworth County), according to the 1964 census. There were 2,446 farms in the four-county area in 1964 of which 22 per cent were classified as cash-grain, 46 per cent as livestock (including ranches), 22 per cent as general farms, and the remaining 10 per cent as poultry, dairy, and miscellaneous farms.

Farmers in this four-county area are major producers of cash crops, which include wheat, flax and rye. In addition, about half the farmers who raised oats and barley in 1964 sold part of that crop (39 per cent of the oats and 46 per cent of the barley). About 40 per cent of the corn acreage harvested in 1964 was picked for grain and the balance was harvested as silage. Only 10 per cent of the farmers who harvested corn for grain in 1964 sold corn grain, which amounted to about 12.4 per cent of the corn grain harvested. Feed grains which were not sold were fed to livestock on the farm.

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

Livestock were found on 75 to 80 per cent of the area's farms. Beef types were the most common, with about 70 per cent of the herds being composed of from 10 to 50 cows. Fifty-four per cent of the farms maintained dairy herds which were relatively small--about 80 per cent of these herds numbered fewer than 15 cows. In 1964, 18 per cent of these farms sold whole milk and nearly 80 per cent sold cream.

Approximately 4 in 10 farms had farrowed sows and a few bought feeder pigs. Sow numbers per farm were usually low--about two-thirds of the sow herds contained fewer than 10 head per farm. The bulk of the farrowings occurred in the spring, however, about one-fourth were fall farrowings.

Sheep production in this area was limited to small flocks numbering less than 50 ewes. About 17 per cent of the area's farmers maintained a farm flock.

Table 1. Number and Per Cent of Farms That Raised and Harvested Major Grain Crops in 1964 in Campbell, Edmunds, McPherson and Walworth Counties

	No. of Farms	Percentage of Farms	Number of Acres Harvested	Percentage of Acres Harvested
Corn1/	1,739	71.1	129,801	18.0
All Wheat2/	2,184	89.3	312,130	43.2
Oats	2,086	85.3	183,953	25.5
Barley	398	16.3	13,600	1.9
Flax	815	33.3	49,062	6.8
Rye	369	15.1	24,222	3.4
Other3/			9,239	1.2

1/ Includes corn harvested for grain, silage and other purposes.
2/ Includes 2,857 acres of winter wheat and 10,337 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 a typical wheat farm was one of 640 acres (333 acres in cropland and 277 acres in native hay and pasture). The average farm size for the four-county area was calculated at 951 acres. It should be pointed out that the average may not depict the most representative size of farms because the 1964 Census of Agriculture averages together all types of farms, including ranch and livestock farms and wheat farms. The livestock farms usually were much larger than wheat farms. The same census shows only 36 per cent of all farms and ranches were 1,000 acres or larger.

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	101	Alfalfa	34
Oats, Barley, Flax	86	Other Tame Hay and Pasture	18
Corn Grain	20	Native Hay	92
Corn Silage	29	Native Pasture	185
Summer Fallow	45		

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 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 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 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 to be used on the model farm, as well as per-acre and per-hour machine-operation costs are presented in Tables 3 through 8. The costs shown in these tables were determined on the basis of the model farm having 187 acres of smallgrain, 49 acres of corn, 45 acres of summer fallow, two cuttings of hay from 34 acres of alfalfa, and one cutting on 92 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.

Table 2. Size, Purchase Price, Expected Useful Life, and Annual Use of Machinery on a Hypothetical 640-Acre Model Farm in the Campbell, Edmunds, McPherson, and Walworth County Area[1/]

Machine	Size	Purchase Price[2/]	Useful Life[3/]		Annual Use	
		Dollars	Years	Hours	Acres	Hours
Tractor	2-Plow	$2,886	25	12,000	1,202	171
Tractor	3-Plow	3,545	20	12,000	1,256	594
Moldboard Plow	3-14-Inch	490	17	2,500	222	145
Tandem Disc	10-Foot	765	25	2,500	236	71
Field Cultivator	12-Foot	510	20	2,000	145	29
Drag Harrow	6-Sect.	178	30	2,500	263	21
Pony Press Drill	3½-Foot	316	26	1,200	59	46
Press Drill	10-Foot	1,530	30	1,200	128	36
Swather PTO	12-Foot	1,096	20	1,200	187	37
Combine PTO	6-Foot	2,616	15	2,000	187	94
Corn Planter	2-Row	560	25	1,200	49	18
Corn Cultivator	2-Row	255	20	2,500	98	32
Mower	7-Foot	485	20	2,000	178	53
Side Rake		561	25	2,500	86	26
Dump Rake	12-Foot	275	30	2,500	92	14
Baler		2,065	15	2,500	86	30
Front End Loader & Attachments		816	25		110	33
2 - Trailers or Wagons		612	25		96	48
Sprayer	30-Foot	459	30	1,500	236	24

1/ Representative farm size was 640 acres with 333 acres of cropland.
2/ Approximate new cost in 1964.
3/ Agricultural Engineers Yearbook.

