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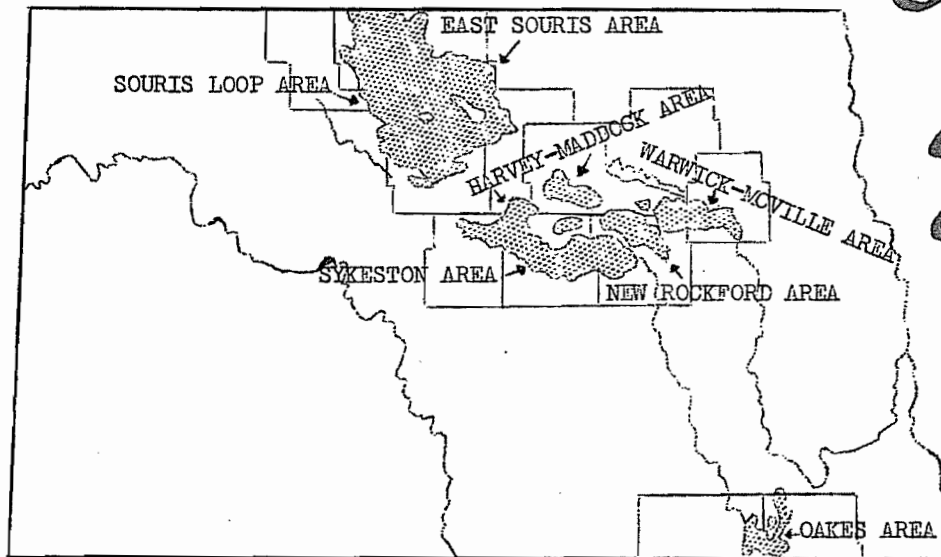
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Dryland Farm Organization in Selected Areas Proposed for Irrigation Development in North Dakota

by LeRoy W. Schaffner

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Fargo, North Dakota

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DRYLAND FARM ORGANIZATION IN SELECTED AREAS PROPOSED FOR
IRRIGATION DEVELOPMENT IN NORTH DAKOTA ^{1/}

by L. W. Schaffner ^{2/}

SUMMARY

The seven proposed irrigation units included in this study are here referred to as the Souris Loop, East Souris Loop, Harvey-Maddock, Sykeston, New Rockford, Warwick-McVillage and Oakes Units. These units are a part of the Bureau of Reclamation's program for water development in North Dakota. In this report these units are divided into two groups, the Northern Area ^{3/}, and the Oakes Unit by itself. ^{4/} The Northern Area includes the other six units in which the present agriculture is sufficiently similar to warrant their combination in this summary report.

The Northern Area contains 1,010,350 acres which have irrigation potential. The Souris Loop Unit is the largest of the proposed irrigation units in North Dakota, containing 468,333 acres of arable land potentially suitable for irrigation. The acres of arable land in the other units of the Northern Area are as follows: East Souris Loop 210,109 acres, Harvey-Maddock Unit 121,637 acres, Warwick-McVillage Unit 59,045 acres and the New Rockford-Sykeston Unit 151,226 acres.

The Oakes Unit contains approximately 121,145 acres which have irrigation potentials. This unit includes, in addition to North Dakota lands, some that falls within Brown and Marshall counties in South Dakota.

Approximately two-thirds of the farms in this study provided the farm families with a reasonably adequate living in 1951, if we assume that a minimum of \$2,500 family labor earnings is required to meet acceptable minimum living standards. About 31 per cent of the 335 farms studied had a family labor earning below \$2,500. In general, the farms which received less than \$2,500 family labor earnings per year were too small to utilize machinery and family labor efficiently. Many of these small farms were

^{1/} This study was carried on under Project ND704 of the North Dakota Agricultural Experiment Station, in cooperation with the Bureau of Reclamation, Missouri-Souris District, Bismarck, North Dakota.

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^{3/} The Northern Area is the northern portion of the Garrison Diversion Unit.

^{4/} The Oakes Unit is the Oakes portion of the Garrison Diversion Unit.

operating with old or second hand equipment because farm income was not large enough to permit them to buy good equipment.

The total farm expenditures are made up principally of machinery costs which amounted to 48 per cent in the Northern Area and 40 per cent in the Oakes Unit. Interest on investment, which was not classified as a cash expense, was the largest single item of cost.

These farms had an average investment of about \$38,000. About 56 per cent of the investment was real estate, 23 per cent livestock, and 21 per cent machinery.

The majority of the farms were operated solely by the farmer and his family. About 20 to 24 per cent of the total labor used on these farms was hired labor.

Wheat was the main cash crop for farms in the Northern Area and corn in the Oakes Unit. In the Northern Area, the type of farm was closely correlated to the amount of cultivated land. This was not true of the Oakes Unit. The land in this area was more intensively farmed than the land in the Northern Area and more of the tillable land was in tame hay and pastures.

In the Northern Area 80 per cent of the farms were grain, 12 per cent grain-livestock and 8 per cent livestock farms. In the Oakes Unit, 56 per cent of the farms were grain, 27 per cent grain-livestock and 17 per cent livestock.

PURPOSE OF THE STUDY

The North Dakota Agricultural College and the Federal agencies involved in the Missouri River Basin development have a direct responsibility in anticipating many agricultural and economic problems that may arise from irrigation developments. In order to measure the economic feasibility of irrigation, information is needed for appraising the probable effect of irrigation upon farm income in the proposed irrigation areas of North Dakota. It is essential to know the present income position of dryland farmers and their farm investment and organization in order to assess realistically the changes in farming, capital requirements and tenure arrangements which will come about with irrigation development.

This study of dryland farm organization will be used as a part of the basis for determining the increased capital requirements, changes in farm organization and size, and other changes which are expected to attend the transformation from dryland to irrigation farming.

SAMPLE DESIGN

In making the study of the dryland agriculture in the proposed irrigation areas, the sample accounted for 20.5 per cent of the arable land in the Northern Area and 27.8 per cent of the arable land in the Oakes Unit. Schedules were taken in blocks which ranged from 6 to 12 sections in size. These blocks were picked on the basis of soil type, amount of irrigable land,

porportion of class 1, 2 and 3 land, location of laterals, topography and present land use. The blocks were so located in the area that the sample would give a fair picture of the agriculture on lands that have irrigation potential.

A farm schedule was taken in the summer and fall of 1952 of the 1951 dryland operations of the farms in the sample. Two-hundred and eighty-three schedules were obtained in the Northern area and 52 schedules in the Oakes Unit. The purpose of the schedule was to obtain the physical organization, input and output relationships and the asset structure of the present dry-land farming system.

PRESENT AGRICULTURE IN THE NORTHERN AREA

The analysis in this report is made principally by type of farm. Three types of farms were used: grain, grain-livestock and livestock farms. A farm was classified as cash grain or livestock when 60 per cent or more of its gross cash income came from the sale of grains or livestock (including livestock products), respectively.

Proposed irrigation areas are more generally found where soils are light and well drained. This has a relationship to the present cropping system and is one of the reasons why statistics in the sample are not comparable to county statistics in these areas. For example, in some of the proposed irrigation areas, farmers explained that the proportion of their land in summerfallow was very low because if the land was left bare all summer it would drift. Conversely, acreage in grasses was higher than in most areas.

Land Use and Livestock System - In the Northern Area 80 per cent of the farms were grain, 12 per cent grain-livestock and 8 per cent livestock. The highest proportion of grain farms are in the East Souris Loop and Harvey -Maddock areas. The area with the highest proportion of livestock farms is the Werwick-McVille unit. It should be pointed out here that the land used for the livestock enterprise is land that cannot be profitable used for crop production because of low productivity, topography, etc., and therefore can only be utilized most profitably with livestock.

Table 1 shows the per cent distribution of the land-use and livestock system. Wheat is the main cash crop on all types of farms in the Northern Area. The livestock farms have only three per cent of their total acreage in summerfallow compared to 15 per cent on the grain farms and 11 per cent on grain-livestock farms. One of the reasons for this is that the livestock farms were generally found in the areas where the land was sandy and subject to blowing.

As might be expected, the livestock farms had the smallest proportion of cropland (32 per cent) and grain farms the highest (75 per cent). For permanent pasture and wild hay, the livestock farms have the highest proportion (63 per cent) and grain farms the smallest (21 per cent).

Four size-of-farm groups were selected from the grain farms in the Northern Area to show the effect of size-of-farm on some of the important items. The four sizes selected include the 260-499, 500-699, 700-999 and

Table 1. Land-Use System in Per Cent of Total Acres Operated and Livestock System in Per Cent of Total Animal Units, 1/ by Type of Farm, 1951.

