Agricultural Economics Report No. 84

For Check Out Only!

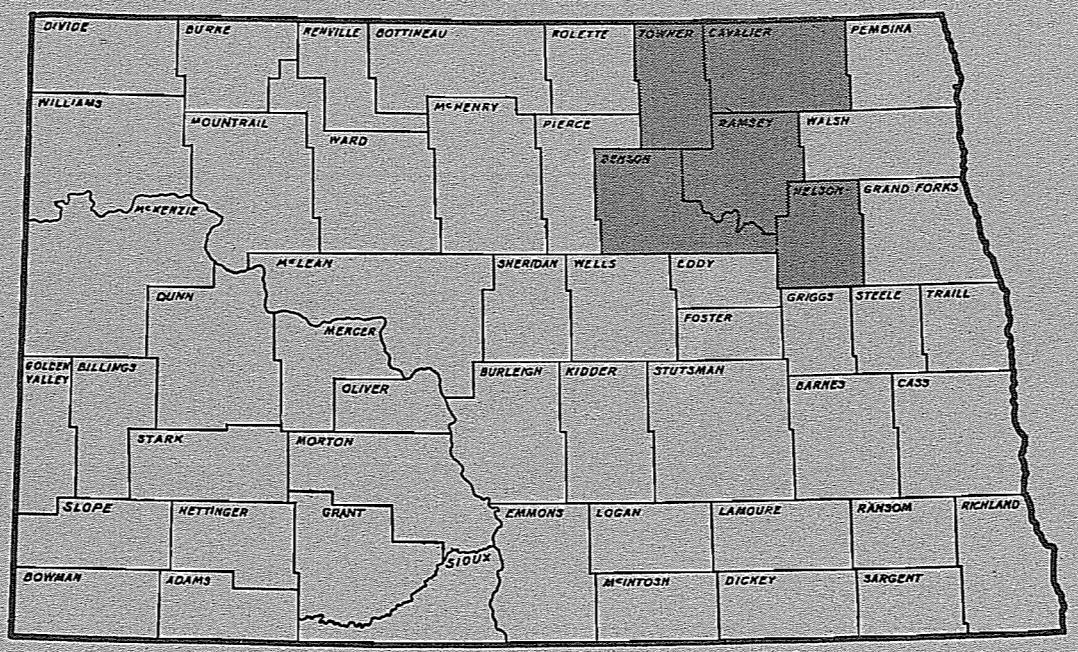
April 1972

Farm Business Analysis

BY SIZE OF FARM

IN

NORTHERN EAST CENTRAL NORTH DAKOTA



By

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FARM BUSINESS ANALYSIS BY SIZE OF FARM IN NORTHERN EAST CENTRAL NORTH DAKOTA

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INTRODUCTION

This report presents results of a study of small grain farms in five counties in the northern part of east central North Dakota. The purpose of the study is to determine the relationship between the size of farm in acres and the costs and returns obtained.

The Sample

A sample of farmers in Benson, Cavalier, Nelson, Ramsey, and Towner counties were interviewed during July and August of 1971 concerning their farm receipts and expenses for the 1970 crop.

The population from which the sample was drawn included all small grain farmers with over 480 acres of land (320 or more tillable) who worked less than 120 days off the farm and had no major crop loss in 1970.[1] A small grain farmer was defined as any farmer receiving over 75 percent of his gross income from small grain production, who did not do custom work in excess of the acreage on his farm[2] and devoted less than 25 percent of his acreage to row crops, certified seed, or grass seed.

The farms in each county were divided into four size categories based on total acres operated. A random sample was taken from each size category in each county. The sample represents approximately 4 percent of the small grain farms in the area. However, a greater percent of the larger farms were surveyed than the smaller farms. The number of farms for which complete information was obtained by farm size and county is presented in Table 1.

Accounting Procedures

The farm business analysis which follows is for the whole farm including the landlord's share on rented land. Cash receipts and expenditure information were supplied by the farm operator. In most cases the farmer referred to his 1970 income tax or other records when providing the data. Landlord's income and expenses were estimated by the farm operator.

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[1]A major crop loss was defined as over 50 percent loss on all crops or over 15 percent of crop with a total loss.

[2]In the case of crop spraying, an acreage up to three times the acreage on farm was allowed.