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 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 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 hay baler assumed for the model farm (Table 2) freezes the purchase cost of $2,065. If placed in a savings account, this would return about $93 per year at an interest rate of 4½ per cent. Perhaps, after adding up the earned interest and costs of the baling operation (including the prorated tractor costs) the farm operator will find it more economical to hire a custom baler.

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:

EXAMPLES

Implement	Purchase Price	Number of Acres Covered	Per Cent of Total Costs Per Acre	
			Fixed	Variable
Moldboard Plow	$ 490	222	42.3	57.7
Drag Harrow	178	263	62.3	37.7
Pony Press Drill	316	59	49.1	50.9
Press Drill	1,530	128	78.6	21.4
Combine	2,616	187	71.2	28.8
Corn Planter	560	49	77.9	22.1
Corn Cultivator	255	98	60.6	39.4
Side Rake	561	86	85.0	15.0
Baler	2,065	86	84.2	15.8

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.

Due to the small acreage involved in corn grain and corn silage, it was assumed custom harvest was used on our model farm. The costs of owning and operating a cornpicker and forage harvester would have been more than double than that of custom hire.

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/ 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 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 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, 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 grains and row crops, and two cultivations on row crops. Other assumptions included a discing for corn stalks in preparation of the land for future crops and fall plowing of alfalfa.

Table 3. Annual Machine Costs by Machine or Implement Used on the 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties

Machine	Size	Annual Use		Depre-ciation	Insurance & Taxes	Interest	Repairs	Fuel, Oil, & Lubricant	Total
		Acres	Hours						
Tractor	2-Plow	1202	171	$103.88	$ 49.03	$111.13	$ 43.79	$ 14.53 1/	$322.36
Tractor	3-Plow	1256	594	159.50	59.84	136.50	207.90	23.76 1/	587.50
Moldboard Plow	3-14-Inch	222	145	25.94	8.31	18.86	29.00	92.80	174.91
Tandem Disc	10-Foot	236	71	27.56	12.96	29.45	7.81	33.37	111.15
Field Cultivator	12-Foot	145	29	22.95	8.69	19.64	2.32	24.65	78.25
Drag Harrow	6-Sect.	263	21	5.33	3.03	6.85	.42	10.50	26.13
Pony Press Drill	3½-Foot	59	46	10.92	5.45	12.17	5.98	31.15	65.67
Press Drill 2/	10-Foot	128	36	45.90	25.98	58.91	11.52	12.96	155.27
Swather PTO 3/	12-Foot	187	37	49.30	18.64	42.20	8.51	18.50	137.15
Combine PTO	6-Foot	187	94	156.93	44.45	100.72	48.88	63.92	414.90
Corn Planter	2-Row	49	18	20.16	9.61	21.56	2.52	7.92	61.77
Corn Cultivator	2-Row	98	32	11.50	4.87	9.82	1.28	17.60	45.07
Mower	7-Foot	178	53	21.85	8.25	18.68	9.54	17.49	75.81
Side Rake 3/		86	26	20.20	9.61	21.60	4.94	4.42	60.77
Dump Rake 3/	12-Foot	92	14	8.23	5.21	10.59	.70	3.78	28.51
Baler		86	30	123.93	41.59	79.51	1.20	35.10	281.33
Front End Loader & Attachments		110	33	29.36	13.86	31.42	5.28	19.80	99.72
2 - Trailers or Wagons		96	48	22.04	10.40	23.55	5.29	25.72	87.00
Sprayer (trailer) 3/	30-Foot	236	24	13.80	7.81	17.68	2.16	9.60	51.05
Total Costs				$879.28	$347.59	$770.84	$399.04	$467.57	$2864.32

1/ Overhead maintenance.
2/ Used ½ time with each tractor size.
3/ Used with 2-plow tractor.

