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THE COST OF PRODUCING MINNESOTA FIELD CROPS, 1913-1917

BY

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SUMMARY

1. The crop yields on the farms concerned in this investigation were above the average for the state by the following amounts per acre: wheat 3.8 bushels, oats 5.9 bushels, barley 0.7 bushel, rye 6.3 bushels, corn 5.4 bushels, and potatoes 17.3 bushels. See Table II.

2. The average monthly cost of board for 1913-1917 at Halstad amounted to $14.96, or 50 cents per day. At Cokato the board cost $16.02 per month, or 53 cents per day. The average daily cost for all farms was 52 cents. See Table VI.

3. The average wage rate per hour for labor hired by the month for the years 1913-1917 for the seven crop months (April to October) was 15.3 cents at Halstad; and 15.7 cents at Cokato. This was an increase of 12 per cent over the previous five-year period. The cost of labor was 21 per cent higher in 1917 than in 1912. Table VII.

4. The five-year average annual cost of maintaining a farm work horse at Halstad was $110.50 and at Cokato $113.36. In 1917 the cost was $151.56 at Halstad and $128 at Cokato. At Halstad the horses averaged 941 hours of labor annually and 3.14 daily. At Cokato they worked 974 hours annually and 3.25 daily. The cost per hour was slightly more than 11 cents in each locality. In 1917 the rate per hour was 17 cents at Halstad and 13.6 cents at Cokato. See Tables IX, X, and XI.

5. For the period 1913-1917 the average annual depreciation of machinery was 7.3 per cent for all machines. The acre cost of machinery for various crops varied from $1.26 on small grain to $3.09 on corn silage. See Tables XII, XIII, and XIV.

6. For the amount and cost of seed and twine used per acre for the various crops, see Tables XV and XVI.

7. The average cost of labor per acre for spring plowing was $1.91 in each locality and for fall plowing, $2.04. See Table XVIII.

8. The total cost per acre including land rental, of producing the principal field crops for the period 1913-1917, was as follows: Spring wheat $16.33, oats $16.54, barley $15.81, rye $16.66, corn $19.28, fodder corn $19.03, corn silage $23.53, potatoes $45.37, flax $18.99, clover and timothy hay, one cutting, $11.22, alfalfa hay, 3 cuttings, $16.59, wild hay $8.67, timothy seed $7.54, and clover seed $9.61. These costs include all labor of the farmer and his family at hired laborer's wages. See Table XXXVIII.

9. By comparing the cost per acre for the five-year period, 1908-1912, with the cost during 1913-1917 it was found that there was an increase in cost of the principal crops as follows: wheat 40 per cent,

oats 28, barley 31, corn 25, silage 16, tame hay 49, wild hay 19, clover seed 15. See Table XXXIX.

10. The average farm prices Dec. 1, 1913 to 1917 were: wheat $1.26 per bushel, oats 43 cents, barley 70 cents, rye $1.02, flax $1.92, corn 71 cents, potatoes 69 cents, and hay $7.64 per ton. At these prices it was necessary to obtain the following yields per acre in order to cover the entire cost of production: wheat 13 bushels, oats 34.4, barley 21.6, rye 15, flax 9.9, corn 27, potatoes 66, and hay 1.4 tons. See Table XLI.

THE COST OF PRODUCING FIELD CROPS, 1913-1917

By F. W. PECK

It is becoming more and more apparent that earnings on land must come from production and not from speculation. This means the adoption of better farming methods, more attention to productive enterprises, and closer application of business principles to the farm business. The nature of the farming business is such that it may be more or less accurately classified as an individually managed business, and the operator should know all the facts possible about his particular business.

At best there are certain handicaps under which he must labor and over which he, as an individual, has little, if any, control. These are (1) Climatic and weather conditions, (2) Diseases and accidents, (3) Violent and sudden market fluctuations.

As these are inherent risks of the farming business it becomes all the more necessary for the operator to know all the facts possible in order to minimize the chances for loss or failure. This knowledge can be obtained only by keeping a record of the various transactions that are principal in determining the financial result. It seems essential for the farm operator to study the factors of cost of production and to make his own application if profitable cropping and livestock systems are to be maintained. The principal value of a study of the cost of production is to give a basis for comparing farm enterprises so as to select profitable units for a farm business.

The data here presented are a continuation of the results of the cost studies started in 1902, the previous results of which have been published in Minnesota Agricultural Experiment Station Bulletins Nos. 97, 117, 124, 145, 157, 161, and 173.[1]

[1] Hays, W. M., and Parker, E. C. The cost of farm products. U. S. Dept. of Agr., Bureau of Statistics, Bull. 48, and Minn. Agr. Exp. Sta. Bull. 97. 1906.

Parker, E. C., and Cooper, Thomas. The cost of producing Minnesota farm products. U. S. Dept. of Agr., Bureau of Statistics, Bull. 73, and Minn. Agr. Exp. Sta. Bull. 117. 1910.

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Peck, F. W. The cost of producing Minnesota farm products, 1908-1912. Minn. Agr. Exp. Sta. Bull. 145. 1915.

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Peck, F. W., and Boss, Andrew. The cost of milk production. Minn. Agr. Exp. Sta. Bull. 173. 1918.

METHODS OF COLLECTING AND COMPILING STATISTICS

A detailed report of methods used in obtaining the data that have furnished the material for this series of bulletins was given in bulletin 97, issued in 1906, and other reports have given briefly the general plan. The discussion of methods will therefore be brief in this publication.

The work was started in 1902 under the direction of W. M. Hays in coöperation with the Bureau of Statistics, United States Department of Agriculture, and several farmers in the state. Three statistical routes were organized: one at Northfield, Rice County, in the southeastern part of the state; one at Marshall, Lyon County, in the southwestern part; and one at Halstad, Norman County, in the northwestern part. These regions were selected as typical farming communities.

A statistical agent, termed the "route man," was located in each community. He visited daily each farm on the route, obtaining in detail the hours of man and horse labor spent on each operation, a record of expenses and receipts, the amount of farm produce used in the household, the livestock production, feeding records, and all items pertaining to crop and livestock production. Complete inventories of stock and equipment were taken at the beginning and the end of each year to determine depreciation.

In order to determine the cost of man labor by the hour, complete household records were obtained. The cost of board was added to the wages paid and the sum divided by the number of hours worked. The same method was used to determine the cost of horse labor. The crop areas were measured each year to determine the exact acreage of each crop.

In 1904 the number of coöperators in each region was reduced from fifteen to eight in order to include a detailed study of the livestock practices.

In 1911 the Bureau of Statistics, United States Department of Agriculture, withdrew from the project, thereby necessitating, for financial reasons, the dropping of the Marshall (Lyon County) route. The investigations at Northfield (Rice County) and Halstad (Norman County) were continued by the Minnesota Agricultural Experiment Station, the farming in these regions being typical of large sections of the state.

The Rice County route was discontinued at the end of 1912 and a new route opened at Cokato, Wright County. The plan was changed somewhat at Cokato and twelve farms were studied in place of eight as at Northfield and Halstad. Each farm was visited every other day instead of every day and most of the milk testing was done by the

creamery tester. The feed was weighed and fed by the unit system, that is, the number of baskets, buckets, measures, scoops, sacks, and other containers of feed were recorded by the farmers and the average weight of the measure of feed was then obtained by the route man. The labor hours were obtained largely by interviews with the farmers, with some aid from labor slips kept by the farm operators.

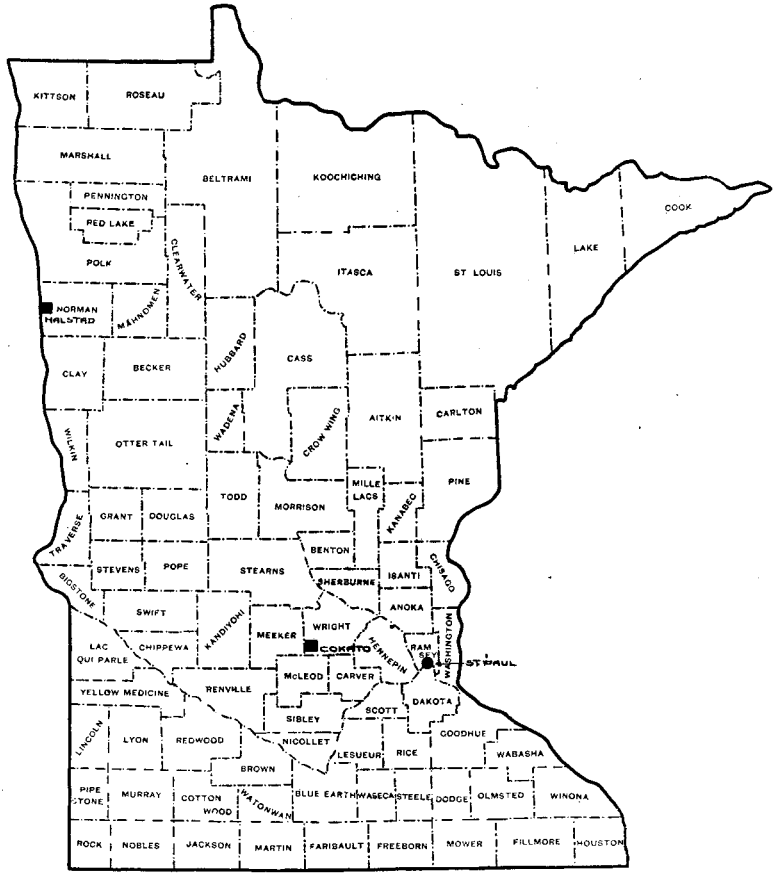

Fig. 1. Location of Statistical Routes
Eight Farms for 5 Years at Halstad
Twelve Farms for 5 Years at Cokato

CLIMATIC CONDITIONS, 1913 TO 1917

The cost of producing crops depends on several factors. One of the important factors in production is the weather. The precipitation and temperature during the growing season influence the yield to a large extent. To understand the conditions under which these cost data were gathered and compiled, a consideration of the climatic conditions is essential.

Table I presents the climatic conditions for the period 1913 to 1917. These conditions are considered typical of the regions studied, for the weather stations are located within forty miles of the statistical farms.

TABLE I
CLIMATIC CONDITIONS, 1913-1917*

Locality	Average annual precipitation		Mean temperature April 1 to Sept. 30		Date of last killing frost in spring	Date of first killing frost in fall	Crop growing days
	Prior to 1913	1913-1917	Prior to 1913	1913-1917			
	Inches	Inches	Degrees	Degrees			
Halstad (Norman Co.)	21.3	19.7	59.4	59.6	May 20	Sept. 20	125
Minneapolis (Hennepin Co.)	29.3	28.8	62.9	61.9	May 10	Sept. 25	135
State average	27.6	26.3	60.0	60.3	.....	.....	.....

* Data are taken from U. S. Weather reports and Minn. Research Bull. 13, "Surface formations and agricultural conditions of Northeastern Minnesota."

From Table I it will be noted that the average rainfall was less at Halstad and East Minneapolis during the five-year period than the average for the preceding years. The mean temperature was approximately normal for this period as compared with the preceding years. The largest variation was at the East Minneapolis station with a difference of 1 degree. The relation of the temperature and rainfall of these stations to the average for the entire state is also given in the table.

The Cokato district has about ten days more of growing weather than the Halstad region, which is ample to make a great difference in the growing of the corn crop. Comments and notes on conditions within the five-year period follow:

1913—The mean temperature was 1.4 degrees above normal, with the precipitation about normal for the state but 3.8 inches below normal at Halstad and 3.2 inches below normal at Minneapolis. The crop yields of small grain were above the five-year average at Halstad and yields of all crops were above the five-year average at Cokato.