TABLE 1. NUMBER OF FARMS INCLUDED IN STUDY BY SIZE CATEGORY AND COUNTY

County	Size of Farm in Total Acres				Total
	480-959	960-1,439	1,440-1,919	1,920-4,500	
Benson	4	10	6	5	25
Cavalier	9	4	6	5	24
Nelson	8	7	5	9	29
Ramsey	9	4	8	5	26
Towner	6	7	10	5	28
TOTAL	36	32	35	29	132

With the exception of crop sales, all income and expenses were those that occurred during the 1970 calendar year. Crop sales were recorded only for the 1970 crop, but included sales made in 1971. Any of the 1970 crop not sold at the time of the interview (July-August, 1971) is reported as an increase in crop inventory.

Interest paid is not reported under farm expenses. Therefore, the net return figures given (return to capital and family labor) represent income of the whole farm on a full equity basis. However, an interest charge against all capital used is made in the calculation of labor and management returns.

A uniform rate of depreciation was charged for machinery and buildings rather than the rate each farmer was actually using for income tax purposes. The farmer placed a market value on major pieces of equipment, such as tractors, trucks, automobiles, combines, drills, and swathers. Other equipment was assigned a value based upon its size and age. Buildings were valued at cost minus depreciation. Depreciation was charged as a percent of current value. The depreciation rates used are presented in Table 2.

TABLE 2. DEPRECIATION RATES USED FOR MACHINERY AND BUILDINGS

Item	Percent of Current Value
Major Machinery and Equipment[a]	
Less than 10 Years Old	20.0%
Ten to 15 Years Old	13.3
Older than 15 Years	10.0
Tillage Equipment	
Less than 3 Years Old	20.0
Over 3 Years Old	10.0
Shop Equipment and Livestock Equipment	10.0
Wood Frame Buildings	6.7
Steel Grain Bins	13.3
Pole Barns	10.0
Steel Quonsets	10.0
Wood Quonsets	8.0

[a]Major machinery items include tractors, trucks, autos, combines, swathers, and drills.

DETAILED FARM BUSINESS ANALYSIS

The information for each farm in the study was processed utilizing the farm business analysis program used by the Cooperative Extension Service in their Mail-In Farm Records Project.[3] The results for the five counties were combined and averaged for each of the four farm size categories.

The analysis is presented in six tables. Measures of farm business size are reported in Table 2. A farm operating statement is presented in Table 3. Table 4 is a presentation of measures of farm business returns. Crop yields and land use are given in Table 5. The dollar returns from each crop and crop returns and expenses per tillable acre are presented in Table 6. An analysis of machinery costs is made in Table 7. Following the tables is an explanation of some of the terms used in the farm business analysis.

TABLE 3. MEASURES OF FARM SIZE, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970[a]

Size of Business	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,500A
Acres Owned	494.73	573.84	869.72	1,282.11
Acres Rented	213.84	598.10	747.43	1,248.90
Total Acres Farmed	708.57	1,171.94	1,617.15	2,531.01
Grain Acres	327.65	554.77	734.22	1,103.32
Hay and Pasture	58.28	87.42	151.49	351.43
Beef Cows to Calf[b]	(10) 10.91	(11) 24.64	(8) 39.51	(10) 44.22
Total Capital Investment	$114,811.81	$175,905.68	$247,195.47	$392,492.63
Land and Buildings	94,382.71	146,504.36	205,806.57	323,228.68
Livestock	1,273.59	3,059.59	5,862.81	9,326.25
Machinery	17,769.25	25,691.78	33,753.63	47,011.99
Crops and Supplies	1,386.30	649.97	1,772.49	12,925.73
Total Labor (Months)	15.24	16.98	19.52	26.84
Mo. Operator Labor	11.87	11.81	13.38	14.76
Mo. Unpaid Family	1.46	2.51	2.32	5.38
Mo. Hired Labor	1.92	2.67	3.83	6.71
Total Men on Farm	1.27	1.42	1.63	2.24

[a]Detail items may not add to totals due to rounding.

[b]Average number for those reporting beef cows; number in parentheses indicates the number of farms in group with beef cows.

[3]Reff, Tom, Mail-In Extension Farm Records Analysis Summary 1970 Report, General Records Summary 8, Cooperative Extension Service, North Dakota State University, Fargo, North Dakota, July, 1971, 88 pp.