Land-Use and Livestock System	Northern Area				Oakes Unit			
	Grain %	Grain-Livestock %	Livestock %	All Farms %	Grain %	Grain-Livestock %	Livestock %	All Farms %
Wheat	34.6	24.9	8.0	31.1	13.5	15.4	3.8	12.4
Oats	6.3	7.5	5.4	6.4	15.2	20.1	15.0	16.3
Barley	4.4	3.8	1.6	4.1	5.1	2.2	1.8	3.9
Flax	6.5	5.6	2.3	6.0	9.7	2.7	2.4	6.9
Rye	.4	.1	--	.3	3.2	1.3	2.2	2.6
Corn	2.3	3.0	4.0	2.5	14.3	23.6	18.3	17.0
Other	--	--	--	--	.6	--	.4	.4
Idle cropland	2.4	.8	1.4	2.1	.8	.1	.7	.6
Fallow	14.6	10.8	2.7	13.1	1.0	.4	.4	.8
Tame hay	2.4	2.8	4.5	2.7	7.9	6.0	6.6	7.2
Cropland pasture	1.5	1.8	1.9	1.6	.4	1.3	2.3	.9
Total cropland	75.4	61.1	31.8	69.9	71.5	73.1	53.9	69.0
Permanent pasture	13.2	22.7	45.1	17.1	14.8	14.1	21.8	15.8
Wild hay	8.1	13.1	18.3	9.6	8.7	6.3	17.2	9.5
Farmstead	1.2	1.4	1.0	1.2	1.0	1.5	1.2	1.1
Other	2.1	1.7	3.8	2.2	4.0	5.0	5.9	4.6
Total acres operated	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Size of farm (acres)	740	602	822	730	713	542	601	648
Horses	9.1	7.4	6.9	8.5	3.9	3.9	2.8	3.6
Milk cows	32.2	26.6	13.7	28.3	18.5	15.5	9.4	15.5
Beef cows	49.4	50.4	69.8	52.9	55.2	52.1	65.9	57.0
Sheep	6.2	12.6	7.6	7.4	12.2	14.4	11.3	12.6
Hogs	.9	.9	.5	.8	6.3	9.0	7.5	7.3
Chickens	2.2	2.1	1.5	2.1	3.9	5.1	3.1	4.0
Total animal units	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of farms	225	34	24	283	29	14	9	52

1/ In order to compare the various kinds of livestock, the numbers are reduced to a common denominator and expressed in animal units. See footnote on page 5.

the 1,000-1,499 acre farms. The land-use system in per cent of the total acres operated shows that all sizes carry about the same proportion of land in similar crops. This land-use table may be found in the appendix.

The livestock farms were the largest in total acres operated and the grain-livestock farms the smallest. Average size of farm for the three types was 822 acres for the livestock, 740 acres for the grain and 602 acres for the grain-livestock farms. Table 2 shows the frequency distribution of the farms by size and type. The most common size of farm for the grain and grain-livestock farms fell within the 260-499 acre range, with 34 per cent of the grain and 38 per cent of the grain-livestock farms falling in this size group. There were two most common groups for the livestock farms, with 25 per cent of the farms in the 260-499 and 25 per cent in the 1,000-1,499 acre range.

Table 2. Frequency Distribution in Per Cent of Total Farms by Size and Type, Northern Area, 1951.

Farm Size in Acres	Grain	Grain-Livestock	Livestock	All Farms
	%	%	%	%
100-174	1.8	8.8	8.3	3.2
175-259	.9	5.9	4.2	1.8
260-499	34.2	38.2	25.0	33.9
500-699	24.0	17.7	16.6	22.6
700-999	22.2	17.7	12.5	20.8
1,000-1,499	11.1	5.9	25.0	11.7
1,500-1,999	2.2	2.9	4.2	2.5
2,000-2,499	2.7	2.9	4.2	2.8
2,500-over	.9	--	--	.7
Total farms	100.0	100.0	100.0	100.0
Total number of farms reporting	225	34	24	283

Table 1 also shows the livestock system in per cent of the total animal units. ^{5/} In order to compare the numbers or the type of the livestock enterprises the different kinds of livestock are reduced to a common denominator and expressed in animal units. Table 1 shows that in all farm types, over half of the animal units are beef cattle. In the areas studied, the grain farms have a higher proportion of their total animal units made up of milk cows. This does not mean that the grain farmer milks more cows than the livestock or the grain-livestock farmer. Grain farms generally have fewer numbers of livestock than the other two farm types and therefore

^{5/} An animal unit as used in this report is equal to: 1 horse, 1 cow, 1 bull, 1 steer or heifer over 1 year of age, 2 head of other cattle, 7 sheep, 14 lambs, 5 hogs, 10 pigs and 100 chickens.

making the proportion of milk cows high even though only have a few. The appendix table on livestock system by size of grain farm shows that the smaller grain farms have a higher proportion of their animal units in milk cows. As the farms get larger this proportion decreases.

Sheep, hogs and chickens are minor enterprises on the farms in the Northern Area. Most farms raise only enough pork and chickens for their own household use.

Tenure System: Table 3 shows that the livestock farms have the largest proportion in full ownerships. The grain and grain-livestock have the larger proportion of part-owners ^{6/} and all three types of farms have about the same proportion (17 per cent) of tenants. On the average, 63 per cent of the land in the sample farms was owned and 37 per cent rented as seen in Table 4.

Table 3. Type of Tenure in Per Cent of Total Farms, Northern Area and Oakes Unit, 1951.

Type of Farm	Owner	Part-Owner	Tenant	Total	Number of Farms
	%	%	%	%	%
Northern Area					
Grain farms, acres					
260-499	44	35	21	100	77
500-699	43	44	13	100	54
700-999	26	56	18	100	50
1,000-1,499	28	60	12	100	25
Total grain farms	38	45	17	100	225
Grain-livestock	38	44	18	100	34
Livestock	46	37	17	100	24
All farms	39	44	17	100	283
Oakes Unit					
Grain farms	31	45	24	100	29
Grain-livestock	36	57	7	100	14
Livestock	33	67	--	100	9
All farms	33	52	15	100	52

In the full-owner group, grain farms average a little above a section, and livestock farms less than three-quarters of a section in size. Among

^{6/} A part-owner is a farmer who owns a part of the land he is farming and rents land in addition to what he owns.

Table 4. Percentage of Land Owned and Rented by Type of Tenure, Northern Area and the Oakes Unit, 1951.

Type of Farm	Owned	Rented	Total
	%	%	%
Northern Area			
Grain farms	63	37	100
Grain-livestock	68	32	100
Livestock	60	40	100
All farms	63	37	100
Oakes Unit			
Grain farms	55	45	100
Grain-livestock	64	36	100
Livestock	74	26	100
All farms	60	40	100

the part-owners, however, livestock farms average two sections, and grain farms less than one and one-half section in size, as shown in Table 5.

PRESENT AGRICULTURE IN THE OAKES UNIT

The Oakes Unit is an area which is different in agriculture from the major part of North Dakota. It lies in the corn belt fringe reaching from the south into North Dakota. The major crop is corn rather than wheat. Also these farms raise a higher proportion of feed crops and have a higher proportion of their livestock enterprise in hogs than is general in North Dakota.

Fifty-six per cent of the farms in the sample were cash grain farms. Twenty-seven per cent grain-livestock and 17 per cent livestock farms. Corn and oats each occupy about 17 per cent of the total land and wheat 12 per cent. (See Table 1) About 89 per cent of the corn acreage is grown for grain and the other 11 per cent is used for silage and feed. Tame hay plays a more important role in the cropping system in the Oakes Unit than it does in the Northern Area.

The average size of the grain farms was 713 acres, 542 for the grain-livestock and 601 for the livestock farms. (See Table 5) The most common size group for the grain farms was the 500-699 acre range (Table 6). Among the grain-livestock farms the point of concentration was less pronounced, with over 70 per cent falling within the range of 260-699 acres. Almost 70 per cent of the livestock farms fell in the range of 500-999 acres.