1914—The mean temperature for the year was slightly above normal, but the spring months were cooler and wetter than usual. The average rainfall for the state was 2 inches above normal; at Minneapolis, 1.8 inches above normal; and at Halstad 1 inch above normal. April, June, and August were wetter than normal and the yield of small grain was decreased at Halstad and Cokato as a consequence. The hay crop was above the five-year average.

1915—The mean temperature was slightly above normal, especially during March and April, altho May and June were unseasonably cool. The precipitation was normal at Halstad and 4 inches above normal at Minneapolis. Cokato had one of the best grain crops of the period but at Halstad the yield was only average. Early frosts cut the corn yield considerably below the average for the five-year period.

1916—The mean temperature was 1 degree below normal at Minneapolis and about normal at Halstad, altho the spring months were unseasonably cool. The rainfall was 1.8 inches below normal at Minneapolis and above normal at Halstad. Heavy rains in August with a large amount of rust decreased the yield of small grain at both Halstad and Cokato, the yield of wheat being less than half a normal crop at Halstad and 70 per cent of a normal crop at Cokato. Hay was a good crop in both localities.

1917—The year was unusually cold and dry for the entire state but the distribution of the light rainfall produced a good crop. The temperature was 4 degrees below normal at Minneapolis and 1 degree below normal at Halstad.

The precipitation was much below normal in the Red River Valley but opportune rains in June helped the yield of small grain. The rainfall was 3.6 inches below normal at Minneapolis but yields of small grain were considerably above the five-year average at Cokato. Corn was injured by cold wet weather again and a low yield resulted. The hay crop was generally poor and high prices prevailed.

AVERAGE CROP YIELDS

Table II presents the crop yields per acre for the two localities and compares the average of all farms studied with the average state yields.

TABLE II

CROPS YIELDS 1913-1917 AT HALSTAD AND COKATO, COMPARED WITH STATE AVERAGE

Crop	Halstad			Cokato			Average yield		Inc. or Dec. compared with state average†
	Acres	Total yield	Acre yield	Acres	Total yield	Acre yield	Route farms	State*	
		Bu.	Bu.		Bu.	Bu.	Bu.	Bu.	Bu.
Wheat	2,721.76	46,849.7	17.2	1,765.84	31,724.6	17.9	17.5	13.7	+3.8
Oats	995.47	38,812.0	39.0	948.43	39,555.0	41.7	40.3	34.4	+5.9
Barley	678.87	41,238.2	24.6	429.15	12,397.8	28.9	25.4	24.7	+0.7
Rye	128.8	3,045.0	23.6	30.84	855.3	27.7	24.4	18.1	+6.3
Flax	.....	.....	.....	45.33	453.5	10.0	10.0	9.3	—0.7
Corn, grain	158.92	4,911.7	30.9	751.44	29,388.7	39.1	37.7	32.3	+5.4
Timothy seed	37.47	120.0	3.2	14.72	73.2	4.9	3.7	.....	.....
Clover seed	21.84	51.8	2.4	18.63	34.9	1.8	2.1	.....	.....
Potatoes	422.14	45,157.7	107.0	43.44	9,474.0	218.0	117.3	100.0	+17.3
		Tons	Tons		Tons	Tons	Tons	Tons	Tons
Corn fodder	51.14	156.0	3.0	43.49	107.5	2.5	2.8	.....	.....
Silage	64.81	326.1	5.0	88.25	615.4	6.9	6.1	.....	.....
Hay, mixed	1,307.44	1,508.8	1.1	1,259.0	2,661.6	2.1	1.6	1.8	—0.2
Hay, alfalfa	165.31	333.0	2.0	69.74	230.7	3.3	2.4	.....	.....
Hay, millet	67.77	91.4	1.3	11.39	12.5	1.1	1.3	.....	.....

* U. S. Dept. of Agr. Yearbooks.
† A plus sign indicates increase, a minus sign, decrease.

The corn yield at Halstad and Cokato was below normal because of the abnormally small crop in 1915 and a relatively poor crop in 1917. The Cokato district is well known as a good corn-growing

community and the conservative average yield of 39 bushels per acre illustrates the effect of averaging the yields over a term of years.

In 1914 the average yield of corn on the farms studied was 47 bushels per acre, but in 1915 it was only 30 bushels. This fluctuation in yield is the general experience with most crops, in most farming districts, over several years.

From a cost standpoint, the yield per acre, within reasonable limits, has little effect on the cost per acre, for a large share of the crop cost is fairly constant regardless of the yield. It is believed that the records from these farms are typical of many other farms, as is well illustrated by a comparison of the yield of these farms and the average. There was an increase on these farms above the state average of approximately 4 bushels of wheat per acre, 6 of oats, 6 of rye, 5 of corn, and 17 of potatoes. The barley and flax yields were approximately the same as the state yield, while a slight decrease is noted in the yield of tame hay. These results indicate that the study was made on fairly typical farms and that the data are representative of many farms in various parts of the state.

AVERAGE FARM PRICES OF FARM CROPS, 1913-1917

The margin between cost per bushel and price per bushel fluctuates widely with different crops and years and even within the year. In terms of the number of bushels required to equal the cost per acre at a current price, this margin between cost and income is entirely dependent on the yield.

In this bulletin no attempt is made to show the margins of profit. One can easily use the average yield as given in Table II with any current price for any year in the period and obtain the acre value of the crop. A comparison with the cost figures will then give an idea of the relative profitableness of the crop.

TABLE III

AVERAGE FARM PRICES PER BUSHEL OR TON OF CROPS IN MINNESOTA, DEC. 1, 1913-1917

Year	Corn	Oats	Barley	Wheat	Flax	Rye	Hay	Potatoes
1913	$0.53	$0.32	$0.48	$0.76	$1.23	$0.48	$6.60	$0.52
1914	0.52	0.40	0.53	1.02	1.28	0.89	6.10	0.32
1915	0.62	0.32	0.49	0.90	1.76	0.81	6.40	0.39
1916	0.80	0.47	0.87	1.62	2.40	1.27	7.00	1.30
1917	1.10	0.63	1.11	2.02	2.95	1.67	12.10	0.91
Average	0.71	0.43	0.70	1.26	1.92	1.02	7.64	0.69
Av. previous 5 years	0.48	0.35	0.59	0.90	1.60	0.63	7.76	0.48
Per cent increase	48	23	19	40	20	62	.....	44

Table III and Figure 2 illustrate the fluctuations in farm prices of Minnesota crops and the general upward trend of prices since 1915. Table III shows a comparison of the average prices for 1913-1917

with the average for the preceding five-year period. Hay is the only crop which does not show a decided increase. Rye increased 62 per cent in the five-year period and the other grains and potatoes show large increases.

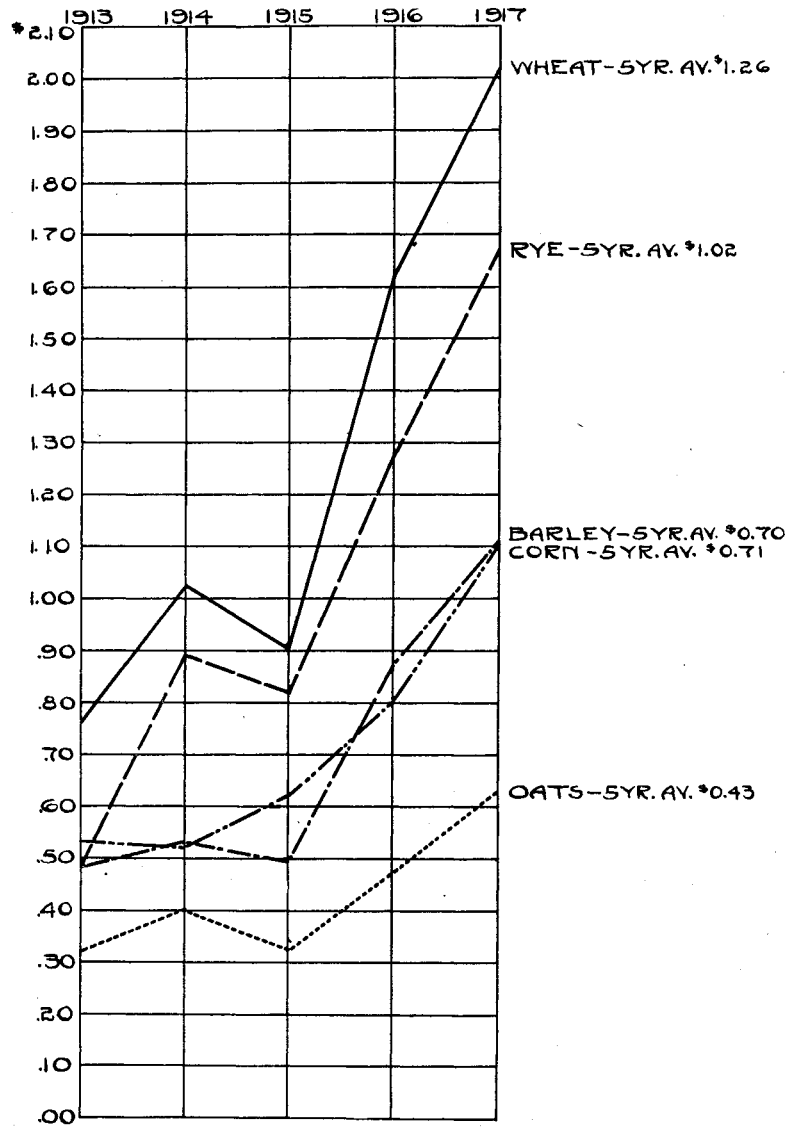

Fig. 2. Price Curves of Five Leading Field Crops, 1913-1917

If the farm prices in 1917 are compared with those of 1912, five years before, the increase shown is 230 per cent for rye, 200 per cent for corn, 170 per cent for wheat and barley, 140 per cent for oats, and 225 per cent for potatoes.

FACTORS OF COST

The factors of cost that enter into the production of field crops are: man labor, horse labor, seed, twine, threshing, values consumed in machinery, land rent, and general expense. In terms of direct and indirect expense, land rent may be considered indirect, and where no rent is actually paid, the farmers usually ignore this item in estimating the cost.

MAN LABOR

Man labor constitutes a large proportion of the cost of crop production.

Under ordinary conditions all labor, both man and horse, constitutes approximately two fifths the cost of producing small grain, one half the cost of producing corn, and from two fifths to one half the cost of producing hay when two crops are cut.

The man and horse labor requirements of crop production are given in detail in Agricultural Experiment Station bulletin 157, and Table IV, taken from that publication, presents the man and horse hours required per acre of crops.