TABLE 4. FARM OPERATING STATEMENT, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970[a]

Operating Statement	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,500A
Cash Farm Expenses				
Livestock Purchased	234.68	362.37	56.88	577.81
Feed and Feed Processing	102.44	159.01	267.01	346.21
Hired Labor and Meals	545.01	1,044.71	1,343.75	2,759.63
Gas, Fuel, and Oil	1,204.98	1,750.39	2,312.26	3,402.18
Machinery Repairs	850.14	1,528.97	1,868.21	2,866.18
Improvement Repairs	40.28	129.78	147.01	198.90
Utilities	317.98	353.30	368.61	524.90
Livestock-Vet & Market	40.98	62.30	172.75	186.80
Seed Purchased	512.11	1,071.94	1,264.95	2,983.42
Fertilizer	657.79	1,101.13	1,742.89	2,554.32
Other Crop Expense	688.17	949.33	1,192.49	1,633.11
Machine Hire	259.14	556.75	544.89	1,359.83
Taxes	989.82	1,519.30	2,060.15	3,216.01
Misc. Cash Expense	679.31	649.97	771.51	1,225.91
TOTAL[b]	$ 7,122.83	$11,239.25	$14,113.34	$23,835.20
Cash Farm Receipts				
Livestock and Products	$ 1,130.23	$ 1,500.20	$ 1,733.07	$ 4,472.92
Wheat and Durum	6,392.65	10,972.81	14,038.16	20,393.95
Barley Sold	2,699.28	4,367.07	6,595.19	7,666.89
Flax Sold	583.73	925.50	1,616.38	1,947.06
Other Crops	518.78	1,494.41	791.14	1,217.35
Custom Work Done	160.01	241.23	340.83	527.11
Government Payments	4,787.60	7,555.36	10,939.43	17,321.94
Misc. Cash Income	550.84	734.88	1,035.72	1,254.80
TOTAL	$16,823.06	$27,791.42	$37,089.88	$54,801.97
Net Cash Income	$ 9,700.23	$16,552.17	$22,976.54	$30,966.77
1970 Crop Inventory[c] (+)	$ 2,761.20	$ 1,473.16	$ 3,955.31	$10,574.60
Depreciation (-)	3,639.64	5,721.94	7,668.20	10,820.22
Return to Capital and Family Labor	$ 8,821.78	$12,303.39	$19,263.65	$30,721.15

[a]Detail items may not add to totals due to rounding.

[b]Does not include interest paid.

[c]Value of 1970 crop not sold by July 30, 1971.

TABLE 5. MEASURES OF FARM BUSINESS RETURNS, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970[a]

Farm Business Returns	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,500A
Crop Returns Over Exp.	$ 16,294.90	$ 23,943.43	$ 33,982.62	$ 51,943.32
Lvstk. Returns Over Exp.	725.49	1,101.19	1,695.72	4,180.13
Miscellaneous Income	32.01	85.30	67.55	108.97
Total Return Over Exp.	$ 17,052.39	$ 25,129.90	$ 35,745.88	$ 56,232.41
Farm Machinery Costs	$ 5,312.95	$ 8,467.36	$ 10,890.18	$ 16,232.35
Bldg. Deprec. & Repair	532.56	903.46	1,188.23	1,784.11
Utilities	317.98	353.30	368.61	524.90
Taxes	989.82	1,519.30	2,060.15	3,216.01
Hired Labor	545.01	1,044.71	1,343.75	2,759.63
Miscellaneous Expense	532.33	538.42	631.35	994.32
Total Other Expenses	$ 8,230.65	$ 12,826.55	$ 16,482.27	$ 25,511.32
Return to Capital and Family Labor	$ 8,821.78	$ 12,303.39	$ 19,263.65	$ 30,721.14
Working Assets 6.0%	1,225.75	1,764.08	2,483.34	4,140.42
Fixed Assets 5.0%	4,719.14	7,325.22	10,290.33	16,161.44
Total Capital Costs	$ 5,944.89	$ 9,089.30	$ 12,773.67	$ 20,301.86
Labor and Mgmt. Returns	$ 2,876.90	$ 3,214.09	$ 6,489.99	$ 10,419.28
Labor and Mgmt. Returns Per Tillable Acre	$ 5.01	$ 3.03	$ 4.95	$ 5.33
Return to Capital and Family Labor	$ 8,821.78	$ 12,303.39	$ 19,263.65	$ 30,721.14
Operator Labor (400/mo)	4,745.95	4,722.59	5,348.58	5,903.45
Family Labor (200/mo)	290.98	500.01	462.86	1,074.49
Total Family Labor	$ 5,036.92	$ 5,222.59	$ 5,811.43	$ 6,977.94
Return to Capital	$ 3,784.86	$ 7,080.81	$ 13,452.22	$ 23,743.21
Average Investment	$114,811.81	$175,905.68	$247,195.44	$392,235.73
Return on Investment	3.30%	4.03%	5.45%	6.06%
Gross Income	$ 19,260.79	$ 28,847.44	$ 40,934.32	$ 64,145.45
Gross Income/Man	$ 15,165.97	$ 20,315.10	$ 25,113.08	$ 28,636.36
Operating Ratio (Exp./ $1 Gross Income) (Cents)	37.59	42.18	37.29	40.49