In all types of farms, beef cattle comprise the largest proportion of the animal units. On the average milk cows make up the second largest proportion of the animal units, sheep are third and hogs fourth (See Table 1). In the Oakes Unit, as in the Northern Area, the grain farms have a

Table 5. Average Size of Farm by Type of Tenure and by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Owner	Part-Owner	Tenant	All Groups
Northern Area				
Grain farms				
260-499	422	427	397	419
500-699	624	600	630	614
700-999	814	857	831	841
1,000-1,499	1,232	1,144	1,213	1,177
Total grain farms	668	810	716	740
Grain-livestock	530	674	580	602
Livestock	418	1,268	930	822
All farms	627	826	717	730
Oakes Unit				
Grain farms	785	709	629	713
Grain-livestock	338	677	480	542
Livestock	573	615	--	601
All farms	616	679	610	648

Table 6. Frequency Distribution of Farms by Size and Type, Oakes Unit, 1951.

Farm Size in Acres	Grain	Grain-Livestock	Livestock	All Farms
100-174	6.9	7.2	11.1	7.7
175-259	6.9	--	--	3.9
260-499	20.7	35.7	22.1	25.0
500-699	31.0	35.7	33.4	32.7
700-999	17.2	14.2	33.4	19.2
1,000-1,499	13.8	7.2	--	9.6
1,500-1,999	--	--	--	--
2,000-2,499	--	--	--	--
2,500-Over	3.5	--	--	1.9
Total	100.0	100.0	100.0	100.0
Total	29	14	9	52

higher proportion of their animal units in milk cows than do the livestock farms. The average number of milk cows per farm was 4 for the grain and grain-livestock farms and 3 for the livestock farms.

Full owner-operatorship represents 33 per cent of the farms, while 52 per cent are part-owners and 15 per cent are tenants. Hence, part-ownership is more pronounced here than in the Northern Area. About 60 per cent of the land in the sample was owned and 40 per cent was rented (Tables 3 and 4). The livestock farms have a higher proportion of owned land than do the other two types of farms. On the average, the part-owners have the larger size of farm and the owners and tenants have about the same size (Table 5).

FARM INCOME

The income data presented here are estimates based upon production reported by farmers and the Bureau of Agricultural Economics average farm prices for North Dakota. Most of the expenditure items are also based upon application of standardized factor costs to the quantities reported by farmers. The index of prices received by North Dakota farmers in 1951 was 275 and the index of prices paid including interest, taxes and wage rates, was 281. This gives a parity ratio of 98 for the year of 1951.

The term net cash farm income as used here is the gross cash farm income minus the cash operating expenditures. The term family labor earnings is the gross cash farm income minus the cash operating expenditures minus an allowance for building and machinery depreciation and interest on investment. In other words, family labor earnings is the amount that would be available to an operator for family living and savings if he had a 100 per cent loan on his land and operating capital, while net cash farm income would be the family income for an owner entirely free of debt.

Gross Cash Income - The gross cash income is an appropriate measure of the size of business rather than of income available to the farm family. It is a much more accurate measure of size than acreage is, since it reflects the productivity of the land and the scale of the livestock enterprise.

In the Northern Area, the grain farms had an estimated average gross cash income of \$13,000 as compared to \$10,000 for the livestock and grain-livestock farms (Table 7). In the Oakes Unit the grain-livestock group had the largest average gross cash income of \$16,000, the grain farms were in a close second position and the livestock farms with \$11,000 in third position. Note the gross income ranges in the various size groups of the Northern grain farms. Although the average gross income of the 1,000-1,499 acre group is almost one-third higher than that of the 700-999 acre group, the gross income ranges are almost identical for both groups. In the Northern Area, the lowest gross income was about \$1,000 in all three farm types, while in the Oakes Unit no farm had a gross income of less than \$2,400. In both areas, the highest gross income was around \$100,000 and was found among the grain farms. In both areas, the grain farms had the widest range and the livestock farms had the narrowest range. The average gross income for all farms was about 20 per cent higher in the Oakes Unit than in the Northern Area. The Northern Area had 15 per cent of all farms with gross incomes below \$5,000; in the Oakes Unit less than 10 per cent of the farms had gross incomes below \$5,000.

Table 7. Average Gross Cash Income by Source and the Low and High Range of Income, by Type of Farm for the Northern Area and the Oakes Unit, 1951.

Type of Farm	Grain	Livestock & Products	Other	Total	Range
Northern Area					
Grain farms, acres					
260-499	\$5,961	\$1,409	\$65	\$7,435	\$993-15,030
500-699	9,282	1,970	71	11,323	3,685-20,480
700-999	12,985	2,643	142	15,770	6,662-43,105
1,000-1,499	17,228	2,948	123	20,299	6,343-41,288
All grain farms	10,928	2,161	87	13,176	993-104,566
Grain-livestock	5,021	4,352	325	9,698	1,094-33,368
Livestock	2,416	7,171	32	9,619	956-28,062
All farms	9,496	2,849	111	12,456	956-104,566
Oakes Unit					
Grain farms	12,356	3,467	74	15,897	2,433-98,606
Grain-livestock	7,861	8,113	134	16,108	3,760-51,433
Livestock	3,297	7,813	207	11,317	3,261-19,965
All farms	9,578	5,470	113	15,161	2,433-98,606

Table 8. Frequency Distribution of the Gross Cash Income by Type of Farm for the Northern Area and the Oakes Unit, 1951.

	Northern Area					Oakes Unit				
	Grain	Grain Live-stock	Live-stock	All Farms	Percent of Total	Grain	Grain Live-stock	Live-stock	All Farms	Percent of Total
	(number of farms)					(number of farms)				
\$ 956- 2,499	5	1	5	11	3.9	1	--	--	1	1.9
2 500- 4,999	20	9	2	31	11.0	2	1	1	4	7.7
5,000- 7,499	39	6	4	49	17.3	1	3	--	4	7.7
7,500- 9,999	38	6	1	45	15.9	7	--	3	10	19.2
10,000-12,499	31	5	4	40	14.1	1	1	1	3	5.8
12,500-14,999	27	2	5	34	12.0	4	5	2	11	21.2
15,000-17,499	18	1	--	19	6.7	6	1	1	8	15.4
17,500-19,999	10	1	1	12	4.3	1	--	1	2	3.8
20,000-22,499	10	--	--	10	3.5	5	--	--	5	9.6
22,500-24,999	7	2	1	10	3.5	--	1	--	1	1.9
25,000-104,566	20	1	1	22	7.8	1	2	--	3	5.8
Total farms	225	34	24	283	100.0	29	14	9	52	100.0

Table 9. Average and Range in the Gross Cash Income per Acre by Type of Farm in the Northern Area and the Oakes Unit, 1951.

Type of Farm	Average	Low	High
Northern Area			
Grain farms, acres			
260-499	\$ 17.72	\$ 2.48	\$ 31.31
500-699	18.44	6.57	32.00
700-999	18.75	6.94	53.88
1,000-1,499	17.20	4.96	34.41
All grain farms	17.79	2.48	53.88
Grain-livestock	16.11	4.89	35.97
Livestock	11.70	1.82	80.40
All farms	17.04	1.82	80.40
Oakes Unit			
Grain farms	22.29	11.26	39.21
Grain-livestock	29.74	13.30	45.92
Livestock	18.83	13.10	39.56
All farms	23.41	11.26	45.92

Table 10. Frequency Distribution of the Gross Cash Income Per Acre by Type of Farm for the Northern Area and the Oakes Unit, 1951.

Gross Cash Income Per Acre	Northern Area					Oakes Unit				
	Grain	Grain Live-stock	Live-stock	All Farms	Percent of Total	Grain	Grain Live-stock	Live-stock	All Farms	Percent of Total
		(number of farms)					(number of farms)			
\$1.82- 4.99	3	2	3	8	2.8	--	--	--	--	--
5. - 9.99	21	4	8	33	11.7	--	--	--	--	--
10. -14.99	57	10	5	72	25.4	4	1	2	7	13.5
15. -19.99	67	7	6	80	28.3	10	2	4	16	30.7
20. -24.88	46	4	--	50	17.7	6	5	2	13	25.0
25. -29.99	22	3	1	26	9.2	3	1	--	4	7.7
30. -34.99	7	3	--	10	3.5	5	--	--	5	9.6
35. -80.40	2	1	1	4	1.4	1	5	1	7	13.5
Total farms	225	34	24	283	100.0	29	14	9	52	100.0

In the Northern Area, the grain farms had the highest gross cash income per acre (\$18) and the livestock farms the lowest (\$12). In the Oakes Unit, the grain-livestock farms had the highest gross income per acre (\$30) and the livestock farms the lowest (\$19). The income on the livestock farms is lower because in general they are utilizing land that cannot be cropped and would otherwise be wasted.