TABLE IV

AVERAGE ANNUAL HOURS OF LABOR PER ACRE REQUIRED IN PRODUCING FIELD CROPS, 1902-1912

Crop	Northfield (Rice County)		Marshall (Lyon County)		Halstad (Norman County)		Glyndon (Clay County)		Average all Farms	
	Hours per acre		Hours per acre		Hours per acre		Hours per acre		Hours per acre	
	Man	Horse	Man	Horse	Man	Horse	Man	Horse	Man	Horse
Wheat, shock-threshed	14.5	28.0	12.2	29.4	10.8	28.2	.....	.....	12.3	29.9
Oats, shock-threshed	14.7	28.2	12.2	30.0	11.7	29.6	.....	.....	13.5	28.9
Barley, shock-threshed	14.8	27.9	13.3	31.4	11.9	29.5	.....	.....	12.8	29.9
Fall rye, shock-threshed	.....	.....	10.2	27.0	10.4	27.5	.....	.....	10.3	27.2
Flax, stack-threshed	15.0	31.0	15.6	40.2	12.9	32.6	.....	.....	13.7	33.8
Corn, husked	30.1	53.6	22.6	51.6	30.9	57.6	.....	.....	26.2	54.2
Fodder corn, cut, shocked, and stacked	33.7	54.1	25.0	51.0	33.1	52.8	.....	.....	30.4	52.6
Ensilage	33.7	56.0	.....	.....	31.5	63.5	.....	.....	32.6	59.8
Potatoes, machine production	.....	.....	.....	.....	.....	.....	44.4	75.0	44.4	75.0
Mangels*	.....	.....	.....	.....	.....	.....	180.7	99.3	180.7	99.3
Hay, timothy and clover, first crop	12.7	11.8	11.0	13.4	12.6	13.8	.....	.....	12.3	13.0
Hay, timothy and clover, two cuttings	21.3	20.3	15.6	23.0	.....	.....	.....	.....	20.7	21.5
Hay, wild	9.1	10.0	11.2	13.5	13.5	20.7	.....	.....	12.2	16.9
Timothy, cut for seed	.....	.....	6.0	8.5	4.4	6.1	.....	.....	5.1	7.1
Clover, cut for seed	10.1	11.3	8.1	13.6	.....	.....	.....	.....	9.2	12.3
Hay, millet	18.5	36.3	16.9	39.1	17.3	39.5	.....	.....	17.3	39.1
Hemp	14.3	27.4	.....	.....	.....	.....	.....	.....	14.3	27.4

* Grown at Minnesota Experiment Station.

CASH WAGES

The monthly wage paid greatly influences the cost of crop production. In Minnesota most of the month labor is employed by the

season or year. It is becoming a common practice to pay a graduated scale of wages to meet the demands of two seasons: (1) the active crop season from April to November inclusive and (2) the winter, or inactive crop season, from December to March inclusive. On many livestock farms most of the labor is fairly well distributed throughout the year and labor is hired on that basis.

Table V shows the average monthly cash wages by years from 1913 to 1917. The variation between 1916 and 1917 at Cokato is due to local conditions. Several of the coöperating farmers were able to get along with younger help and did not pay the wages that would have been demanded by experienced men. It is noted that the wages at Halstad are consistently higher than at Cokato, especially during the winter months.

FARM BOARD

The cost of board is an important item in the cost of man labor. The monthly cost of board is obtained by determining the total cost of maintaining the farm family and dividing this amount by the number of adults or adult equivalents boarded. Farm help is scaled to the adult as a unit according to age, size, and character of work done.

The cost of board includes groceries, meats, farm produce used, fuel, depreciation on kitchen and room equipment, and current wages for woman labor. The woman wage varied from $3 to $5 per week. Work performed by men about the house was charged at regular rates. It will be noted from Table VI that board constitutes about one third of the total cost of man labor.

TABLE V

AVERAGE MONTHLY CASH WAGES PAID TO FARM LABORERS, 1913-1917

	Halstad					Cokato				
	1913	1914	1915	1916	1917	1913–14	1914–15	1915–16	1916–17	1917–18
January...	$30.13	$27.91	$26.35	$27.14	$34.90	$17.50	$10.00	$26.66	$25.00	$15.00
February...	27.88	27.91	26.35	33.96	30.56	17.50	10.00	26.66	25.00	20.00
March.....	28.42	29.68	29.89	33.96	30.56	18.66	10.00	17.50	22.25	20.00
April.....	35.06	34.73	35.41	35.57	36.20	25.00*	23.20	20.62	20.00	25.00
May.....	35.06	35.48	35.41	34.90	36.20	25.75	26.58	23.33	24.25	27.00
June.....	34.79	34.50	35.41	35.57	36.20	22.16	25.25	23.33	25.00	25.25
July.....	35.53	36.40	36.67	35.57	36.20	23.33	25.16	32.50	35.00	26.25
August....	36.61	36.40	36.67	34.90	36.20	31.25	26.20	30.00	35.00	28.75
September..	36.96	36.40	35.41	34.90	35.96	27.50	26.75	33.33	34.00	27.50
October....	35.54	36.20	35.41	35.57	35.60	28.75	25.66	35.00	32.50	25.00
November..	33.73	35.09	35.41	34.90	33.96	24.39	22.50	26.66	24.00	22.50
December..	31.75	28.12	31.76	34.90	29.45	19.50	10.00	26.66	30.00	25.00
Average..	$34.47	$34.07	$34.09	$34.75	$34.37	$23.33	$21.37	$26.32	$27.49	$25.50

* The statistical period began April 1, 1913, and ended March 31, 1918. The figures for Cokato for January, February, and March are for the calendar years 1914-15-16-17 and 18. They are used in the table, as they are, to facilitate the tabulation.

TABLE VI
COST OF FARM BOARD PER MAN, BY MONTH AND DAY, 1913-1917

Year	Halstad		Cokato	
	Month	Day	Month	Day
1913	$14.01	$0.47	$16.83	$0.56
1914	14.37	0.48	15.30	0.51
1915	13.37	0.45	14.82	0.49
1916	15.03	0.50	15.92	0.53
1917	18.03	0.60	17.21	0.57
Average	$14.96	$0.50	$16.02	$0.53

Average all farms, per month, $15.49; per day, 52 cents.

RATE PER HOUR FOR MONTH LABOR

The wage rates per hour as given in Table VII are based on cash wages and farm board as presented in Tables V and VI. The rate is determined by dividing the total cost of labor on all farms in each region by the total number of hours worked each month by month help. The labor of the proprietor and unpaid family labor are converted into a cash cost at regular hired men's rates so as to include all labor in the cost of production.

Boy labor is scaled according to the work performed, and reduced to a man basis at regular rates. Many operations are performed by boys whose labor on those operations is equivalent to a man's labor. In other instances the boy's labor must be estimated as so many tenths of a man's labor according to the best judgment of the investigator.

The average rate per hour for all farms increased considerably over the rate for the previous five-year period, as shown in the last two columns in Table VII.

The average rate per hour for the year, for all farms, was 15.6 cents, an increase of 14 per cent over the average rate for the period 1908-1912. On the farms studied, the rate for the month labor in 1917 averaged 17.1 cents per hour, which is considerably higher than the five-year average.

RATE PER HOUR FOR DAY LABOR

Table VIII presents the rates per hour for labor hired by the day. The cash wages and the value of board have been divided by the number of hours of labor performed. These rates apply mostly to extra help hired for haying, harvesting, threshing, and silo filling during July, August, September, and October. At other seasons, day help is often employed for building operations, tiling, plowing, and hauling manure.

TABLE VII

RATE OF WAGES PER HOUR (INCLUDING COST OF BOARD) FOR MAN LABOR HIRED BY THE MONTH
(AVERAGE OF ALL FARMS COMPARED WITH PREVIOUS FIVE-YEAR PERIOD)

MONTH	Halstad						Cokato						Average all farms	Increase over previous 5-year period
	1913	1914	1915	1916	1917	Average	1913-14	1914-15	1915-16	1916-17	1917-18	Average		
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Per cent
January	16.51	14.37	16.36	16.41	16.89	16.11	12.61	12.46	15.07	20.21	17.44	15.56	15.83	26
February	16.87	15.25	16.77	16.83	16.87	16.52	12.61	10.96	15.07	20.21	17.00	15.17	15.84	19
March	16.22	13.96	15.64	16.41	15.07	15.46	12.03	8.91	13.00	16.42	17.00	13.47	14.47	10
April	15.13	16.13	16.07	17.23	16.63	16.24	13.03*	13.38	11.58	15.00	17.65	14.13	15.18	10
May	14.28	15.33	15.16	15.16	15.72	15.13	13.81	14.94	15.48	13.80	17.71	15.15	15.14	10
June	15.38	15.62	15.60	14.49	16.28	15.47	13.29	15.90	14.33	16.30	16.95	15.35	15.41	13
July	15.97	15.49	15.05	14.71	16.74	15.59	14.19	15.61	16.13	17.38	21.20	16.90	16.25	21
August	15.32	16.08	15.03	13.75	14.17	14.87	14.52	15.20	14.90	17.57	17.06	15.85	15.36	10
September	15.48	15.29	14.56	14.82	16.74	15.38	13.25	15.93	17.13	16.88	21.01	16.84	16.11	12
October	15.40	15.35	13.43	13.78	15.84	14.76	13.59	14.14	17.16	19.01	16.21	16.02	15.39	7
November	15.25	16.57	18.42	14.88	20.18	17.06	13.35	13.67	15.07	15.49	16.77	14.87	15.97	8
December	16.33	17.76	16.41	16.89	20.42	17.56	12.21	13.84	15.07	19.75	16.44	15.46	16.51	24
Average	15.43	15.52	15.49	15.11	16.61	15.62	13.16	13.78	14.55	16.52	17.97	14.67	15.30	14

* Beginning of statistical year 1913, see footnote, Table V.

TABLE VIII

RATE OF WAGES PER HOUR (INCLUDING COST OF BOARD) FOR MAN LABOR BY THE DAY, 1913-1917

MONTH	Halstad						Cokato						Average all farms
	1913	1914	1915	1916	1917	Average	1913–14	1914–15	1915–16	1916–17	1917–18	Average	
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
January	17.90	21.95	13.46	21.44	18.85	18.80	.....	18.83	15.82	14.42	29.39	25.62	23.58
February	16.94	22.47	13.85	18.08	16.33	18.04	.....	13.96	21.15	18.84	19.27	18.40	18.17
March	17.56	22.25	15.14	17.90	15.50	17.92	22.26	13.45	.....	13.97	20.34	17.45	17.76
April	20.76	20.00	15.59	11.00	19.07	16.39	18.65*	33.05	18.32	21.87	16.46	18.64	16.92
May	16.26	17.83	17.66	14.25	17.48	16.51	18.37	24.02	17.60	12.29	16.92	18.28	16.80
June	15.15	18.77	16.30	20.28	18.73	18.21	16.66	22.02	.....	18.27	25.51	22.57	19.13
July	19.04	20.53	17.18	24.11	17.05	20.05	17.94	18.89	14.85	24.15	28.88	23.07	20.75
August	27.71	26.09	25.05	28.37	28.33	27.26	18.77	25.01	20.77	28.39	27.68	23.97	26.56
September	27.16	27.05	25.13	24.36	26.22	25.84	23.04	17.32	17.05	18.88	30.42	19.63	23.73
October	18.57	22.81	27.23	25.21	25.88	24.72	22.41	24.92	15.14	28.25	31.24	23.62	24.37
November	17.29	18.84	14.87	17.62	17.34	17.00	19.57	21.05	23.64	18.91	31.42	23.74	20.24
December	18.91	12.85	19.41	20.70	23.20	17.86	18.49	13.77	15.95	11.44	32.27	24.54	22.58
Average	21.26	22.58	20.38	22.87	22.23	21.92	20.33	20.44	17.86	19.75	27.40	22.17	22.00

* See footnote, Table V.