Table 4. Machine Costs Per Hour of Use by Machine and Implement Used, 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties

Machine or Implement	Size	Annual Use Hours	Dollar Cost Per Hour[1/] Depre-ciation	Ins. & Taxes	Int.	Repairs	Total
Moldboard Plow	3-14-Inch	145	$0.18	$0.06	$0.13	$0.20	$0.57
Tandem Disc	10-Foot	71	.39	.18	.41	.11	1.09
Field Cultivator	12-Foot	29	.79	.30	.68	.08	1.85
Drag Harrow	6-Sect.	21	.25	.14	.33	.02	.74
Pony Press Drill	3½-Foot	46	.24	.12	.26	.13	.75
Press Drill	10-Foot	36	1.28	.72	1.64	.32	3.96
Swather PTO	12-Foot	37	1.33	.50	1.14	.23	3.20
Combine PTO	6-Foot	94	1.67	.47	1.07	.52	3.73
Corn Planter	2-Row	18	1.12	.53	1.20	.14	2.99
Corn Cultivator	2-Row	32	.36	.15	.31	.04	.86
Mower	7-Foot	53	.41	.16	.35	.18	1.10
Side Rake		26	.78	.37	.83	.19	2.17
Dump Rake	12-Foot	14	.59	.37	.76	.05	1.77
Baler PTO		30	4.13	1.39	2.65	.04	8.21
Front End Loader & Attachments		33	.89	.42	.95	.16	2.42
2 - Trailers or Wagons		48	.46	.22	.49	.11	1.28
Sprayer (trailer)	30-Foot	24	.58	.33	.74	.09	1.74

1/ Costs include only machine or implement.

Table 5. Tractor, Machine, and Implement Costs Per Hour of Use, 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties[1/]

Machine or Implement	Size	Dollar Cost Per Hour Depre-ciation	Ins. & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	3-14-Inch	$0.45	$0.16	$0.36	$0.55	$0.68	$2.20
Tandem Disc	10-Foot	.66	.28	.64	.46	.51	2.55
Field Cultivator	12-Foot	1.06	.40	.91	.43	.89	3.69
Drag Harrow	6-Sect.	.52	.24	.56	.37	.54	2.23
Pony Press Drill	3½-Foot	.51	.22	.49	.48	.72	2.42
Press Drill	10-Foot	1.55	.82	1.87	.67	.40	5.31
Press Drill[2/]	10-Foot	1.89	.99	2.29	.58	.41	6.16
Swather PTO[2/]	12-Foot	1.94	.77	1.79	.49	.58	5.57
Combine PTO	6-Foot	1.94	.57	1.30	.87	.72	5.40
Corn Planter	2-Row	1.39	.63	1.43	.49	.48	4.42
Corn Cultivator	2-Row	.63	.25	.54	.39	.59	2.40
Mower	7-Foot	.68	.26	.58	.53	.37	2.42
Side Rake[2/]		1.39	.64	1.48	.45	.25	4.21
Dump Rake[2/]	12-Foot	1.20	.64	1.41	.31	.13	3.69
Baler PTO		4.40	1.49	2.88	.39	1.21	10.37
Front End Loader & Attachments		1.16	.52	1.18	.51	.64	4.01
2 - Trailers or Wagons[2/]		1.07	.49	1.14	.37	.62	3.69
Sprayer (trailer)[2/]	30-Foot	1.19	.60	1.39	.35	.48	4.01

1/ All costs include tractor costs.
2/ Two-plow tractor--all other implements and machines pulled with a 3-plow tractor.

Table 6. Tractor Costs Per Acre of Use for Specific Machines and Implements, 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties

Machine or Implement	Size	Dollar Cost Per Acre					
		Depre-ciation	Ins. & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	3-14-Inch	$0.174	$0.065	$0.149	$0.228	$0.026	$0.642
Tandem Disc	10-Foot	.081	.030	.069	.105	.012	.297
Field Cultivator	12-Foot	.054	.020	.046	.070	.008	.198
Drag Harrow	6-Sect.	.021	.008	.018	.028	.003	.078
Pony Press Drill	3½-Foot	.209	.078	.179	.273	.031	.770
Press Drill	10-Foot	.075	.028	.064	.098	.011	.276
Press Drill1/	10-Foot	.170	.080	.182	.072	.024	.528
Swather PTO1/	12-Foot	.122	.057	.130	.051	.017	.377
Combine PTO	6-Foot	.134	.050	.115	.175	.020	.494
Corn Planter	2-Row	.097	.036	.083	.126	.014	.356
Corn Cultivator	2-Row	.089	.033	.076	.116	.013	.327
Mower	7-Foot	.081	.030	.069	.105	.012	.297
Side Rake1/		.182	.086	.195	.076	.026	.565
Dump Rake1/	12-Foot	.091	.043	.097	.038	.013	.282
Baler PTO		.094	.035	.080	.123	.014	.346
Front End Loader & Attachments		.081	.030	.069	.105	.012	.297
2 - Trailers or Wagons1/		.304	.143	.325	.128	.043	.943
Sprayer (trailer)1/	30-Foot	.061	.029	.065	.026	.009	.190