Note that per acre gross income for the northern grain farms increased up to the 700-999 group, then dropped off in the 1,000-1,499 groups below the level of the smallest group.

Turning from gross income as a measure of business size to net income as a measure of family well-being, two net income terms are used to indicate the range within which most of the families actually fall. Since the survey did not include the equity position, debt and rental payments it can only indicate within what range the net farm income available for family living, saving and taxes is likely to fall, depending upon debt and rental obligation. The net cash income represents the income which would be available to the operator if he would own all land and other assets free of debt; family labor earnings represent the net cash income he would have if all the land and other assets were 100 per cent encumbered (by a 100 per cent loan) and he had paid current interest charges (but no principal) on these assets.

In reality, only tenants with very little machinery and livestock of their own, and very heavily encumbered owners will approach closely or fall below the labor earnings limit. Many farmers received, in addition to their labor earnings, interest on their unencumbered assets. On the other hand, taxes and principal repayments on debts must come out of the farm labor earnings or the net cash income before we know the disposable income available to the family. It is also likely that estimates for production expenditures are incomplete, giving the net income figures an upward bias.

The average net cash income for all farms was about \$1,000 higher in the Oakes Unit than in the Northern Area. For the livestock farms, it was practically the same in both areas, but for the grain-livestock farms, it was almost twice as high in the Oakes Unit as in the Northern Area, as shown in Table 11. It should be remembered that these net incomes include interest earnings on all capital and land assets.

If interest and depreciation charges are deducted from the net cash income the result is the family labor earnings. For the average of all farms, this interest and depreciation charge amounts to around \$3,000. In the Northern Area, the average family labor earnings was \$6,041 for the grain farms, \$3,486 for the grain-livestock and \$3,177 for the livestock farms. In the Oakes Unit, the average family labor earnings was \$6,701 for the grain farms, \$7,486 for the grain-livestock and \$3,008 for the livestock farms.

In the Northern Area, the family labor earnings were 46 per cent of the gross cash income for the grain farms, 36 per cent for the grain-livestock and 33 per cent for the livestock farms. In the Oakes Unit, the percentage was 42 for the grain farms, 46 for the grain-livestock and 27 for the livestock farms. The reason for family labor earnings being a smaller percentage of gross income livestock farms is because of the interest charges on

Table 11. Average Net Cash Income and Average Family Labor Earnings by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Net Cash Income	Average Family Labor Earnings	Per Cent of Gross Income	
			Net Cash Income	Family Labor Earnings
Northern Area				
Grain farms, acres				
260-499	\$4,962	\$3,193	67	43
500-699	7,519	4,887	66	43
700-999	11,018	7,747	70	49
1,000-1,499	14,685	10,424	72	51
All grain farms	8,934	6,041	68	46
Grain-livestock	5,906	3,486	61	36
Livestock	6,197	3,177	64	33
All farms	8,338	5,491	67	44
Oakes Unit				
Grain farms	9,893	6,701	62	42
Grain-livestock	10,185	7,486	63	46
Livestock	6,148	3,008	54	27
All farms	9,323	6,273	61	41

the heavier livestock and real estate investment. 7/

Table 12 shows that in the Northern Area nearly 30 per cent of the grain farms and over 40 per cent of the grain-livestock and livestock farms had family labor earnings of less than \$2,500. In the Oakes Unit this proportion was about the same for the grain farms, but was only around 30 per cent for the grain-livestock and the livestock farms. None of the livestock farms showed labor earnings of over \$12,500, while the highest labor earnings occurred in the grain farms.

Family labor earnings per acre represents a combined index of land productivity and efficiency of capital use. This figure averages \$7.50 in the Northern Area and \$9.50 or almost 30 per cent higher, in the Oakes Unit. (Tables 13 and 14.) For the grain-livestock farms in the Oakes Unit, labor earnings per acre average by far the highest, while in the Northern Area they fall between those of the grain and the livestock farms.

7/ The real estate values used in this study were the average for the county as reported in the census. On this basis, livestock farms which have a high proportion of non-cropland will be over valued resulting in a downward bias in the family labor earnings income figure.

Table 12. Per Cent Distribution of the Family Labor Earnings by Type of Farm, Northern Area and the Oakes Unit, 1951.

Range in Family Labor Earnings	Northern Area				Oakes Unit			
	Grain	Grain-Live-stock	Live-stock	All Farms	Grain	Grain-Live-stock	Live-stock	All Farms
	%	%	%	%	%	%	%	%
\$-8,928-\$ -1	6.2	14.7	29.1	9.2	10.3	--	11.1	7.7
0- 2,499	22.7	26.7	12.5	22.3	17.2	28.6	22.2	21.1
2,500- 4,999	28.0	29.4	25.0	27.9	24.1	28.6	55.6	30.8
5,000- 7,499	13.3	17.7	16.7	14.1	13.8	21.5	--	13.5
7,500- 9,999	11.5	2.9	12.5	10.6	20.7	--	11.1	13.5
10,000- 12,499	7.6	5.9	4.2	7.1	6.9	7.1	--	5.8
12,500- 14,999	3.6	2.9	--	3.2	3.5	--	--	1.9
15,000- 17,499	2.7	--	--	2.1	--	--	--	--
17,500- 19,999	1.8	--	--	1.4	--	--	--	--
20,000- 22,499	.9	--	--	.7	--	7.1	--	1.9
22,500- 24,499	.4	--	--	.3	--	--	--	--
25,000- 79,047	1.3	--	--	1.1	3.5	7.1	--	3.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number farms	225	34	24	283	29	14	9	52

Table 13. Family Labor Earnings Per Acre by Type of Farm Northern Area and the Oakes Unit, 1951.

Type of Farm	Family Labor Earnings Per Acre		
	Average	Low	High
Northern Area			
Grain farms, acres			
260-499	\$7.61	\$-6.84	\$19.46
500-699	7.96	-7.12	20.66
700-999	9.21	-5.27	43.53
1,000-1,499	8.83	-3.91	22.36
All grain farms	8.16	-7.12	43.53
Grain-livestock farms	5.79	-7.57	25.71
Livestock farms	3.86	-4.83	20.04
All farms	7.51	-7.57	43.53
Oakes Unit			
Grain farms	9.39	-3.81	21.92
Grain-livestock farms	13.82	3.75	27.18
Livestock farms	5.01	-1.27	20.41
All farms	9.69	-3.81	27.18

Table 14. Frequency Distribution of the Per Acre Family Labor Earnings by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Range in Dollars Per Acre										Total Farms	
	Negative	0-4.99	5.00-9.99	10.99-14.99	15.00-19.99	20.00-24.00	25.00-29.99	30.00 Over	(number of farms)			
Northern Area												
Grain farms, acres												
260-499	4	18	30	17	8	--	--	--	--			77
500-699	4	13	20	9	7	1	--	--	--			54
700-999	3	11	17	10	6	2	1	--	--			50
1,000-1,499	2	5	6	9	2	1	--	--	--			25
All grain farms	13	58	78	46	24	4	1	1	1			225
Grain-livestock farms	5	8	11	6	2	1	--	--	--			34
Livestock farms	7	6	9	1	--	1	--	--	--			24
All farms	26	71	98	53	26	6	1	2	1			283
Oakes Unit												
Grain farms	3	6	7	5	7	1	--	--	--			29
Grain-livestock farms	--	2	6	2	1	1	1	2	--			14
Livestock farms	1	4	3	--	--	1	--	--	--			9
All farms	4	12	16	7	8	3	2	2	--			52

Actually, net incomes on most of these farms was in between the net cash income and the family labor earnings (Table 11). Most of the farmers have some equity in the land and equipment on which they are not paying interest to lenders. It is these interest returns on unencumbered assets on which some of the farmers with very low or negative labor earnings are depending for a living.

Another measure of efficiency which would be more accurate than the family labor earnings per acre would be the family labor earnings per \$100 investment in the farm. This measure would more accurately take into account the livestock enterprises on a farm, especially those which are not so closely related to the farm acreage, such as poultry. This return to family labor per \$100 investment tells the same story as does the returns to family labor per acre (Table 15). In the Northern Area, the grain farms are more efficient up to the 700-999 acre group and then the returns start decreasing. As a whole, the two areas had about the same return per \$100 investment in the grain and livestock farms. This table also shows that the livestock incomes reflect the heavier interest on the livestock and real estate investment.