TABLE IX

AVERAGE ANNUAL COST OF MAINTAINING A FARM WORK HORSE

	Halstad						Cokato					
	1913	1914	1915	1916	1917	Average	1913	1914	1915	1916	1917	Average
Interest on investment	$8.19	$8.15	$7.76	$7.95	$8.09	$8.02	$9.73	$8.81	$7.97	$8.27	$7.74	$8.53
Depreciation	1.84	7.83	1.84	5.29	8.04	5.02	15.37	16.57	2.28	15.75	11.90	12.55
Harness charge	2.69	2.83	2.30	1.85	3.17	2.56	2.89	3.47	3.11	2.92	2.88	3.05
Shoeing	0.24	0.07	0.05	0.03	0.04	0.08	0.91	0.60	0.57	0.39	0.62	0.62
Feed	47.84	52.83	59.55	65.25	94.09	64.43	51.59	76.82	77.34	55.77	80.00	67.63
Labor	27.52	27.41	27.45	30.03	38.20	30.22	16.26	18.62	20.86	22.95	24.59	20.59
Misc. expense	0.22	0.32	0.17	0.39	0.22	0.26	0.71	0.27	0.39	0.28	0.30	0.39
Total	$88.64	$99.34	$99.12	$110.79	$151.85	$110.59	$97.46	$125.16	$112.52	$106.33	$128.03	$113.36

HORSE LABOR

The problem of economic and adequate motor power to perform the necessary farm labor confronts every farm operator. As yet horse power rather than mechanical power is used for most of the farm operations. For certain types of work on the larger farms, tractors are being used to good advantage, yet on these farms horses are maintained for certain kinds of work not well adapted to tractor power.

The nature of farm work in relation to seasonal operations is such as to compel the maintenance of work horses during comparatively slack seasons. This means relatively few hours of labor per day through the year and a high cost rate per hour unless economies in maintenance are practiced. In 1917 the annual cost of keeping a work horse on the farms studied was more than $140. This was 15 cents per hour of labor or $3 per day of ten hours during the rush seasons for a team's work. Because of the slack seasons, the daily labor per horse will rarely average more than three and a half hours.

AVERAGE COST OF MAINTAINING A FARM WORK HORSE

The annual cost of keeping a work horse is made up of cost of feed, labor, interest, depreciation, shoeing, harness charge, and miscellaneous expense. The miscellaneous expense is made up of taxes, insurance, and cash cost items. Interest and depreciation have been computed for the work horses from actual annual inventories. The credits for colt increases have been deducted from the depreciation, leaving this figure as the net decrease in value.

On the Halstad farms the depreciation amounted to $5 per horse, while on the Cokato farms it was $12.50, the difference being largely because of fewer colts and older horses on the farms at Cokato.

The figures presented in Table IX on maintenance costs are believed typical of the cost on the majority of Minnesota farms. Knowing the cost of keeping a horse and the number of hours worked, the farm operator can determine the cost per hour and have an idea of the efficiency of his horse labor.

During the previous five-year period, 1908-1912, the average annual cost of keeping a work horse was $94. The average from 1913 to 1917 is $112, an increase of approximately 20 per cent. The increase in 1917 over 1912, 5 years previous, was more than 50 per cent, indicating the heavy increase in cost during 1917.

Table X presents the number of hours worked annually per horse on the farms in the investigation. Because of the more diversified type of farming at Cokato, more horse labor is required than on the farms at Halstad.

Even tho more grain is grown in the latter locality there are fewer days of labor for the horses, owing to the small demand in winter.

TABLE X
HOURS OF LABOR PER HORSE ANNUALLY

	1913	1914	1915	1916	1917	Annual average	Daily average
Halstad.....	987	953	976	905	892	941	3.14
Cokato.....	1,024	1,009	993	907	942	974	3.25

Dividing the total maintenance cost by the hours of labor performed gives the cost rate per hour for horse labor. The rate by years and the 5-year average are presented in Table XI. The rate per hour for the period 1908-1912 was approximately 9 cents, giving an increase for the period 1913-1917 of 27 per cent.[2] For 1917 the average rate was 15 cents per hour.

TABLE XI
COST OF HORSE LABOR PER HOUR

	1913	1914	1915	1916	1917	Average
	Cents	Cents	Cents	Cents	Cents	Cents
Halstad.....	8.98	10.42	10.15	12.24	17.03	11.13
Cokato.....	9.52	12.40	11.33	11.72	13.59	11.63

MACHINERY

FACTORS OF COST IN MACHINERY CHARGES

The use of machinery in crop production entails an annual charge against the crops made up of depreciation, interest, cash repairs, and labor.

Depreciation of farm machinery is usually estimated at 10 per cent per year. This is close enough for general estimating for all classes of machinery. The statistics gathered on a considerable number of farms in Minnesota for the years 1902-1907 showed that the average depreciation of all machines was approximately 7.3 per cent. The records on the same farms for the years 1908-1912 gave 6.7 per cent depreciation. For the period 1913-1917, with some of the same farms and others in Wright County, the records show an average of 7.3 per cent, or the same as for the period 1902-1907. It has been found that the longer records are collected on the same machines, the smaller the depreciation becomes, for they often last much longer than their appearance the first few years would indicate. Having twelve farms out of twenty on record for the first time during the period 1913-1917 a higher average rate of depreciation would result than that shown on older machines.

[2] Minn. Bull. 145.

Table XII presents the annual depreciation of machines for the two localities and the average for all farms. These computations were made from inventories showing the original value, the years in use, and the present value of each machine. The annual depreciation in dollars thus obtained divided by the average original investment gives the annual rate of depreciation in percentage form.

The inventory value of a machine is based on the number of years used, amount of work done, repairs, shelter provided, present condition, and apparent future usefulness. The auction sale price is also kept in mind in fixing the value.

TABLE XII

ANNUAL DEPRECIATION OF FARM MACHINERY EXPRESSED IN PERCENTAGES

Machine	Halstad	Cokato	Average all machines
	Per cent	Per cent	Per cent
Grain binder	5.76	7.59	6.68
Grain drill	6.24	8.40	7.15
Fanning mill	5.36	10.17	7.55
Smut mill	7.38	.....	7.38
Seed cleaner	6.55	.....	6.55
Wild-oat mill	7.14	.....	7.14
Grain tank	4.96	.....	4.96
Separator	6.78	.....	6.78
Corn grader	.....	10.85	10.85
Corn binder	6.65	9.02	7.8
Corn planter	7.39	8.46	7.93
Corn cultivator	5.58	8.59	6.83
Corn sheller	7.14	10.34	8.77
Hay mower	5.03	9.58	7.49
Hay rake	5.92	7.88	6.8
Hay loader	6.17	.....	6.17
Hay tedder	6.49	6.83	6.64
Hay stacker	.....	10.36	10.36
Forks, ropes, etc.	5.2	5.16	5.18
Stack covers	.....	8.42	8.42
Gang plow	5.61	8.94	7.21
Sulky plow	6.02	8.74	7.17
Walking plow	7.0	9.16	8.32
Breaking plow	2.75	10.69	6.01
Disk plow	23.41	.....	23.41
Harrow	3.7	8.74	6.14
Disk	5.65	10.81	7.93
Wagon	4.1	7.21	5.58
Sled	4.29	10.32	6.91
Racks	10.0	11.08	10.52
Manure spreader	9.2	11.18	10.25
Silage cutter	5.47	8.33	6.87
Harness, heavy	4.29	8.6	6.65
Cream separator	7.24	7.64	7.44
Gasoline engine	11.78	8.77	10.59
Gasoline tractor	16.52	.....	16.52
Incubator	7.45	6.76	7.06
Weeder	4.35	.....	4.35
Corn husker	.....	8.84	8.84
Grass seeder	.....	3.85	3.85
Potato cutter	11.87	.....	11.87
Potato treater	10.0	.....	10.0
Potato planter	8.75	7.46	8.16
Potato sprayer	8.67	5.35	7.08
Potato digger	8.03	5.5	6.81
Potato sorter	6.21	.....	6.21

VALUE OF FARM MACHINERY CONSUMED PER ACRE

In order to charge the machinery values consumed in producing crops, it is necessary to determine the acre cost of each machine and distribute it to the various crops. The sum of the cost items for each machine divided by the number of acres on which the machine is

used gives the value consumed per acre per year. Table XIII presents these values and shows the percentage of increase in cost per acre over the previous five-year period, 1908-1912.

The average increase in cost for the machines as given in Table XIII is approximately sixty per cent, owing largely to increased cost of labor, higher priced repairs, and larger initial costs of machines.

TABLE XIII

VALUES OF FARM MACHINERY CONSUMED PER ACRE ANNUALLY, 1913-1917

Machinery	Halstad	Cokato	Average all farms	Percentage increase in cost over 1908-1912*
Grain machinery				
Binders	$0.199	$0.312	$0.239	42
Drills	0.136	0.19	0.155	100
Fanning mills	0.032	0.048	0.039	175
Smut mill	0.019	.....	0.019	.....
Tanks	0.012	.....	0.012	60
Wagons, sleds, racks	0.095	0.127	0.106	37
Corn machinery				
Binders	0.361	0.656	0.497	−17
Planters	0.141	0.232	0.181	118
Cultivators	0.258	0.309	0.281	26
Huskers	.....	1.709	1.709	.....
Wagons, sleds, racks	0.156	0.30	0.231	18
Silage cutter	0.977	1.738	1.237	17
Hay machinery				
Mowers	0.209	0.284	0.247	48
Rakes	0.108	0.164	0.136	72
Stackers	.....	0.234	0.234	.....
Tedders	0.068	0.10	0.092	48
Loaders	0.119	.....	0.119	25
Forks, slings, etc	0.079	0.087	0.082	80
Wagons, sleds, racks	0.189	0.279	0.234	51
Potato machinery				
Cutters	0.06	.....	0.06	.....
Planters	0.514	0.654	0.537	.....
Sprayers	0.364	0.447	0.376	.....
Diggers	0.674	0.866	0.781	.....
Cultivator	0.258	0.309	0.281	.....
Wagons, sleds, racks	0.19	0.784	0.277	.....
All crops				
Plows	0.127	0.196	0.152	60
Harrows	0.019	0.045	0.029	52
Disks	0.073	0.109	0.085	124
Manure spreaders	1.149	0.916	1.011	.....

*Average increase of machinery cost per acre, 1913-1917 over 1908-1912, 60 per cent.

Table XIV gives the acre cost for the various crops for all machinery used in their production. These costs are used in the tables giving the total cost per acre of the various crops.

TABLE XIV

MACHINERY COST PER ACRE FOR VARIOUS CROPS, 1912-1917

Crops	Halstad	Cokato	Average all farms
Wheat	$1.09	$1.57	$1.26
Oats	1.09	1.57	1.26
Barley	1.09	1.57	1.26
Rye	1.09	1.57	1.26
Corn	1.53	2.20	1.90
Corn silage	2.71	3.80	3.09
Potatoes	2.43	3.15	2.51
Tame hay	1.31	1.61	1.46
Millet	1.36	.....	1.36
Timothy seed	0.69	1.48	1.01
Clover seed	.....	1.32	1.32
Alfalfa seed	1.17	.....	1.17

SEED

The cost of seed has been charged in all cost tables on the basis of actual cash cost or its equivalent. The farmers' home-grown seeds were valued at current prices according to the judgment of the route man.

Table XV shows the amount and value of the seed used per acre in the two localities.

TABLE XV
AMOUNT AND COST OF SEED PER ACRE, 1913-1917

Crop	Halstad		Cokato	
	Amount	Cost	Amount	Cost
	Bu.		Bu.	
Wheat	1.46	$1.80	1.37	$1.98
Oats	2.8	1.23	2.51	1.27
Barley	1.96	1.18	1.94	1.34
Rye	1.62	1.03	1.24	1.04
Flax	.....	.....	0.51	0.84
Corn	0.18	0.46	0.16	0.47
Corn fodder	0.36	0.89	0.22	0.83
Potatoes	12.1	11.6	.....	.....