[a]Detail items may not add to totals due to rounding.

TABLE 6. CROP YIELDS AND LAND USE, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970

Crop Analysis-Production	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,400A
Crop Yield Index	99.05	95.83	99.53	100.23
Crop Yields Per Acre:		(Bushels Per Acre)		
Durum	30.47	28.56	29.56	28.81
Hard Wheat	33.07	27.48	31.04	32.80
Barley	37.47	37.05	37.83	40.26
Flax	12.32	12.63	13.10	12.39
Oats	43.02	45.80	44.17	53.75
Rye	46.20	---	---	---
Hay--All Types (Tons/A)	1.25	2.01	1.44	1.69
Percent of Tillable Acres By Crops:				
All Wheat	30.94	31.46	30.31	31.21
Feed Grains	22.88	21.83	21.23	20.36
Flax and Rye	3.44	4.55	4.66	4.44
Tillable Hay and Pasture	1.42	.19	2.01	3.26
Summer Fallow	41.34	41.99	41.82	40.77
Total Tillable Acres	575.10	965.67	1,311.69	1,955.38
Tillable Acres Per Man	453.19	682.93	806.70	874.50
Value of Land and Buildings Per Acre	$133.21	$125.02	$127.27	$127.71

TABLE 7. CROP RETURNS AND COSTS, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970[a]

Crop Analysis-Returns	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,400A
Returns from Crops:				
Durum	$ 5,681.15	$ 7,632.07	$10,632.04	$14,460.85
Hard Wheat	2,506.96	4,492.37	6,086.46	12,152.96
Barley	3,312.30	4,585.83	7,063.06	9,288.38
Flax	677.37	973.19	1,690.31	2,347.55
Oats	821.76	1,713.17	1,619.96	2,924.02
Other Crops	154.68	25.55	---	---
Total Grains	$13,154.20	$19,422.16	$27,091.81	$41,173.74
Government Payment	4,787.60	7,555.36	10,936.58	17,321.94
Hay Sold	10.47	---	---	30.04
Total Crop Production	$17,952.25	$26,977.52	$38,028.38	$58,525.70
Misc. Crop Income	410.14	462.11	705.81	797.66
Total Crop Returns	$18,362.39	$27,439.68	$38,734.18	$59,323.36
Total Crop Expenses	$ 2,067.49	$ 3,496.25	$ 4,751.57	$ 7,380.04
Fertilizer Used	683.46	1,112.10	1,727.32	2,495.69
Seed Used	695.87	1,434.83	1,831.77	3,264.01
Spray, Other Expenses	688.17	949.33	1,192.49	1,620.35
Crop Returns Over Expenses	$16,294.90	$23,943.43	$33,982.62	$51,943.32
Crop Returns/Tillable Acre	$ 31.20	$ 27.94	$ 29.00	$ 29.92
Crop Expenses/Tillable Acre	$ 3.60	$ 3.63	$ 3.63	$ 3.78
Crop Expenses/Acre of Grain Crops	$ 6.22	$ 6.25	$ 6.56	$ 6.58
Fertilizer Used	1.82	2.02	2.37	2.41
Seed Used	2.14	2.55	2.49	2.80
Spray, Other Expenses	2.26	1.69	1.71	1.39

[a]Detail items may not add to totals due to rounding.