Table 15. Family Labor Earnings Per \$100 Investment in Land, Livestock and Machinery, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Family Labor Earnings Per \$100 Investment
Northern Area	
Grain farms, acres	
260-499	\$15.01
500-699	15.61
700-999	19.15
1,000-1,499	18.94
All grain farms	16.78
Grain-livestock farms	10.90
Livestock	7.52
All farms	15.23
Oakes Unit	
Grain farms	16.06
Grain-livestock	21.13
Livestock	7.10
All farms	15.63

FARM EXPENDITURES

Total farm expenditures per acre, an index of intensity of land use, varied from a low of \$2 to a high of \$60 per acre. In the Northern Area the 1951 total farm expenditure per acre averaged \$9.50 and in the Oakes Unit

\$13.70, or 44 per cent higher. ^{8/} This indicates a substantially higher degree of land use intensity in the Oakes Unit as compared to the Northern Area (Table 16).

Table 17 shows the frequency distribution of the farms by the per acre expenditure. In the Northern Area almost 10 per cent of the farms had an expenditure of less than \$6.50 per acre, while in the Oakes Unit none of the farms had so low an expenditure. On the other hand, less than 5 per cent of the farms in the Northern Area had expenditures of \$15.50 or more, in contrast to 40 per cent in the Oakes Unit (Table 17).

The cash expenditures were about 59 per cent of the total farm expenditures in the Northern Area and 66 per cent in the Oakes Unit. (Table 18) The interest on the investment is the largest of the total expense items. This is not a cash expense item; an operator entirely free of debt could use this for family living or reinvest it in the farm. In these analyses, it was assumed that the farms were all owner-operated. Hence, rent payments and principal repayments on debts were not included in the expenditures. Interest on real estate was started at 4 per cent and on operating capital (including livestock at 6 per cent).

Table 16. Average Expenditure Per Farm and the Per Acre Average, Low and High Expenditure by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Average Expenditure Per Farm	Expenditure Per Acre		
		Average	Low	High
Northern Area				
Grain farms, acres				
260-499	\$4,242	\$10.11	\$2.41	\$25.72
500-699	6,436	10.48	6.62	17.18
700-999	8,023	9.54	5.70	16.12
1,000-1,499	9,875	8.37	4.99	12.05
All grain farms	7,135	9.63	2.41	25.72
Grain-livestock farms	6,213	10.32	4.85	21.49
Livestock farms	6,442	7.84	3.80	60.36
All farms	6,965	9.53	2.41	60.36
Oakes Unit				
Grain farms	9,196	12.89	7.06	19.25
Grain-livestock	8,622	15.92	8.34	24.89
Livestock farms	8,309	13.83	8.74	19.15
All farms	8,888	13.72	7.06	24.89

^{8/} The term farm expenditure as used in this report includes the cash operating expenditures plus building and machinery depreciation plus interest on investment.

Table 17 Frequency Distribution of Farms by the Total Farm Expenditure Per Acre, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Range in Per Acre Expenditure								Total Farms
	2.41 6.49	6.50 9.49	9.50 12.49	12.50 15.49	15.50 18.49	18.50 21.49	21.50 25.72		
Northern Area									
Grain farms, acres				(number of farms)					
260-499	5	28	35	5	2	1	1	77	
500-699	--	20	23	10	1	--	--	54	
700-999	6	19	21	3	1	--	--	50	
1,000-1,499	4	16	5	--	--	--	--	25	
All grain farms	16	91	91	21	4	1	1	225	
Grain-livestock farms	3	14	9	3	3	2	--	34	
Livestock farms	8	9	3	2	--	1	1	24	
All farms	27	114	103	26	7	4	2	283	
Oakes Unit									
Grain farms	--	6	6	7	7	3	--	29	
Grain-livestock farms	--	2	1	3	3	4	1	14	
Livestock farms	--	1	2	3	1	2	--	9	
All farms	--	9	9	13	11	9	1	52	

Table 18. Average Farm Expenditures Per Farm, by Type of Farm, Northern Area and the Oakes Unit, 1951.

	Northern Area				Oakes Unit			
	Grain	Grain-Livestock	Live-stock	All Farms	Grain	Grain-Livestock	Live-stock	All Farms
Crop expense	\$ 186	\$ 109	\$ 120	\$ 171	\$ 305	\$ 121	\$ 113	\$ 222
Fuel, grease & oil	956	690	560	891	1,039	917	946	991
Machine repairs	523	318	299	479	581	614	646	601
Labor	561	464	190	518	879	788	610	808
Auto and truck	607	456	439	575	652	628	805	672
Insurance	183	113	92	167	229	213	139	209
Taxes (R.E. & P. Prop.)	447	409	447	442	518	441	442	484
Livestock	308	791	740	403	1,038	1,497	935	1,144
Custom work	98	109	146	103	266	272	111	241
Building repair	227	178	234	222	284	212	236	256
Electricity & Telephone	80	80	80	80	80	80	80	80
Miscellaneous	66	75	75	67	133	140	106	130
Total cash expense	4,242	3,792	3,422	4,118	6,004	5,923	5,196	5,838
Building depreciation	195	153	200	190	243	182	206	220
Machinery depreciation	959	685	721	906	936	764	807	868
Interest on investment	1,739	1,583	2,099	1,751	2,013	1,752	2,127	1,962
Total farm expenditure	7,135	6,213	6,442	6,965	9,196	8,621	8,309	8,888
Cash expense in per cent of total	59	61	53	59	65	69	62	66

Machinery costs, which include fuel, grease, oil, repairs, auto and truck expense, depreciation and interest on investment, were 48 per cent of the total farm expenditures in the Northern Area and 40 per cent in the Oakes Unit. In the Northern Area, the grain farms had the highest machinery costs and the livestock farms the lowest. In the Oakes Unit, all types of farms had about the same machinery costs.

Total farm expenditures in per cent of gross farm income indicates the share of the gross income required to cover the total cost of farming. In the Northern Area, the most common group (22 per cent) for all types of farms fell within the 50 to 60 per cent range, Table 19. The Oakes Unit had a bimodal distribution, with 25 per cent falling in the 40-50 per cent, and 25 per cent in the 60-70 per cent range. One of the reasons why the farm expenditures on livestock farms were relatively higher than on the other farm types was that in 1951 livestock farmers were carrying large inventories and in this analysis income was figured on the cash basis and the inventory changes did not enter into the gross income figure. High livestock inventories, however, were reflected in the interest charges entered into farm expenditures.

FARM INVESTMENT

The farm investment is made up of the value of the real estate, machinery and equipment and livestock. The livestock farms have the largest average investment per farm (\$42,000) and the grain-livestock farms had the lowest (\$32,000), Table 20. Average investment for all farms in the Oakes Unit (\$40,000) was 11 per cent greater than in the Northern Area (\$36,000). Real estate represented around 55 per cent of the total investment in both areas.

In the Oakes Unit, the average investment per farm was \$41,721 for the grain, \$35,431 for the grain-livestock and \$43,360 for the livestock farms. The most frequent group of farms (29 per cent) in the Northern Area had a total farm investment which fell within the \$20,000 to \$30,000 range (Table 21). In the Oakes Unit, farms had a bimodal distribution with 19 per cent of the farms in the \$20,000 to \$30,000 range and 23 per cent in the \$40,000 to \$50,000 range.

The average per acre investment, a combined index of land productivity and intensivity of capital inputs, is shown in Table 22. In the Northern Area, there was little difference between the average per acre investment of the three types of farms, all being nearly \$50. The average per acre investment for the Oakes Unit, however, ranged from \$58 for the grain, to \$70 for the livestock farms.

Real Estate - The real estate values were based on the 1950 census of agriculture for the counties in which the sample farms were located. The census value per acre was converted to a 1951 value by the use of index numbers for real estate values in North Dakota. 9/

9/ The index used in converting the census real estate value of 1951 value was 114 for 1950 and 125 for 1951.

Table 19. Distribution of the Total Farm Expenditures in Per Cent of the Gross Farm Income for the Northern Area and the Oakes Unit, 1951.