TWINE

Table XVI shows the amount and cash cost of the twine used per acre for the various crops at Halstad and Cokato. The average price of Minnesota Prison twine to the Minnesota farmers for the period 1913-1917 was approximately 12 cents per pound. For the season of 1918 this cost increased fully 100 per cent.

TABLE XVI
AMOUNT AND COST OF TWINE PER ACRE, 1913-1917

Crop	Halstad		Cokato	
	Amount	Cost	Amount	Cost
	Lbs.	Cents	Lbs.	Cents
Wheat	2.14	23	2.05	24
Oats	2.21	24	2.52	30
Barley	2.16	24	2.34	28
Rye	2.06	23	2.08	29
Flax	.....	.....	2.0	21
Corn	2.25	25	2.82	34
Corn fodder	3.95	48	3.1	38

CASH THRESHING

The cash threshing cost per bushel was about three cents for oats and five cents for wheat during this five-year period. This allows only for the common machine crew and spike pitchers furnished by the threshermen. Table XVII gives the average cash cost per bushel.

TABLE XVII
CASH COST OF THRESHING PER BUSHEL

	Wheat	Oats	Barley	Rye	Flax
	Cents	Cents	Cents	Cents	Cents
Halstad	4.5-5	3	3	4	.....
Cokato	5-6	3.5	4	4.5-5	12-15

LAND RENTAL

Land rent as a cost factor in production of crops is usually ignored by most farmers in their calculations of cost unless they actually pay cash or share rent. The position is taken in this bulletin that it is a proper charge against the crop whether it is paid or not. Land rent is really interest on the value of the land, and in the crop cost tables it has been computed at 6 per cent on $70 land at Halstad and 5 per cent on $100 land at Cokato. The argument that a lower rate of interest than is used here, on such good security as land, is more satisfactory than interest on other securities, is not sound, for all records indicate that farming as a business is subject to great risk and deserves a fair rate of interest on a fair valuation.

Under ordinary conditions, land rental amounts to approximately one third of the cost of producing small grain, one fourth of the cost of growing corn, and two fifths of the cost of growing hay.

GENERAL EXPENSE

One of the difficult phases of cost accounting is the proper distribution of the general expense to the various enterprises comprising the farm business. The principal items of general expense are taxes, insurance, and labor which is not properly chargeable to any one crop or productive enterprise. In this study the charge was found to vary from 54 cents per acre on rye to $1.55 on potatoes. The general expense was distributed on the basis of "operating expense" on these crops. This seems to be the proper basis, for operating and general expense are similar in origin, that is, all expense is similar in that it is produced by the use of labor and capital. The principal factor affecting the general expense charge per acre is that of taxes on the land, which in turn depends largely on the location of the farm in relation to town limits, school districts, and similar factors.

PLOWING

Table XVIII presents the total acreage plowed in spring and fall and the hours and cost per acre in each locality. Tractors were used as power for plowing on too small an acreage to present in table form. Tractor plowing is probably little cheaper than horse plowing altho on large farms the tractor may be an economic investment in the entire year's operations.

At Cokato there is little gang plowing, as is shown by the ratio between man and horse hours and the larger number of hours required per acre for that locality. Obviously there is a saving in man labor by using machinery of larger capacity.

TABLE XVIII
COST OF PLOWING, 1913-1917

Locality	Spring plowing				Fall plowing			
	Total acres five years	Hours per acre		Labor cost per acre	Total acres five years	Hours per acre		Labor cost per acre
		Man	Horse			Man	Horse	
Halstad	823.7	2.64	12.39	$1.91	4,847.1	2.84	14.04	$2.00
Cokato	646.3	4.21	10.63	1.92	3,048.0	4.11	12.0	2.07

LABOR COST OF APPLYING MANURE

In the tables on crop costs, only the annual labor cost of applying manure is used. No charge has been made for the use of machinery or the fertilizer value of the manure. This value depends on so many varying factors that no attempt has been made to estimate it for the farms studied. Among these factors are: kind and quality of manure, kind of soil to which applied, condition of soil and crop to which applied, season, amount applied, and the distance hauled. Table XIX shows the hours of man and horse labor required per acre to apply 8 or 9 loads per acre and the labor cost of application. On the year basis, the cost is approximately one fourth the cost of application, as the crop acres were covered once in four years on these farms.

Most of the manure was applied with spreaders of about seventy bushels' capacity.

TABLE XIX
COST OF APPLYING MANURE, 1913-1917

Locality	Period	Acres covered	Hours per acre		Labor cost per acre*	Loads per acre	Distance hauled (rods)	Annual hrs. per acre		Annual cost per acre
			Man	Horse				Man	Horse	
Halstad	5 years	605	9.03	20.88	$3.93	8	40-180	2.25	5.22	$0.98
Cokato	5 years	1,003	11.01	17.27	3.73	9	40-160	2.75	4.32	0.93

*Labor distributed over four years.

LOSSES IN SOIL FERTILITY

The loss in soil fertility caused by the production of crops is not here considered a proper charge in the data prepared. Even granting that there may be a consumption of fertility and plant food, no just and equitable financial basis exists for the proper charging of this loss. On the other hand, if a crop such as clover or any legume increases the nitrogen in the soil, the cost should be decreased by the estimated value of the increase. The soil can not be compared with machinery, horse power, or buildings. These depreciate constantly in spite of the best management, whereas the soil is kept up and often enriched through good management.

THE ACRE AS A BASIS

The cost per acre rather than the yield unit, as bushel or ton, is the basis taken for computing the cost tables on the various crops. The yields vary so much that this basis could be used only with long-time records with representative yields. The largest items of the cost of crops remain practically the same regardless of the yield; for instance, there is little difference between the cost per acre of a 10-bushel crop of wheat and a 20-bushel crop. The cost of seed, cost of plowing, dragging, seeding, cutting, machinery values consumed, and land rental, comprise over three fourths of the total cost of either the 10- or 20-bushel crop of wheat. The cost of twine, threshing, shocking, and stacking varies somewhat with the yield, yet the variation is so slight as to make the cost applicable to ordinary yields. Undoubtedly careful preparation of the soil and management of fertility will increase the yield without proportionately increasing the cost. To a certain point of diminishing returns, a given amount of preparation will usually yield an increase of profit.

In these studies the cost of marketing has been included where data were available. Distance from market, size of load, condition and character of roads, and yield are factors vitally affecting this cost. The cost of marketing should not be ignored and can easily be accurately determined by multiplying the hours in any case by the rates of man and horse labor given in Tables VII and XI. Table XLII presents the cost of marketing grain on the farms studied.

In all the following tables the data represent five years' results in each locality.

COST OF PRODUCTION PER ACRE

The cost tables following include seed, man and horse labor by operations, twine, cash threshing, general expense, values consumed in farm machinery, and land rental.

In figures for all grains except rye, the total cost includes stack- rather than shock-threshing because of the relatively larger acreage stacked in Wright County, altho more grain is usually threshed from the shock in Norman County. The reverse is true for rye, as noted in Table XXIII.

Total acreage in the cost tables means the number of acres on which the statistics for various operations were gathered. The acreage varies for the different operations because of climatic conditions, weeds, and crop diseases. A field of oats may be partly cut for hay, partly shocked and stack-threshed, or, in cases of very poor yield, not cut at all. The cost of plowing and manuring is based on the total acres handled. Each crop is charged for plowing according to the season in which the plowing was done.

Notes appended to each table show the number of times various operations such as harrowing, disking, and cultivating were performed. The hours required and cost per acre for shock-threshing are also given at the foot of the grain tables.

SPRING WHEAT

The average yield of wheat in Minnesota for the ten-year period 1908-1917, according to the Yearbooks of the United States Department of Agriculture, was 13.9 bushels, with an average acre value of $15.01. The average yield per acre and the farm value at Halstad for the five-year period, 1913-1917, was 17.2 bushels valued at $21.67 per acre, and at Cokato, 17.9 bushels valued at $21.76 per acre. This value has allowed a fair margin of profit ranging from $4 to $5 per acre on the farms studied.

TABLE XX
COST OF PRODUCING WHEAT—FALL PLOWED

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	2,869.27	.....	.....	$ 1.80	1,729.32	.....	.....	$1.99
Cleaning seed	2,015.66	0.37	0.01	0.06	1,218.84	0.46	.....	0.06
Treating seed	1,055.09	0.14	.....	0.02	.....	.....	.....	.....
Hauling seed	131.13	0.06	0.11	0.02	.....	.....	.....	.....
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	4,847.14	2.84	14.04	2.00	3,048.03	4.11	12.0	2.07
Disking*	626.43	0.87	3.49	0.53	391.52	1.0	3.6	0.55
Harrowing	2,845.13	0.74	2.85	0.44	1,691.74	0.85	2.39	0.40
Seeding	2,869.27	0.63	2.4	0.37	1,744.11	0.83	2.56	0.41
Cutting	2,732.14	0.82	3.01	0.47	1,765.84	1.01	3.41	0.56
Twine	2,732.14	.....	.....	0.23	1,765.84	.....	.....	0.24
Shocking	2,732.14	1.13	.....	0.25	1,765.84	1.55	.....	0.26
Stacking	707.05	2.83	3.0	0.89	1,178.22	3.71	3.88	1.08
Stack-threshing, labor	690.82	1.57	0.96	0.50	1,178.22	0.96	0.9	0.28
Marketing	880.55	0.72	1.38	0.28	584.76	1.74	3.15	0.64
Threshing, cash cost	690.82	.....	0.69	0.69	1,178.22	.....	.....	0.95
Machinery cost	.....	.....	.....	1.09	.....	.....	.....	1.57
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	2,726.3	.....	.....	0.59	1,751.96	.....	.....	0.86
Totals	.....	13.97	36.47	$15.41	.....	18.97	36.21	$17.85
Shock-threshing, labor	1,750.61	2.44	3.9	$0.91	587.62	2.22	3.88	$0.81

* The seedbed at Halstad was harrowed 2.3 times and disked 1.8 times; at Cokato it was harrowed twice and disked 1.4 times.

Cost statistics indicate that many wheat growers operate on the bare margin of cost with no profit, while others receive only the direct charges with no land rental. A yield of less than 12 bushels per acre, even under present prices, does not allow any profit.

The wheat crop in the Northwest will probably always be the large cash crop and plans should be made to increase the yield per acre on the wheat farms. Rotations with potatoes as the cultivated crop have been used in the Red River Valley with marked increases in the yield of wheat.

OATS

The oat crop is one of the most valuable feeding crops. Its value as a horse feed and for supplementary dairy and hog rations is well known. From a direct profit-making standpoint the yield per acre in Minnesota has not averaged enough to make the crop a paying one. However, from a management standpoint, in the operation of the entire farm it is a profitable crop and few farms can afford a cropping system without oats. This grain ranks among the first as a grass-seeding medium where the crop is fed rather than sold as a cash crop. From a cost-of-production viewpoint, 38 bushels per acre were required on the farms studied to cover the cost during the period 1913-1917.