TABLE 8. MACHINERY ANALYSIS, 132 FARMS, FIVE NORTHERN EAST CENTRAL COUNTIES, 1970[a]

Machinery Analysis	36 Small Farms 480-959A	32 Sm.-Med. Farms 960-1,439A	35 Medium Farms 1,440-1,919A	29 Large Farms 1,920-4,400A
Machinery Investment/Farm	$17,769,25	$25,691.78	$33,753.63	$47,011.99
Machinery Investment/ Tillable Acre	$ 30.90	$ 26.61	$ 25.74	$ 24.05
Tractors and Trucks	13.13	11.62	10.64	11.55
Tillage Equipment	3.82	3.07	2.77	2.86
Planting Equipment	1.85	1.67	1.56	1.29
Harvesting Equipment	7.32	6.92	7.20	5.49
Other Equipment	5.07	4.22	3.16	3.28
Machinery Costs Per Farm	$ 5,312.95	$ 8,467.36	$10,890.18	$16,232.35
Auto (Including Depreciation)	414.68	432.84	459.52	593.76
Machinery Repairs	850.14	1,528.97	1,868.21	2,866.18
Machinery Depreciation	2,879.76	4,627.07	6,307.72	8,872.94
Fuel (- Tax Refund)	1,048.98	1,562.97	2,050.69	3,066.76
Net Custom Work	119.41	315.52	204.06	832.73
Machinery Cost/ Tillable Acre[b]	$ 8.31	$ 8.00	$ 7.80	$ 7.58
Depreciation/Tillable Acre	5.01	4.80	4.81	4.54
Repairs/Tillable Acre	1.48	1.59	1.43	1.47
Fuel/Tillable Acre	1.83	1.62	1.57	1.57
Custom Cost/Tillable Acre	.21	.33	.16	.43
Total Machinery Cost/ Tillable Acre[c]	$ 8.51	$ 8.32	$ 7.95	$ 8.00

[a]Detail items may not add to totals due to rounding.

[b]Does not include auto or custom work.

[c]Machinery cost plus custom work.

Explanation of Terms and Calculations

Those terms in the preceding tables which are not self-explanatory are explained below:

Table 2--Measures of Farm Size:

Total capital investment includes the average value of all farm assets. Land was valued at its current market value. Machinery and building investment is the average of January 1 and December 31 inventory values. Livestock is the end of the year value. Grain inventories include only the 1970 crop not sold at the time of interview (July-August, 1971).

Total men on farm is the total months of labor divided by 12 months.

Table 3--Farm Operating Statement:

Cash farm expenses are farm business expenses incurred by the operator and landlord during the year; only the farm share of auto and utility expenses are included. Interest expenses are not included here. Interest paid was not obtained from all farmers. It is excluded to put all farms on an equal no-debt basis.

Total farm sales include all sales of the farm operator plus landlord's income. Crop sales are for the 1970 crop, including sales made in 1971. No sales of prior years' crops sold in 1970 are included. Landlord sales of crops were computed by multiplying the landlord's share of crop produced by the average area price for the crop. See Table 8 for prices used.

1970 crop inventory represents the value of the 1970 crop not sold at the time of the survey (July-August, 1971). See Table 9 for prices used.

Depreciation is the depreciation charge for all machinery, including farm share of auto plus building depreciation.

Return to capital and family labor is the net earnings of the owner(s) and/or operator(s) from the farm business assuming a 100 percent equity basis. It is the return earned by all the farm capital and all the labor and management provided by the farm operator and his family.

Table 4--Measures of Farm Business Returns:

Return to labor and management is the net return to the operator and his family after an interest charge on the total capital investment in the farm business has been deducted.

The interest rate charged was 5 percent on fixed assets (land and buildings) and 6 percent on working assets (machinery, livestock, crops, and supplies).

Return to capital is obtained by subtracting a charge for operator and family labor from the return to capital and family labor. Charges of $400 per month for operator's labor and $200 per month for other unpaid family labor were used.

Return on investment is the rate of return after removal of labor charges (both paid and unpaid). It is computed by dividing the return to capital by the average investment for the year.

Gross income is a measure of the total value of production per farm. It is the sum of the total value of crops produced plus livestock returns over feed costs plus miscellaneous receipts.

Operating ratio indicates the proportion of gross income absorbed by operating expenses.

Table 5--Crop Yields and Land Use:

Crop yield index is a comparison of the yield per acre of all major crops with the average for the five-county area. It is calculated by dividing the production of each crop on a given farm by the average yield for the area to find the number of acres required to obtain the actual production if yields had been equal to the average. The resulting total of standard acreages is then divided by the actual number of acres in crops on the farm. The standard yields for each area are shown in Table 9.

Table 6--Crop Returns and Costs:

Returns from crops were calculated by adding sales of 1970 crop plus home-grown grain used for feed and/or seed plus landlord's share of crop plus ending inventory of 1970 crop. The prices listed in Table 9 were used to calculate the value of the landlord's share of crop, home-grown grain used for seed and feed, as well as ending inventories.