	Average Per Cent	Range in Per Cent										Total Farms	
		Less than 30	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100 Over			
Northern Area					(number of farms)								
Grain farms, acres													
260-499	57	1	7	15	20	13	6	6	6	5	4	77	
500-699	57	--	7	9	14	8	6	4	2	4	4	54	
700-999	51	4	7	9	11	6	6	4	--	3	3	50	
1,000-1,499	49	--	8	7	2	5	1	--	--	2	2	25	
All grain farms	54	6	30	43	49	33	23	18	9	14	225		
Grain-livestock farms	64	1	2	6	8	6	2	2	2	5	34		
Livestock farms	67	--	1	3	6	2	3	1	1	7	24		
All farms	56	7	33	52	63	41	28	21	12	26	283		
Oakes Unit													
Grain farms	58	--	1	10	5	4	2	2	2	3	29		
Grain-livestock farms	54	--	2	2	1	6	2	1	--	--	14		
Livestock farms	73	--	--	1	1	3	1	1	1	1	9		
All farms	59	--	3	13	7	13	5	4	3	4	52		

Table 20. Average, Low and High Farm Investment by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Real Estate	Live-stock	Machinery	Total Investment	Range	
					Low	High
Northern Area						
Grain farms, acres						
260-499	\$11,876	\$ 3,806	\$ 5,590	\$21,272	\$11,028	\$32,198
500-699	17,291	5,450	8,571	31,312	21,638	45,139
700-999	23,034	7,362	10,052	40,448	27,749	61,091
1,000-1,499	33,339	9,636	12,075	55,050	35,385	87,567
All grain farms	20,716	6,576	8,719	36,011	5,705	239,142
Grain-livestock farms	16,821	8,933	6,230	31,984	9,474	135,543
Livestock farms	21,797	13,912	6,549	42,258	5,521	106,690
All farms	20,340	7,481	8,236	36,057	5,521	239,142
Oakes Unit						
Grain farms	24,587	8,622	8,512	41,721	8,222	147,562
Grain-livestock farms	18,668	9,814	6,949	35,431	11,524	65,220
Livestock farms	20,713	14,311	7,336	42,360	13,074	60,739
All farms	22,323	9,927	7,888	40,138	8,222	147,562

Table 21. Frequency Distribution of the Total Farm Investment by Number of Farms, Northern Area and the Oakes Unit, 1951.

Range in Dollars	Northern Area					Oakes Unit				
	Grain	Grain-Live-stock	Live-stock	All Farms	Per Cent	Grain	Grain-Live-stock	Live-stock	All Farms	Per Cent
0-9,999	4	2	2	8	2.8	1	--	--	1	1.9
10,000-19,999	32	12	3	47	16.6	3	2	1	6	11.6
20,000-29,999	73	5	4	82	29.0	5	4	1	10	19.2
30,000-39,999	52	7	2	61	21.6	6	1	2	9	17.3
40,000-49,999	30	5	4	39	13.8	6	5	1	12	23.1
50,000-59,999	13	--	3	16	5.6	4	1	3	8	15.4
60,000-69,999	7	1	3	11	3.9	2	1	1	4	7.7
70,000-79,999	3	--	1	4	1.4	1	--	--	1	1.9
80,000-89,999	6	1	1	8	2.8	--	--	--	--	--
90,000-99,999	2	--	--	2	.7	--	--	--	--	--
100,000-Over	3	1	1	5	1.8	1	--	--	1	1.9
Total farms	225	34	24	283	100.0	29	14	9	52	100.0

Table 22. Total Investment Per Acre by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Average	Low	High
Northern Area			
Grain farms, acres			
260-499	\$ 50.68	\$ 33.08	\$ 68.91
500-699	51.00	35.47	70.53
700-999	48.08	34.84	67.95
1,000-1,499	46.64	34.78	59.77
All grain farms	48.62	33.08	70.53
Grain-livestock farms	53.13	35.90	91.50
Livestock farms	51.39	34.51	98.63
All farms	49.33	33.08	98.63
Oakes Unit			
Grain farms	58.49	45.11	91.85
Grain-livestock farms	65.42	49.90	76.81
Livestock farms	70.50	63.21	92.75
All farms	61.98	45.11	92.75

The average value per acre for the Northern Area was \$28.34 and for the Oakes Unit it was \$34.47, or 22 per cent higher.

Machinery and Equipment - the value of machinery was based on new machinery prices in 1950 and adjusted by the Bureau of Agricultural Economics index numbers of prices paid for farm machinery. The new price was depreciated according to the age of the machine and the expected life.

In both areas, the grain farms had the largest investment per farm in machinery and the grain-livestock farms had the smallest (Table 20). The average machinery investment in both areas was around \$8,600 for the grain farms, while for the other two farm types it was greater in the Oakes Unit.

In the Northern Area, the machinery investment per acre decreases as the farms increase in size. In both areas, the grain farms had the highest per acre machinery investment and the livestock farms had the smallest. In the Northern Area, the frequency distribution showed the most common group for the grain farms to fall within the \$10 to \$15 range, and the grain-livestock and livestock farms fell within the \$5 to \$10 range. In the Oakes Unit, the most common group for all types of farms fell within the \$10 to \$15 range.

In both areas, all farms reported having at least one tractor. In the Northern Area, the majority of farms in the grain and grain-livestock groups had two tractors per farm, and in the livestock farms only one tractor (Table 24). In the Oakes Unit, most grain and livestock farms had two tractors per farm.

Table 23. Average, Low and High Machinery Investment Per Acre by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Machinery Investment Per Acre		
	Average	Low	High
Northern Area			
Grain farms, acres			
260-499	13.32	3.98	33.90
500-699	13.96	5.67	28.58
700-999	11.95	4.36	25.21
1,000-1,499	10.20	5.37	23.14
All grain farms	11.77	3.98	33.90
Grain-livestock farms	10.35	2.99	31.73
Livestock farms	7.97	2.63	19.56
All farms	11.26	2.63	33.90
Oakes Unit			
Grain farms	13.51	5.19	30.00
Grain-livestock farms	12.83	6.29	26.68
Livestock farms	12.21	6.21	18.58
All farms	12.18	5.19	30.00

Table 24. Number of Tractors Per Farm in Per Cent of Total Farms, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Number of Tractors Per Farm					Total Farms
	1	2	3	4	5	
(Per cent of farms reporting)						
Northern Area						
Grain farms, acres						
260-499	60	37	3	--	--	100
500-699	17	74	7	2	--	100
700-999	10	64	22	2	2	100
1,000-1,499	8	56	24	8	4	100
All grain farms	30	52	13	3	2	100
Grain-livestock farms	35	59	--	6	--	100
Livestock farms	54	25	13	8	--	100
All farms	32	51	11	4	2	100
Oakes Unit						
Grain farms	28	52	10	7	3	100
Grain-livestock	35	29	29	7	--	100
Livestock farms	22	56	22	--	--	100
All farms	29	46	17	6	2	100

As one can expect, the grain farms showed the highest proportion of farms with combines and the livestock farms with the smallest proportion (Table 25).

The 12 foot and the 6 foot combines were the two most common sizes (Table 26). The 6 foot combine was the most common on the smaller grain farms, the grain-livestock and the livestock farms.

Investment in Livestock - Valuations for livestock were based on the number of animals found on the farm January 1, 1952. The values were arrived at by using the North Dakota prices received by farmers for 1951.

Livestock farms in the Northern Area had twice as high an investment in livestock as the grain farms. In the Oakes Unit, livestock farms had only 65 per cent more livestock investment than grain farms. Grain farms in the Oakes Unit had almost as high a livestock investment as did grain-livestock farms in the Northern Area. On the average, farms in the Oakes Unit have more animal units per farm than do the farms in the Northern Area. The livestock farms in the Northern Area include two farms which had no livestock on the farm on January 1, 1952. One farmer sold off his livestock in 1951 and the other farmer buys cattle in the spring, pastures them and sells them in late fall.

In the Northern Area, the most common group for the grain and grain-livestock farms fell within the 10 to 20 animal unit range and for the livestock group the modal range was 50 to 60 animal units (Table 28). In the Oakes Unit, the most frequent range for the grain farms was the 40 to

Table 25. Number of Combines Per Farm in Per Cent of the Total Farms, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Number Per Farm				Total
	0	1	2	3	
	(Per cent of total farms)				
Northern Area					
Grain farms, acres					
260-499	19	81	--	--	100
500-699	--	94	6	--	100
700-999	8	86	4	2	100
1,000-1,499	4	80	16	--	100
All grain farms	9	83	7	1	100
Grain-livestock farms	21	76	--	3	100
Livestock farms	54	46	--	--	100
All farms	14	79	6	1	100
Oakes Unit					
Grain farms	17	73	10	--	100
Grain-livestock farms	21	79	--	--	100
Livestock farms	22	78	--	--	100
All farms	19	75	6	--	100

Table 26. Size of Combine in Per Cent of Total Combines Reported, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Size of Combine							Total
	6'	9'	10'	12'	14'	16'	20'	
				(Per cent)				
Northern Area								
Grain farms, acres								
260-499	44	7	2	44	-	3	-	100
500-699	28	-	3	67	-	2	-	100
700-999	24	-	-	68	4	4	-	100
1,000-1,499	7	-	4	78	4	4	3	100
Grain farms	27	2	2	63	2	3	1	100
Grain-livestock farms	56	-	-	38	3	3	-	100
Livestock farms	73	-	-	27	-	-	-	100
All farms	32	2	2	59	2	3	-	100
Oakes Unit								
Grain farms	52	7	-	41	-	-	-	100
Grain-livestock farms	55	-	-	45	-	-	-	100
Livestock farms	86	-	-	14	-	-	-	100
All farms	58	4	-	38	-	-	-	100

Table 27. Average, High and Low Animal Units of Livestock Per Farm, by Type of Farm, Northern Area and the Oakes Unit, 1951.