TABLE XXI
COST OF PRODUCING OATS—FALL PLOWED

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	1,132.24	.....	.....	$1.23	959.09	.....	.....	$1.28
Cleaning seed	907.62	0.69	.....	0.11	595.77	0.58	.....	0.07
Treating seed	23.4	0.17	.....	0.03	.....	.....	.....	.....
Hauling seed	93.55	0.25	0.56	0.08	.....	.....	.....	.....
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	4,847.14	2.84	14.04	2.00	3,048.03	4.11	12.0	2.07
Disking	229.83	0.98	3.94	0.90	231.09	1.07	3.9	0.63
Harrowing*	1,083.21	0.75	2.84	0.46	892.27	0.81	2.19	0.37
Seeding	1,132.24	0.64	2.44	0.39	959.09	0.88	2.62	0.43
Cutting	1,014.04	1.05	3.83	0.62	945.23	1.07	3.36	0.56
Twine	1,014.04	.....	.....	0.24	945.23	.....	.....	0.30
Shocking	1,014.04	1.25	.....	0.29	945.23	1.59	.....	0.26
Stacking	305.64	2.64	2.81	0.87	574.88	3.5	3.65	0.99
Stack-threshing, labor	302.11	1.82	1.06	0.59	574.88	1.3	1.05	0.35
Threshing, cash cost	302.11	.....	.....	1.16	574.88	.....	.....	1.58
Machinery cost	.....	.....	.....	1.09	.....	.....	.....	1.57
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	1,016.4	.....	.....	0.69	941.91	.....	.....	0.88
Totals	.....	15.33	36.74	$15.93	.....	17.66	33.09	$17.27
Shock-threshing, labor	562.63	2.89	4.66	$1.07	373.55	2.92	4.84	$1.06

* The seedbed was harrowed 2.6 times and disked 1.7 times at Halstad, and harrowed twice and disked 1.5 times at Cokato.

BARLEY

Barley is usually a more difficult crop to handle than oats and usually requires more labor to handle properly. Barley threshing requires more time than oats threshing; and marketing as a cash crop, especially at Cokato, brings the labor requirement to 20 man hours per acre. Smaller loads hauled to market at Cokato account for the higher cost of marketing at that point than at Halstad where large grain tanks are used.

Barley is grown on both fall and spring plowing but in order to compare with other crops fall plowing has been used as the basis of plowing cost.

TABLE XXII
COST OF PRODUCING BARLEY—FALL PLOWED

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	1,702.72	.....	.....	$1.18	429.15	.....	.....	1.34
Cleaning seed	1,184.13	0.59	.....	0.09	255.06	0.85	.....	0.11
Treating seed	54.61	0.06	.....	0.01	.....	.....	.....	.....
Hauling seed	89.82	0.11	0.22	0.04	.....	.....	.....	.....
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	4,847.14	2.84	14.04	2.0	3,048.03	4.11	12.0	2.07
Disking	1,204.63	1.09	4.37	0.66	115.82	1.24	4.08	0.65
Harrowing*	1,586.63	0.81	2.96	0.47	416.08	1.01	2.65	0.46
Seeding	1,702.72	0.63	2.42	0.38	429.15	0.96	2.86	0.48
Cutting	1,680.57	0.97	3.51	0.56	428.15	1.11	3.5	0.60
Twine	1,680.57	.....	.....	0.24	428.15	.....	.....	0.29
Shocking	1,680.57	1.19	.....	0.26	428.15	1.52	.....	0.27
Stacking	579.01	2.66	2.86	0.85	279.51	3.51	3.72	1.04
Stack-threshing, labor	579.01	1.53	0.81	0.47	279.51	1.31	1.37	0.40
Marketing	155.92	0.87	1.6	0.36	41.99	2.2	4.24	0.92
Threshing, cash cost	579.01	.....	.....	0.69	279.51	.....	.....	1.12
Machinery cost	.....	.....	.....	1.09	.....	.....	.....	1.57
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	1,686.0	.....	.....	0.66	425.47	.....	.....	1.04
Totals	.....	15.6	38.01	$15.19	.....	20.57	38.74	$18.29
Shock threshing, labor	848.03	2.77	4.42	$1.04	149.64	3.11	5.15	$1.10

* The seedbed was harrowed 2.6 times and disked twice at Halstad, and harrowed twice and disked 1.7 times at Cokato.

RYE

Rye is the only fall grain crop used extensively in Minnesota and it is not grown to any large extent in Wright County. This crop is almost universally shock-threshed.

TABLE XXIII
COST OF PRODUCING RYE—FALL PLOWED

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, three years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	206.02	.....	.....	$1.03	23.84	.....	.....	$0.95
Cleaning seed	189.07	0.38	.....	0.06	9.64	0.42	.....	0.06
Hauling	26.65	0.15	0.3	0.05	.....	.....	.....	.....
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	4,847.14	2.84	14.04	2.00	3,048.03	4.11	12.0	2.07
Disking	89.1	1.1	4.25	0.59	.....	.....	.....	.....
Harrowing*	63.14	0.81	2.74	0.40	14.2	0.78	2.11	0.38
Seeding	206.02	0.83	3.82	0.52	23.84	0.92	2.73	0.44
Cutting	128.8	0.92	3.16	0.49	30.84	1.02	2.53	0.55
Twine	128.8	.....	.....	0.23	30.84	.....	.....	0.29
Shocking	128.8	1.50	.....	0.27	30.84	2.09	.....	0.36
Stacking	.....	.....	.....	.....	30.84	3.6	4.48	1.16
Shock-threshing, labor	78.92	3.69	6.3	1.53	.....	.....	.....	.....
Stack-threshing, labor	.....	.....	.....	.....	30.84	1.12	1.07	0.32
Marketing	10.72	1.07	1.68	0.34	8.22	0.85	1.7	0.33
Threshing, cash cost	69.21	.....	.....	0.96	30.84	.....	.....	1.19
Machinery cost	.....	.....	.....	1.09	.....	.....	.....	1.57
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	128.76	.....	.....	0.54	23.07	.....	.....	1.06
Totals	.....	15.54	41.51	$15.28	.....	17.66	30.94	$16.66

* The seedbed was harrowed 2.4 times and disked twice at Halstad, and was harrowed twice at Cokato.

CORN

Shock corn.—The practice of feeding bundle-corn is becoming more common every year and the economy in labor of handling and feeding the crop in this form is at once apparent to the cattle- or hog-feeder. Table XXIV presents the cost of producing shock corn hauled in from the field. The saving of labor and the roughage are important items.

TABLE XXIV

COST OF PRODUCING CORN—CUT, SHOCKED, AND HAULED FROM FIELD

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	829.76	.....	.....	$0.46	1,129.15	.....	.....	$0.47
Shelling seed	361.19	0.24	.....	0.04	293.05	0.5	.....	0.07
Testing seed	197.49	0.52	.....	0.08	187.49	0.56	.....	0.07
Grading seed	89.56	0.16	.....	0.02	66.89	0.08	.....	0.01
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	823.74	2.64	12.39	1.91	646.28	4.21	10.63	1.92
Disking*	671.94	1.2	4.85	0.72	940.58	1.63	5.87	0.92
Harrowing	817.8	1.02	3.68	0.59	1,167.96	1.51	4.0	0.70
Planting	834.02	0.88	1.78	0.34	1,064.83	1.04	1.9	0.38
Cultivating	805.73	4.94	11.35	2.08	1,154.84	7.56	14.39	2.91
Cutting	693.61	1.61	4.44	0.77	703.23	1.8	3.19	0.91
Shocking	399.92	3.09	.....	0.67	604.33	3.6	.....	0.59
Twine	577.27	.....	.....	0.24	732.86	.....	.....	0.34
Picking up ears	162.59	1.2	1.28	0.33	239.93	2.04	2.05	0.58
Hauling	183.81	3.77	5.53	1.17	258.72	3.99	4.72	1.11
Machinery cost	.....	.....	.....	1.53	.....	.....	.....	2.20
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	908.62	.....	.....	0.91	1,140.71	.....	.....	1.49
Totals	.....	23.52	50.52	$17.04	.....	31.38	53.07	$20.60

* For all field corn crops the seedbed was disked twice, harrowed three times, and cultivated 4.3 times at Halstad; and was disked 2.6 times, harrowed 2.8 times, and cultivated 4.3 times at Cokato.

Ear corn husked from standing stalks.—The labor cost of husking the ears from standing stalks has been computed by using the rates per hour for man and horse labor for October and November. Practically all husking in these sections of Minnesota is done by the farmer and his regular monthly help; labor is therefore charged by the month rather than by the bushel or the day. Farther south, in the corn belt, large ears and efficient huskers would probably cheapen the cost somewhat, altho the larger yields would tend to increase it slightly. No value is here given for the pasturing of an acre of cornstalks.

TABLE XXV

COST OF PRODUCING CORN—EARS HUSKED FROM STANDING STALKS

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	829.76	.....	.....	$0.46	1,129.15	.....	.....	$0.47
Shelling seed	361.19	0.24	.....	0.04	293.05	0.50	.....	0.07
Testing seed	197.49	0.52	.....	0.08	187.49	0.56	.....	0.07
Grading seed	89.56	0.16	.....	0.02	66.89	0.08	.....	0.01
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	823.74	2.64	12.39	1.91	646.28	4.21	10.63	1.92
Disking	671.94	1.20	4.85	0.72	940.58	1.63	5.87	0.92
Harrowing	817.80	1.02	3.68	0.59	1,167.96	1.51	4.00	0.70
Planting	834.02	0.88	1.78	0.34	1,064.83	1.04	1.90	0.38
Cultivating	805.73	4.94	11.35	2.08	1,154.84	7.56	14.39	2.91
Husking	61.79	12.31	16.15	3.57	258.50	13.6	10.72	3.67
Machinery cost	.....	.....	.....	1.53	.....	.....	.....	2.20
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General expense	908.62	.....	.....	0.91	1,140.71	.....	.....	1.49
Totals	.....	26.16	55.42	$17.43	.....	33.44	51.83	$20.74
Marketing	.....	.....	.....	.....	72.24	5.39	10.13	$2.07

Table XXVI presents the cost of producing shock corn husked from the shocks, at Cokato. This practice is not commonly followed, as the hours of labor are increased; the cost is higher, and less of the fodder is consumed after the ears have been removed.

TABLE XXVI

COST OF PRODUCING CORN—CUT, SHOCKED, AND HUSKED FROM SHOCKS, COKATO

Item	Total acreage 5 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	1,129.15	.....	.....	$ 0.47
Shelling seed	293.05	0.5	.....	0.07
Testing seed	187.49	0.56	.....	0.07
Grading seed	66.89	0.08	.....	0.01
Manuring	1,002.81	2.75	4.32	0.93
Plowing	646.28	4.21	10.63	1.92
Disking	940.58	1.63	5.87	0.92
Harrowing	1,167.96	1.51	4.0	0.70
Planting	1,064.83	1.04	1.9	0.38
Cultivating	1,154.84	7.56	14.39	2.91
Cutting	703.23	1.84	5.19	0.91
Shocking	604.33	3.67	.....	0.59
Husking (shocks)	225.68	12.79	3.34	2.59
Twine	732.86	.....	.....	0.34
Machinery cost	.....	.....	.....	2.20
Land rental	.....	.....	.....	5.00
General expense	1,140.71	.....	.....	1.49
Totals	.....	38.14	49.64	$21.50

Shredded corn.—The shredding of corn is largely a past practice. The silo has provided the storing place for a feed that surpasses shredded corn, and silage has largely supplanted the corn in shredded form. Labor is increased by the shredding operation and it is doubtful if it is a paying method of caring for the corn crop under present conditions.