Total crop expenses include fertilizer, seed, weed spray, crop insurance, and other direct crop expenses incurred during the year. Machinery costs are not included here.

Table 7--Machinery Analysis:

Machinery investment per farm is the average of opening and closing investments in machinery. Investment includes tractors, trucks, field machinery, livestock, and general equipment, and farm share of auto.

Machinery costs per tillable acre include fuel, repairs, depreciation, and custom hire. Income from custom work done for others was deducted to compensate for machine costs which should not be charged to the crop acres on the farm to which the machines "belong."

Standard Prices and Yields

Standard prices were used to value the landlord's share of the crop, grains used for seed and feed, and to inventory 1970 crop production not sold at the time of interview. Standard yields were used to calculate the index of crop yields. These standards are presented in Table 9.

TABLE 9. STANDARD PRICES AND YIELDS USED IN THE FARM BUSINESS ANALYSIS, 1970

Crop	Standard Price[a]	Standard Yield
Durum	$1.30	30.2 bu.
Hard Wheat	1.35	31.4 bu.
Barley	.87	39.2 bu.
Oats	.48	45.3 bu.
Flax	2.31	12.5 bu.
Alfalfa Hay	--	1.6 ton
Other Hay	--	1.3 ton

[a]North Dakota Crop and Livestock Reporting Service average price received in five-county area in 1970.

SUMMARY

This report presents a detailed analysis of 1970 farm business costs and returns for small grain farms in northern east central North Dakota. The farms surveyed were divided into four size groups in order to compare farm organization, returns, and costs by size of farm.

Enterprise organization changed very little among farm size groups. Just over 30 percent of the land was devoted to wheat or durum and slightly over 40 percent was summer fallowed in all size categories. Crop yields did not vary appreciably due to the size of the farm. A beef cow herd was the most common livestock enterprise for the minority of farms with a livestock enterprise.

Crop returns per tillable acre were slightly higher for the smallest size group, but remained nearly constant for other size groups. Income from livestock was less than 8 percent of gross income for all groups.

Both labor and management returns and rate of return on investment increased as the size of farms increased. The higher net return for the larger farms occurred chiefly because of lower total costs per tillable acre.

A summary of costs and returns per tillable acre by size groups is presented in Table 10.

TABLE 10. SUMMARY OF INCOME AND COSTS PER TILLABLE ACRE BY SIZE OF FARM, 132 FARMS, NORTHERN EAST CENTRAL NORTH DAKOTA, 1970

Income and Costs	Number of Farms			
	36	32	35	29
Average Tillable Acres	575.10	965.67	1,311.69	1,955.38
Gross Income/Tillable Acre	$ 33.49	$ 29.87	$ 31.21	$ 32.80
Costs Per Tillable Acre				
All Labor[a]	$ 9.71	$ 6.49	$ 5.45	$ 4.98
Machinery[b]	8.51	8.32	7.95	8.00
Crop and Livestock Expense[c]	3.84	3.85	3.96	4.04
Farm Overhead[d]	4.85	3.88	3.59	3.63
Total	$ 26.91	$ 22.54	$ 20.95	$ 20.65
Return to Capital/Tillable Acre	$ 6.58	$ 7.33	$ 10.26	$ 12.15
Investment/Tillable Acre	$199.64	$182.16	$188.46	$200.59
Return on Investment	3.30%	4.03%	5.45%	6.06%

[a]Hired labor plus operator and family labor.

[b]Repairs, depreciation, fuel, and net custom work.

[c]Fertilizer, seed, spray, purchased feed and other crop and livestock expenses.

[d]Building depreciation and repair, utilities, real estate taxes, farm share of auto and miscellaneous farm expenses.

The major cost savings of larger farms occur in labor. Although larger farms spend more for hired labor and also have more family labor available, the combined hired and family labor cost per tillable acre is nearly 50 percent lower for the largest size group compared to the smallest. Machinery costs decline only slightly with the size of farm. Crop and livestock expenses remain nearly constant among farm size groups. Farm overhead expenses, such as for buildings, utilities, and farm share of auto, are nearly $1 per acre higher for the smallest sized farms, but decline little for larger sized farms.

Rate of return on total investment ranges from 3.3 percent for farms between 480 and 960 total acres and increases steadily to slightly over 6 percent for farms over 1,920 acres. No charge for management has been made in calculating return on investment.