Type of Farm	Average	Low	High
	(number of animal units per farm)		
Northern Area			
Grain farms			
260-499	14.10	0.00	40.70
500-699	20.26	0.00	50.15
700-999	24.57	0.00	89.95
1,000-1,499	32.48	0.00	93.00
All grain farms	23.17	0.00	322.95
Grain-livestock farms	33.17	5.00	169.68
Livestock farms	51.82	0.00	149.00
All farms	26.80	0.00	322.95
Oakes Unit			
Grain farms	30.38	0.00	74.70
Grain-livestock farms	36.16	6.55	77.26
Livestock farms	48.20	18.50	73.58
All farms	35.02	0.00	77.26

Table 28. Frequency Distribution of Animal Units Per Farm by Number of Farms Reporting, by Type of Farms, Northern Area and the Oakes Unit, 1951.

Animal Units	Northern Area			Oakes Unit				All Farms
	Grain	Grain-Livestock	Live-stock	Grain	Grain-Livestock	Live-stock	All Farms	
0								
1-9.99	13	-	2	2	-	-	15	2
10-19.99	38	3	1	4	2	-	42	6
20-29.99	71	10	2	5	1	1	83	7
30-39.99	48	6	-	3	2	1	54	6
40-49.99	31	8	2	4	5	-	41	9
50-59.99	8	2	3	7	1	1	13	9
60-69.99	3	2	5	1	1	4	10	6
70-79.99	6	1	4	2	1	1	11	4
80-89.99	2	-	1	1	1	-	3	3
90-99.99	2	-	3	-	-	-	5	-
100-Over	1	2	1	-	-	-	2	-
Total farms	225	34	24	29	14	9	283	52

50 animal unit range, 30 to 40 for the grain-livestock and 50-60 animal units for the livestock farms.

Table 1 showed the distribution of the animal units by kind of livestock by type of farm so it will not be repeated here.

LABOR

The farms in all these areas are principally family type farms in which the operator and his family contribute most of the labor. Table 29 shows distribution of labor by source. Attention is called to the operator category, as some types of farms show over 12 months of operator labor. This is due to the fact that there were several partnerships and father-son-agreements and the operator was charged with 24 months of labor if both worked full-time.

In the Northern Area, about 60 per cent of the total labor was contributed by the operator, 20 per cent by the family and 20 per cent hired. In the Oakes Unit, 66 per cent of the labor was operator, 10 per cent family and 24 per cent hired.

The farmers in the Oakes Unit hired more labor of all types than did farmers in the Northern Area (Table 30). Day and monthly labor was used on about the same proportion of the farms (25 per cent) in the Northern Area while 9 per cent of the farms reported year-around hired labor. None of the livestock farms in either area reported year-around labor. In the Oakes Unit, 35 per cent of the farms reported day labor, 25 per cent monthly labor and 11 per cent reported year-around labor.

Table 29. Months of Labor Required for Average Farm by Type of Labor, Northern Area and the Oakes Unit, 1951.

Type of Farm	Operator	Family	Hired Labor			Total Labor
			Year	Month	Day	
(months of labor)						
Northern Area						
Grain farms, acres						
260-499	11.7	4.5	.2	.4	.3	17.1
500-699	11.8	5.2	2.4	.7	.4	20.5
700-999	12.4	4.3	1.2	1.3	.8	20.0
1,000-1,499	13.4	3.1	5.3	1.3	.9	24.0
All grain farms	12.1	4.3	2.3	1.2	.5	20.4
Grain-livestock farms	11.6	4.1	3.5	1.1	.5	20.8
Livestock farms	11.5	2.3	2.5	1.1	.3	17.7
All farms	12.0	4.1	2.4	1.2	.5	20.2
Oakes Unit						
Grain farms	12.4	1.2	2.1	3.0	.3	19.0
Grain-livestock farms	12.5	4.6	3.4	.1	.6	21.2
Livestock farms	14.7	.8	--	2.7	.9	19.1
All farms	12.8	2.0	2.1	2.1	.5	19.5

Table 30. Per Cent Distribution of Hired Labor by Type, Northern Area and the Oakes Unit, 1951.

Type of Farm	Type of Labor Hired				Total
	Farms with no Hired Labor	Day Labor	Month Labor	Year Labor	
%					
Northern Area					
Grain	42	25	23	10	100
Grain-livestock	46	20	26	8	100
Livestock	50	29	21	--	100
All farms	43	25	23	9	100
Oakes Unit					
Grain	35	24	35	6	100
Grain-livestock	29	35	7	29	100
Livestock	11	67	22	--	100
All farms	29	35	25	11	100

Appendix Table 1. Land-Use and Livestock System by Type of Farm, 1951.

Land-Use System	Northern Area				Oakes Unit			
	Grain	Grain-Livestock	Live-stock	All Farms	Grain	Grain-Livestock	Live-stock	All Farms
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
Wheat	256	150	66	227	96	83	23	80
Oats	47	45	45	46	109	109	90	106
Barley	33	23	14	30	36	12	11	25
Flax	48	34	19	44	68	15	14	44
Rye	3	1	--	2	23	7	13	17
Corn	17	18	32	19	102	127	110	110
Other	--	--	--	--	4	--	2	3
Idle cropland	18	5	11	16	6	1	5	4
Fallow	108	64	22	95	7	2	2	5
Tame hay	18	17	37	19	56	33	40	47
Cropland pasture	11	11	15	11	3	7	14	6
Total cropland	559	368	261	510	510	396	324	447
Permanent pasture	97	137	371	125	105	77	131	102
Wild hay	60	79	150	70	62	34	104	62
Farmstead	9	8	8	9	7	8	7	7
Other	15	10	32	16	29	27	35	30
Total Acres operated	740	602	822	730	713	542	601	648

Crop System in Per Cent of Total Cropland

Wheat	45.9	40.7	25.2	44.5	18.8	21.0	7.1	17.9
Oats	8.4	12.3	17.1	9.1	21.4	27.5	27.9	23.6
Barley	5.8	6.3	5.2	5.8	7.1	3.0	3.3	5.6
Flax	8.6	9.2	7.3	8.6	13.4	3.7	4.4	10.0
Rye	.5	.1	.1	.5	4.5	1.8	4.1	3.8
Corn	3.1	4.9	12.4	3.7	20.0	32.2	33.9	24.7
Other	--	--	--	--	.8	--	.7	.6
Idle cropland	3.2	1.3	4.3	3.1	1.1	.2	1.4	.9
Fallow	19.3	17.6	8.4	18.7	1.4	.5	.7	1.1
Tame hay	3.2	4.6	14.1	3.8	11.0	8.3	12.3	10.5
Cropland pasture	2.0	3.0	5.9	2.2	.5	1.8	4.2	1.3
Total cropland	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Livestock System

Number per farm

Number per farm

Horses	2	2	3	2	1	1	1	1
Milk cows	6	7	5	6	4	4	3	4
Beef cows	9	13	27	11	12	13	23	14
Sheep	8	23	21	11	19	25	28	22
Hogs	1	1	1	1	7	11	14	9
Chickens	39	33	58	42	85	129	112	101

Appendix Table 2. Land-Use System in Per Cent of Total Acres Operated and Livestock System in Per Cent of Total Animal Units for Grain Farms in the Northern Area, 1951, by Size of Farm.