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

Table 7. Costs Per Acre by Machine and Implement Used, 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					
			Depre-ciation	Ins. & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	3-14-Inch	222	$0.117	$0.037	$0.085	$0.131	$0.418	$0.788
Tandem Disc	10-Foot	236	.117	.055	.125	.033	.141	.471
Field Cultivator	12-Foot	145	.158	.060	.135	.016	.170	.539
Drag Harrow	6-Sect.	263	.020	.012	.026	.002	.040	.100
Pony Press Drill	3½-Foot	59	.185	.092	.206	.101	.528	1.112
Press Drill	10-Foot	128	.358	.203	.460	.090	.101	1.212
Swather PTO	12-Foot	187	.264	.100	.226	.046	.099	.735
Combine PTO	6-Foot	187	.839	.238	.539	.261	.342	2.219
Corn Planter	2-Row	49	.411	.196	.440	.051	.162	1.260
Corn Cultivator	2-Row	98	.117	.050	.100	.013	.180	.460
Mower	7-Foot	178	.123	.046	.105	.054	.098	.426
Side Rake		86	.235	.112	.251	.057	.051	.706
Dump Rake	12-Foot	92	.089	.057	.115	.008	.041	.310
Baler PTO		86	1.440	.484	.924	.014	.408	3.270
Front End Loader & Attachments		110	.267	.126	.286	.048	.180	.907
2 - Trailers or Wagons		96	.230	.108	.245	.055	.268	.906
Sprayer (trailer)	30-Foot	236	.058	.033	.075	.009	.041	.216

SUMMARY

Machine costs for this "representative wheat farm" were developed under assumptions which included specific crops 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 this four-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 8. Tractor, Machine and Implement Costs Per Acre of Use, 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties[1/]

Machine or Implement	Size	Annual Use in Acres	Dollar Cost Per Acre					
			Depreciation	Ins. & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Moldboard Plow	3-14-Inch	222	$0.291	$0.102	$0.234	$0.359	$0.444	$1.430
Tandem Disc	10-Foot	236	.198	.085	.194	.138	.153	.768
Field Cultivator	12-Foot	145	.212	.080	.181	.086	.178	.737
Drag Harrow	6-Sect.	263	.041	.020	.044	.030	.043	.178
Pony Press Drill	3½-Foot	59	.394	.170	.385	.374	.559	1.882
Press Drill	10-Foot	64	.433	.231	.524	.188	.112	1.488
Press Drill 2/	10-Foot	64	.528	.283	.642	.162	.125	1.740
Swather 2/	12-Foot	187	.386	.157	.356	.097	.116	1.112
Combine PTO	6-Foot	187	.973	.288	.654	.436	.362	2.713
Corn Planter	2-Row	49	.508	.232	.523	.177	.176	1.616
Corn Cultivator	2-Row	98	.206	.083	.176	.129	.193	.787
Mower	7-Foot	178	.204	.076	.174	.159	.110	.723
Side Rake 2/		86	.417	.198	.446	.133	.077	1.271
Dump Rake 2/	12-Foot	92	.180	.100	.212	.046	.054	.592
Baler		86	1.534	.519	1.004	.137	.422	3.616
Front End Loader & Attachments		110	.348	.156	.355	.153	.192	1.204
2 - Trailers or Wagons 2/		96	.534	.251	.570	.183	.311	1.849
Sprayer (trailer) 2/	30-Foot	236	.119	.062	.140	.035	.050	.406

1/ All costs include tractor costs.
2/ Two-plow--all other implements and machines pulled with a 3-plow tractor.