TABLE XXVII
COST OF PRODUCING CORN—CUT, SHOCKED, AND SHREDDED, COKATO

Item	Total acreage 5 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	1,129.15			$0.47
Shelling seed	293.05	0.5		0.07
Testing seed	187.49	0.56		0.07
Grading seed	66.89	0.08		0.01
Manuring	1,002.81	2.75	4.32	0.93
Plowing	646.28	4.21	10.63	1.92
Disking	940.58	1.63	5.87	0.92
Harrowing	1,167.96	1.51	4.0	0.70
Planting	1,064.83	1.04	1.9	0.38
Cultivating	1,154.84	7.56	14.39	2.91
Cutting	703.23	1.84	5.19	0.91
Shocking	604.33	3.67		0.59
Twine	732.86			0.34
Picking up ears	239.93	2.04	2.05	0.58
Shredding	96.5	9.86	12.92	2.76
Machinery cost				2.20
Land rental				5.00
General expense	1,140.71			1.49
Totals		37.25	61.27	$22.25

Fodder corn.—During the last few years corn has become quite popular as a forage crop because of the high yield per acre and comparatively high feeding value. Professor T. L. Haecker, of this Station, places the feeding value of a ton of field and fodder corn at $6.01, as compared with bran at $20. The crop has no value until it is hauled to the barn or feed lot, which operation costs from $1 to $3 per acre, depending on length of haul, condition of soil, ease of hauling, and other conditions.

TABLE XXVIII
COST OF PRODUCING FODDER CORN PLANTED THICKLY FOR FORAGE—CUT, SHOCKED AND HAULED

Item	Halstad				Cokato			
	Total acreage, four years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, three years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	227.21			$0.89	82.67			$0.82
Shelling seed	3.16	0.32		0.04	2.39	0.42		0.06
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	823.74	2.64	12.39	1.91	646.28	4.21	10.63	1.92
Disking*	184.69	1.39	5.57	0.95	16.18	1.42	4.27	0.70
Harrowing	182.5	1.01	3.34	0.64	67.11	1.21	3.49	0.58
Planting	228.51	0.89	2.0	0.40	60.66	0.79	1.58	0.30
Cultivating	208.23	3.63	8.03	1.64	61.13	5.59	10.67	2.15
Cutting	222.7	1.87	5.31	1.02	34.92	1.8	5.41	0.90
Shocking	140.11	4.54		1.02	13.04	2.84		0.48
Hauling in	46.88	4.22	5.82	1.31	27.53	4.45	7.85	1.70
Twine	173.02			0.48	76.74			0.38
Machinery cost				1.53				2.20
Land rental				4.20				5.00
General expense	76.64			0.62	1,140.71			1.49
Totals		22.76	47.68	$17.63		25.48	48.22	$19.61

*The seedbed was disked twice, harrowed 3 times, and cultivated 3 times at Halstad; and disked 1.5 times, harrowed 2.7 times, and cultivated 4.5 times at Cokato.

Silage.—With the growth of the cattle industry, corn silage has become very popular as a feed for dairy cows. The large increase in the number of silos throughout the corn belt testifies that not only

is it considered valuable for dairy stock but also for beef cattle and sheep. In intensive farming, where each acre of tillable land is made to produce the maximum of feed in demand for livestock production, silage is especially valuable. In supplementing and in actually replacing green summer pasture it has no equal. The convenience in feeding the corn crop in silage form is an important consideration, for the corn is stored in considerable quantity in a place convenient for handling in any kind of weather. The adaptability of the crop to different kinds of livestock and for various systems of feeding makes it of special value on the diversified stock farm. The large yield per acre, the saving of the entire corn crop, and the palatability of the silage ration are other factors in its popularity.

Silage is not a particularly cheap crop in itself but its effect on the other parts of a ration make it an invaluable feed. At Halstad, with a yield of 5 tons per acre the cost per ton amounted to $4.14. At Cokato the yield was 6.9 tons per acre, produced at a cost of $3.70 per ton. Based on its feeding value, it has been calculated to be worth $2.93 per ton compared to bran at $20 per ton.[3]

TABLE XXIX
COST OF PRODUCING CORN SILAGE

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	227.21	.....	.....	$0.89	82.67	.....	.....	$0.82
Shelling seed	3.16	0.32	.....	0.04	2.39	0.42	.....	0.06
Manuring	604.89	2.25	5.22	0.98	1,002.81	2.75	4.32	0.93
Plowing	823.74	2.64	12.39	1.91	646.28	4.21	10.63	1.92
Disking*	184.69	1.39	5.57	0.95	16.18	1.42	4.27	0.70
Harrowing	182.5	1.01	3.34	0.64	67.11	1.21	3.49	0.58
Planting	228.51	0.89	2.0	0.40	60.66	0.79	1.58	0.30
Cultivating	208.23	3.63	8.03	1.64	61.13	5.59	10.67	2.15
Cutting	222.7	1.87	5.31	1.02	34.92	1.8	5.41	0.90
Twine	173.02	.....	.....	0.48	76.74	.....	.....	0.38
Filling silo	64.81	8.29	10.92	4.09	100.17	12.52	14.92	4.19
Coal	.....	.....	.....	.....	33.62	.....	.....	0.98
Rental, power machinery	.....	.....	.....	.....	47.08	.....	.....	1.16
General expense	64.81	.....	.....	0.74	88.25	.....	.....	1.50
Farm machinery and ensilage cutter	.....	.....	.....	2.71	.....	.....	.....	3.80
Land rent	.....	.....	.....	4.20	.....	.....	.....	5.00
Totals	.....	22.29	52.78	$20.69	.....	30.71	55.29	$25.37

* The seedbed was disked twice, harrowed 3.2 times, and cultivated 3 times at Halstad; and disked 1.5 times, harrowed 2.7 times, and cultivated 4.4 times at Cokato.

POTATOES

Potatoes, as a cash crop, are particularly adaptable to northern Minnesota. They are a good substitute for corn in the rotations in that region and the soil seems to be excellent for potato production. On small farms this crop readily and profitably supplements the dairy

[3] Haecker, T. L. Feeding dairy cows, Minnesota Farmers' Library, Bull. No. 12 (out of print).

business in the form of a cash crop marketed during the season when a cash income is especially useful. Table XXX presents the cost at Halstad where machine production of potatoes is becoming the common practice. For one or two acres with more hand labor and small machines the cost will be higher than shown in Table XXX.

TABLE XXX
COST OF PRODUCING POTATOES, HALSTAD

Item	Total acreage 5 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	442.61	.....	.....	$11.60
Manuring	604.89	2.25	5.22	0.98
Plowing	823.74	2.64	12.39	1.91
Disking*	318.59	1.52	6.12	1.07
Harrowing	442.61	1.33	5.07	0.85
Sorting seed	98.06	1.59	.....	0.28
Cutting	435.45	6.4	.....	1.03
Treating	91.6	0.87	.....	0.13
Hauling seed	29.86	1.01	0.87	0.26
Planting	442.61	2.86	4.97	1.07
Cultivating	442.61	6.73	14.0	2.93
Weeding	96.94	0.62	1.25	0.23
Spraying	441.35	1.04	1.75	0.37
Digging	427.14	3.3	10.22	1.86
Picking up	105.75	5.73	.....	1.20
Picking and hauling	113.94	6.26	6.49	2.07
Sorting	28.11	2.74	.....	0.47
Marketing	289.45	7.19	9.74	2.82
Spray material	348.06	.....	.....	0.69
Picking, cash	231.7	.....	.....	5.37
Machinery cost	.....	.....	.....	2.43
General expense	454.57	.....	.....	1.55
Land rental	.....	.....	.....	4.20
Totals	.....	54.08	78.09	$45.37
Weeding, hand	106.74	3.55	.....	$0.57
Hoeing	58.99	3.83	.....	0.73
Hilling	79.25	1.29	2.44	0.47

* The seedbed was disked 2.5 times, harrowed 3 times, cultivated 4.5 times, and weeded once.

FLAXSEED

Flax is usually sown on sod land, especially on new soil, in which case the cost is greater than that given in Table XXXI. Breaking the new sod and preparing the seedbed increase the cost at least $2 per acre.

Practically no flax was raised on the Halstad farms during the period 1913-1917, altho this locality produced a large acreage in former years.[4] Flax is often threshed from the windrow when the weather is dry and threshing machines are readily available, with a consequent saving of from $1 to $2 per acre in the cost of production. The acreage of the crop handled in this way is too small to be of value in table form.

Binding the flax crop is uncommon because it not only increases the cost of production but often delays threshing on account of the slow drying of the tightly bound bundles. It is very doubtful if the flax crop is important on the older settled farms, because of the de-

[4] Minn. Bull. 117 and 145.

teriorating effect on the soil, and the better yields and higher feeding value of other crops. In new sections, however, the flax as a cash crop is often more valuable than other crops. Table XXXI presents the cost of producing flax at Cokato.

TABLE XXXI
COST OF PRODUCING FLAX—FALL PLOWED, COKATO

Item	Total acreage 2 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	45.33	.....	.....	$0.84
Cleaning seed	1.96	0.51	.....	0.07
Manuring	1,002.81	2.75	4.32	0.93
Plowing	3,048.03	4.11	12.0	2.07
Disking*	36.86	1.45	5.14	0.76
Dragging	45.33	0.93	2.11	0.36
Seeding	45.33	0.9	2.66	0.41
Cutting	32.05	1.76	5.3	0.81
Shocking	25.53	2.59	.....	0.39
Twine	32.05	.....	5.36	0.21
Stacking	23.52	5.72	1.36	1.46
Stack-threshing labor	23.52	2.45	1.31	0.56
Marketing	28.31	0.65	.....	1.05
Threshing, cash cost	23.52	.....	.....	1.57
Machinery cost	.....	.....	.....	1.57
Land rental	.....	.....	.....	5.00
General expense	45.94	.....	.....	0.93
Totals	.....	23.82	39.56	$18.99

* The seedbed was disked twice and harrowed twice.

HAY

TABLE XXXII
COST OF PRODUCING HAY—TIMOTHY AND CLOVER

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, four years	Man hours per acre	Horse hours per acre	Cost per acre
				First Crop				
Seed	.....	.....	.....	$0.50	.....	.....	.....	$0.75
Mowing	1,169.5	1.46	2.63	0.54	1,261.04	1.67	3.27	0.69
Raking	1,136.94	0.85	1.62	0.32	1,203.08	0.72	1.4	0.30
Tedding	26.8	0.34	0.67	0.12	179.04	1.0	1.85	0.40
Cocking	378.89	0.86	.....	0.14	.....	.....	.....	.....
Bunching	17.31	0.29	0.23	0.08	309.81	3.02	.....	0.51
Spreading	90.46	1.47	.....	0.25	84.65	2.19	.....	0.37
Hauling	835.78	4.69	5.11	1.37	626.05	7.3	7.3	2.19
Machinery cost	.....	.....	.....	1.31	.....	.....	.....	1.61
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
General Expense	1,169.5	.....	.....	0.77	1,261.04	.....	.....	0.91
Totals	.....	9.96	10.26	$9.60	.....	15.9	13.82	$12.73
Bucking	16.58	2.47	3.38	$0.80	.....	.....	.....	.....
Stacking	327.26	3.73	3.56	1.11	612.83	6.89	6.5	$2.00
				Second Crop				
Mowing	69.19	1.08	2.15	0.42	451.09	1.34	2.65	0.55
Raking	69.19	0.56	1.11	0.22	430.09	0.8	1.53	0.32
Cocking	61.19	0.78	.....	0.13	57.82	2.05	.....	0.34
Spreading	12.5	0.96	.....	0.20	17.5	1.97	.....	0.30
Hauling	38.96	3.0	3.47	0.96	244.33	3.94	4.1	1.17
General Expense	69.19	.....	.....	0.53	451.09	.....	.....	0.59
Totals	.....	6.38	6.73	$2.46	.....	10.1	8.28	$3.27
Totals, two cuttings	.....	16.34	16.99	$12.06	.....	26.0	22.1	$16.00
Stacking	15.23	4.92	4.33	$1.29	184.95	4.21	4.15	$1.20

Timothy and clover.—The hay crop is the cheapest of all crops to produce and is one of the most valuable in Minnesota. Sowing with a grain crop and cutting twice decreases the cost and increases the total value. The cutting of the second crop for hay adds from $2 to $3 to the cost per acre. The value of the seed was determined as follows: 7 pounds of timothy at 7 cents a pound, and 5 pounds of clover at 20 cents a pound, were seeded per acre, making the acre seed cost $1.49. Allowing for three years of grass at Halstad makes the annual seed cost 50 cents per acre and with two years of grass at Cokato the seed cost per year is 75 cents per acre.