Land-Use System	Size of Farm				All Grain Farms
	260-499	500-699	700-999	1,000-1,499	
Wheat	36.0	39.2	34.5	32.9	34.6
Oats	7.6	6.8	5.8	6.5	6.3
Barley	5.3	5.5	4.4	3.2	4.4
Flax	5.7	6.0	6.1	7.0	6.5
Rye	.2	.3	.6	.5	.4
Corn	1.7	2.9	2.5	2.1	2.3
Idle cropland	1.9	1.3	1.5	2.2	2.4
Fallow	13.6	12.2	17.9	16.6	14.6
Tame hay	2.4	2.2	2.3	1.9	2.4
Cropland pasture	1.0	1.3	2.5	1.2	1.5
Total cropland	75.4	77.7	78.1	74.1	75.4
Permanent pasture	13.8	12.1	11.5	13.1	13.2
Wild hay	7.3	6.5	7.3	9.3	8.1
Farmstead	1.8	1.4	1.0	.9	1.2
Other	1.7	2.3	2.1	2.6	2.1
Total acres operated	100.0	100.0	100.0	100.0	100.0

Crop System in Per Cent of Total Cropland Acres for Grain Farms

Wheat	47.8	50.4	44.2	44.4	45.9
Oats	10.0	8.8	7.4	8.7	8.4
Barley	7.1	7.1	5.6	4.3	5.8
Flax	7.6	7.8	7.9	9.5	8.6
Rye	.3	.3	.8	.7	.5
Corn	2.2	3.7	3.2	2.8	3.1
Idle cropland	2.5	1.6	1.9	3.0	3.2
Fallow	18.0	15.7	22.9	22.4	19.3
Tame hay	3.2	2.9	2.9	2.6	3.2
Cropland pasture	1.3	1.7	3.2	1.6	2.0
Total cropland	100.0	100.0	100.0	100.0	100.0

Livestock System

Per Cent of Total Animal Units

Horses	12.8	11.0	9.5	7.3	9.1
Milk cows	47.9	42.7	28.7	23.8	32.2
Beef cows	28.4	36.9	55.0	64.4	49.4
Sheep	6.7	5.4	3.8	2.3	6.2
Hogs	.7	1.3	.9	.6	.9
Chickens	3.5	2.7	2.1	1.6	2.2
Total	100.0	100.0	100.0	100.0	100.0

Appendix Table 3. Summary of Labor and Fuel Requirements Per Acre by Size of Machine, Oakes Unit, 1951.

Size and Type of Machine	Number Reporting	Low		Average		High	
		MH/ac ^{1/}	Fuel/ac	MH/ac	Fuel/ac	MH/ac	Fuel/ac
<u>Plow, Moldboard</u> 3 - 14 inch	21	.33	.83	.73	1.76	1.00	2.50
<u>Plow, Pack and Drill</u> 3 - 14 inch	8	.40	1.00	.63	1.74	.90	3.30
3 - 16 inch	8	.40	1.05	.58	1.87	.67	3.00
<u>One-Way Plow</u> 6 feet	6	.33	1.00	.47	1.43	.60	2.33
<u>Disc, Single</u> 15 feet	8	.14	.33	.19	.47	.30	.83
<u>Disc, Tandem</u> 10 feet	10	.17	.40	.30	.77	.50	1.36
<u>Cultivation, Shallow</u> 10 feet	9	.20	.50	.42	.96	1.00	2.20
<u>Harrow, Spiketooth</u> 25 feet	12	.06	.12	.14	.30	.27	.50
<u>Drill</u> 10 feet	14	.25	.38	.36	.60	.60	1.00
12 feet	14	.19	.30	.25	.50	.40	.80
<u>Swather</u> 12 feet	22	.16	.28	.26	.51	.50	1.00
<u>Combine</u> 6 feet	18	.33	.64	.50	1.62	.70	2.67
12 feet	15	.20	1.00	.38	1.57	.60	3.00
<u>Corn Planter</u> 2-row	15	.17	.32	.49	.71	1.00	1.11
<u>Corn, Cultivation</u> 2-row	25	.18	.40	.46	.72	.83	1.25
4-row	18	.17	.24	.21	.58	.40	1.00
<u>Corn Listing</u> 2-row	14	.25	.40	.44	.93	.67	1.67
4-row	10	.17	.25	.24	.74	.30	1.17
<u>Mowing Hay</u> 7 feet	42	.20	.25	.41	.65	.67	1.15

^{1/} Man-hours per acre.

Appendix Table 4. Summary of Labor and Fuel Requirements Per Acre
by Size and Type of Machine, Northern Area, 1951.

Size and Type of Machine	Number Reporting	Low		Average		High	
		MH/ac ¹	Fuel/ac	MH/ac	Fuel/ac	MH/ac	Fuel/ac
<u>Plow, Moldboard</u>							
3 - 14 inch	39	.50	.87	.66	1.68	.87	2.38
4 - 14 inch	23	.33	.73	.50	1.77	.67	3.60
3 - 16 inch	18	.44	.80	.67	1.67	1.20	2.50
<u>Plow, Pack, Drill</u>							
3 - 14 inch	83	.32	1.00	.70	2.04	1.25	3.12
4 - 14 inch	48	.32	.83	.51	1.74	.69	2.50
3 - 16 inch	36	.29	.86	.58	1.85	.87	3.00
<u>One-Way Plow</u>							
6 feet	39	.25	.12	.50	1.38	.90	2.50
8 feet	27	.22	.50	.35	1.21	.80	4.80
9 feet	14	.25	1.00	.39	1.45	.71	2.50
<u>Disc, Single</u>							
15 feet	27	.12	.29	.20	.58	.29	1.00
21 feet	9	.07	.40	.12	.42	.18	.75
<u>Disc, Tandem</u>							
10 feet	45	.15	.23	.28	.84	.42	1.82
<u>Cultivation, Shallow</u>							
8 feet	9	.27	.53	.37	1.08	.48	2.00
9 feet	11	.17	.48	.36	.91	.56	1.50
10 feet	28	.20	.43	.32	.97	.50	2.00
12 feet	54	.07	.29	.25	.78	.55	2.25
<u>Cultivation, Deep</u>							
10 feet	12	.20	.55	.38	1.14	.67	2.17
13 feet	13	.13	.33	.28	.93	.50	1.75
<u>Harrow, Spiketooth</u>							
21 feet	47	.06	.10	.14	.30	.30	.70
25 feet	11	.06	.10	.16	.34	.25	1.00
<u>Drill</u>							
10 feet	15	.20	.24	.30	.53	.33	1.00
12 feet	57	.12	.25	.22	.52	.37	.94
14 feet	9	.14	.20	.18	.32	.24	.43
15 feet	10	.10	.25	.20	.49	.28	1.00
16 feet	18	.06	.12	.17	.36	.40	1.00
<u>Swather</u>							
10 feet	14	.25	.15	.30	.40	.33	.50
12 feet	132	.12	.17	.23	.44	.37	1.00
14 feet	11	.17	.20	.20	.32	.25	.50
15 feet	11	.10	.25	.16	.37	.28	1.00
16 feet	27	.06	.12	.16	.38	.40	1.00

Appendix Table 4. continued.

Size and Type of Machine	Number Reporting	Low		Average		High	
		MH/ac ^{1/}	Fuel/ac	MH/ac	Fuel/ac	MH/ac	Fuel/ac
<u>Combine</u>							
6 feet	57	.29	.50	.54	1.50	1.00	3.00
12 feet	121	.14	.30	.32	1.27	.55	2.50
<u>Binder</u>							
10 feet	8	.29	.29	.38	.64	.50	1.00
<u>Corn Planter</u>							
2 row	40	.25	.28	.46	.54	.80	1.25
<u>Corn Cultivation</u>							
2 row	69	.25	.32	.47	.58	1.11	2.00
<u>Field Cutter, Corn</u>							
1 row	26	.50	.71	.96	1.59	1.67	3.12
<u>Mowing Hay</u>							
7 feet	94	.20	.17	.38	.58	1.25	1.50
<u>Raking Hay</u>							
10 feet	5	.17	.17	.35	.42	.67	.67
<u>Stacking Hay</u>							
Per ton	16	.24	.37	.52	.79	1.33	1.88

^{1/} Man-hours per acre.

Appendix Table 5. Average Weights of Livestock Sold by Type of Livestock, Northern Area and the Oakes Unit, 1951.

Type of Livestock	Northern Area (lbs.)	Oakes Unit (lbs.)
Dairy cows	1,130	983
Beef cows	1,148	1,081
Heifers and steers (over 1 yr.)	789	849
Calves	426	432
Bulls	1,228	1,153
Sows	---	348
Hogs	226	241
Sheep	118	150
Lambs	85	91

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