Table 9. Machine Costs Per Acre by Crop and by Type of Operation on 640-Acre Model Farm; Campbell, Edmunds, McPherson, and Walworth Counties

Crop	Type of Operation	Machine Time Hours Per Acre	Dollar Cost Per Acre: Depreciation	Ins. & Taxes	Int.	Repairs	Fuel, Oil, & Lubricant	Total
Summer Fallow	Tillage	$1.25	$0.93	$0.34	$0.78	$0.62	$0.98	$3.65
Wheat or Flax After Summer Fallow	Pony Plow & Drill	.78	.39	.17	.39	.37	.56	1.88
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Harvest	.70	1.36	.45	1.01	.53	.48	3.83
	Total	1.58	1.87	.68	1.54	94	1.09	6.12
Wheat or Flax After Small Grain or Corn Silage	Pony Plow & Drill (½)	.39	.20	.09	.19	.19	.28	.95
	Tillage (½)	.51	.27	.10	.24	.26	.32	1.19
	Planting (½)	.14	.24	.13	.29	.08	.06	.80
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Harvest	.70	1.36	.45	1.01	.53	.48	3.83
	Total	1.84	2.19	.83	1.87	1.10	1.19	7.18
Wheat, Flax or Other Small Grain After Corn Grain	Tillage	1.37	.75	.30	.69	.68	.79	3.21
	Planting	.28	.48	.26	.58	.17	.12	1.61
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Harvest	.70	1.36	.45	1.01	.53	.48	3.83
	Total	2.45	2.71	1.07	2.42	1.42	1.44	9.01
Other Small Grain After Small Grain or Corn Silage	Tillage	1.20	.55	.22	.49	.54	.66	2.46
	Planting	.28	.48	.26	.58	.17	.12	1.61
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Harvest	.70	1.36	.45	1.01	.53	.48	3.83
	Total	2.28	2.31	.99	2.32	1.28	1.31	8.31
Small Grain After Alfalfa	Tillage	1.41	.77	.31	.71	.70	.84	3.33
	Planting	.28	.48	.26	.58	.17	.12	1.61
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Harvest	.70	1.36	.45	1.01	.53	.48	3.83
	Total	2.28	2.73	1.08	2.44	1.44	1.49	9.18
Corn After Summer Fallow	Tillage	1.12	.69	.29	.63	.46	.63	2.70
	Planting	.36	.51	.23	.52	.18	.18	1.62
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Subtotal	1.58	1.32	.58	1.29	.68	.86	4.73
Corn Grain	Harvest (custom hired)							3.30
	Total		1.32	.58	1.29	.68	.86	8.03
Corn Silage	Harvest (custom hired)							5.10
	Total		1.32	.58	1.29	.68	.86	9.81
Corn After Small Grain	Tillage	1.73	.96	.38	.85	.80	1.05	4.04
	Planting	.36	.51	.23	.52	.18	.18	1.62
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Subtotal	2.19	1.59	.67	1.51	1.02	1.28	6.07
Corn Grain	Harvest (custom hired)							3.30
	Total		1.59	.67	1.51	1.02	1.28	9.37
Corn Silage	Harvest (custom hired)							5.10
	Total		1.59	.67	1.51	1.02	1.28	11.17
Corn After Corn Grain	Tillage	2.09	1.25	.50	1.11	.97	1.27	5.10
	Planting	.36	.51	.23	.52	.18	.18	1.62
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Subtotal	2.55	1.88	.79	1.77	1.19	1.50	7.13
Corn Grain	Harvest (custom hired)							3.30
	Total		1.88	.79	1.77	1.19	1.50	10.43
Corn Silage	Harvest (custom hired)							5.10
	Total		1.88	.79	1.77	1.19	1.50	12.23
Corn After Corn Silage	Tillage	1.79	1.05	.41	.91	.83	1.12	4.32
	Planting	.36	.51	.23	.52	.18	.18	1.62
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Subtotal	2.25	1.68	.70	1.57	1.05	1.35	6.35
Corn Grain	Harvest (custom hired)							3.30
	Total		1.68	.70	1.57	1.05	1.35	9.65
Corn Silage	Harvest (custom hired)							5.10
	Total		1.68	.70	1.57	1.05	1.35	11.45
Corn After Alfalfa	Tillage	1.84	1.04	.41	.92	.85	1.10	4.32
	Planting	.36	.51	.23	.52	.18	.18	1.62
	Spraying	.10	.12	.06	.14	.04	.05	.41
	Subtotal	2.30	1.67	.70	1.58	1.07	1.33	6.39
Corn Grain	Harvest (custom hired)							3.30
	Total		1.67	.70	1.58	1.07	1.33	9.65
Corn Silage	Harvest (custom hired)							5.10
	Total		1.67	.70	1.58	1.07	1.33	11.45
Tame Hay1/	Mow, rake, and bale	.95	2.16	.79	1.62	.43	.61	5.61
Native Hay1/	Mow, rake, and stack	.75	.73	.33	.74	.36	.36	2.52

1/ Per cutting per acre.