TABLE XXXIII
COST OF PRODUCING ALFALFA HAY*

Item	Halstad				Cokato			
	Total acreage, five years	Man hours per acre	Horse hours per acre	Cost per acre	Total acreage, four years	Man hours per acre	Horse hours per acre	Cost per acre
Seeding cost (previous year ¼, with nurse crop)	.....	.....	.....	$2.09	.....	.....	.....	$2.06
				First Cutting				
Mowing	184.84	1.04	2.08	0.46	70.24	1.58	3.16	0.66
Raking	174.03	0.61	1.19	0.26	69.74	0.76	1.41	0.29
Cocking	128.04	2.59	.....	0.44	74.58	3.75	1.16	0.80
Spreading	14.37	1.78	.....	0.27	26.17	2.39	.....	0.41
Hauling	145.78	2.82	2.8	0.87	60.56	5.33	5.61	1.62
General expense	184.84	.....	.....	0.32	70.24	.....	.....	0.99
Machinery	.....	.....	.....	1.31	.....	.....	.....	1.61
Land rental	.....	.....	.....	4.20	.....	.....	.....	5.00
Totals	.....	8.84	6.07	$8.13	.....	13.81	11.34	$11.38
Stacking	30.70	4.72	3.94	1.36	9.68	2.48	3.31	$0.78
				Second Cutting				
Mowing	160.02	1.13	2.26	0.49	68.08	1.43	2.82	0.61
Raking	133.68	0.66	1.35	0.28	62.57	0.69	1.33	0.28
Cocking	97.98	1.99	.....	0.37	.....	.....	.....	.....
Spreading	28.18	1.83	.....	0.36	34.46	2.67	.....	0.45
Hauling	97.96	3.00	2.54	0.89	51.9	3.89	3.91	1.16
General expense	160.02	.....	.....	0.28	68.08	.....	.....	0.60
Totals	.....	8.61	6.15	$2.67	.....	8.68	8.06	$3.10
Stacking	51.95	4.48	4.21	1.34	16.18	3.83	6.3	$1.50
				Third Cutting				
Mowing	48.82	1.15	2.27	0.46	47.57	1.52	3.05	0.66
Raking	48.82	0.66	1.31	0.25	47.57	0.76	1.51	0.33
Cocking	31.04	1.6	.....	0.31	17.78	1.74	.....	0.33
Spreading	6.24	1.84	.....	0.37	.....	.....	.....	.....
Hauling	37.87	3.72	3.46	1.07	41.89	2.2	2.34	0.69
General expense	48.82	.....	.....	0.33	47.57	.....	.....	0.46
Totals	.....	8.97	7.04	$2.79	.....	6.22	6.9	$2.47
Stacking	9.97	4.51	4.41	$1.17	5.68	2.82	2.82	$0.86
Total cost of seeding and 3 cuttings	.....	26.42	19.26	$15.68	.....	28.71	26.3	$19.01

* If Alfalfa is seeded without a nurse crop and no crop is grown on the land the year of seeding, the alfalfa should be charged with preparation of the land and rental for that year.

Alfalfa hay.—The value of alfalfa from a feeding standpoint is well known. It provides a maximum amount of nutriment per acre

for the hours of labor required. A yield of three tons has been considered equal to ten tons of good quality corn silage while it costs about two thirds as much to produce. In charging the seed cost in Table XXXIII it has been assumed that the crop will last four years. The average yield on the farms studied was 2 tons per acre at Halstad, giving a cost of $7.80 per ton; and 3.3 tons at Cokato, produced at a cost of $5.80 per ton.

There is usually a wide margin between cost and cash or feeding value of alfalfa. The competition with corn for man and horse labor limits its production, however, in the corn belt.

Millet.—Millet is considered here only as a forage crop altho the cost of production is more nearly that of small grains than of the common grass crops.

The yield is often higher than that of good mixed or clover hay and the cost much higher. It should be used in Minnesota more as a catch crop than as a regular forage crop. No millet was grown at Cokato.

TABLE XXXIV
COST OF PRODUCING MILLET HAY, HALSTAD

	Total acreage 4 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	63.79	.....	.....	$0.75
Manuring	604.89	2.25	5.22	0.98
Plowing	823.74	2.64	12.39	1.91
Harrowing*	60.99	0.92	3.46	0.58
Disking	17.49	1.54	6.18	0.95
Seeding	63.79	0.68	2.73	0.43
Mowing	60.99	1.41	2.82	0.63
Raking	50.64	0.89	1.78	0.41
Cocking	37.32	2.65	.....	0.59
Hauling	22.56	10.73	10.64	3.43
Machinery cost	.....	.....	.....	1.36
Land rental	.....	.....	.....	4.20
General expense	60.99	.....	.....	1.12
Totals	.....	23.71	45.22	$17.34
Stacking	34.02	4.04	4.03	$1.45

* The seedbed was harrowed 2.5 times and disked 2.6 times.

TABLE XXXV
COST OF PRODUCING WILD HAY, HALSTAD

	Total acreage 3 years	Man hours per acre	Horse hours per acre	Cost per acre
Mowing	127.34	1.41	2.8	$0.60
Raking	127.34	0.7	1.39	0.31
Hauling	90.89	4.47	5.48	1.53
Machinery	.....	.....	.....	1.31
Land rental	.....	.....	.....	4.20
General expense	.....	.....	.....	0.72
Totals	.....	6.58	9.67	$8.67
Stacking	36.45	4.72	4.83	$1.55

Wild hay.—Wild hay is usually grown in low, undrained areas. An appreciable amount of land in such areas causes a loss in farm

profits, for tame hay not only yields more but can be included in the rotation, thereby improving the productivity of the soil. The land having all been valued at an average price, the wild-hay land must stand the same rental charge as the improved land. The data on wild hay at Cokato were too indefinite to permit tabulation.

Timothy, cut for seed.—With yields of more than five bushels per acre, timothy seed pays fairly well. The selling price is rarely more than five cents per pound but this price with a good yield allows a good profit.

TABLE XXXVI
COST OF PRODUCING TIMOTHY—CUT FOR SEED, HALSTAD

	Total acreage 4 years	Man hours per acre	Horse hours per acre	Cost per acre
Seed	.....	.....	.....	$0.15
Cutting	37.47	0.91	3.26	0.50
Twine	37.47	.....	.....	0.12
Shocking	37.47	1.01	.....	0.24
Stacking	19.53	0.64	0.72	0.17
Stack threshing labor	19.53	0.51	0.46	0.16
Threshing, cash cost	19.53	.....	.....	0.54
Cleaning seed	5.21	1.54	.....	0.26
Machinery cost	.....	.....	.....	0.69
Land rental	.....	.....	.....	4.20
General expense	37.47	.....	.....	0.51
Totals	.....	4.61	4.44	$7.54
Shock-threshing labor	17.94	3.23	3.57	$0.96

Clover cut for seed.—The second crop of clover, cut for seed, provides a good profit when yields of more than two bushels per acre are obtained. In recent years high prices have encouraged the marketing of clover seed. There is seldom a charge for the preparation or care of the soil during the season, as the seed is usually sown with a grain crop.

TABLE XXXVII
COST OF PRODUCING CLOVER—CUT FOR SEED, HALSTAD

	Total acreage 3 years	Man hours per acre	Horse hours per acre	Cost per acre
Cutting	21.84	1.95	5.78	$0.96
Twine	19.84	.....	.....	0.26
Shocking	19.84	1.61	.....	0.24
Threshing, labor	21.84	4.21	3.02	1.27
Threshing, cash	21.84	.....	.....	1.31
Cleaning seed	11.84	1.14	.....	0.18
Machinery cost	.....	.....	.....	0.69
Land rental	.....	.....	.....	4.20
General expense	21.84	.....	.....	0.50
Totals	.....	8.91	8.72	$9.61

FIELD CROP SUMMARY

Table XXXVIII presents the summary of the cost per acre of the various crops in each locality and the average of all farms.

TABLE XXXVIII

AVERAGE ANNUAL COST PER ACRE (INCLUDING LAND RENTAL) OF FIELD CROPS

Crop	Table No.	Halstad	Cokato	Average all farms
Wheat, fall-plowed, stack-threshed	XX	$15.41	$17.85	$16.33
Oats, fall-plowed, stack-threshed	XXI	15.93	17.27	16.54
Barley, fall-plowed, stack-threshed	XXII	15.19	18.29	15.81
Rye, fall-plowed, shock-threshed	XXIII	15.28	.....	15.28
Rye, fall-plowed, stack-threshed	XXIII	.....	16.66	16.66
Corn, cut, shocked, and hauled from field	XXIV	17.04	20.60	19.03
Corn, husked from standing stalks	XXV	17.43	20.74	19.28
Corn, cut, shocked and husked from shocks	XXVI	.....	21.50	21.50
Corn, cut, shocked, and shredded	XXVII	.....	22.25	22.25
Fodder-corn, cut, shocked, and hauled	XXVIII	17.63	19.61	18.04
Silage, siloed	XXIX	20.69	25.37	23.53
Potatoes, machine production	XXX	45.37	.....	45.37
Flax-seed, stack-threshed	XXXI	.....	18.99	18.99
Hay, clover and timothy, first crop	XXXII	9.60	12.73	11.22
Hay, alfalfa, three cuttings	XXXIII	15.68	19.01	16.59
Hay, millet	XXXIV	17.34	.....	17.34
Hay, wild	XXXV	8.67	.....	8.67
Timothy seed	XXXVI	7.54	.....	7.54
Clover seed	XXXVII	9.61	.....	9.61

COMPARISON WITH PREVIOUS FIVE-YEAR PERIOD

It is of interest to compare the cost of the two five-year periods, 1908-1912 and 1913-1917. The figures were not collected in the same localities except at Halstad where practically the same farms continued the investigation. It is believed, however, that the increase in cost, which averages about thirty per cent for all crops, is typical of the prevailing trend for the two periods. Labor, seed, land rent, twine, and general expense have all increased during the last five years and the figures shown in Table XXXIX are significant of that increase.

TABLE XXXIX

COST PER ACRE OF FIELD CROPS, 1913-1917
COMPARED WITH PREVIOUS FIVE-YEAR PERIOD, 1908-1912

Crop	Cost per Acre		Increase per acre over 1908-12	Percentage increase
	1913-1917	1908-1912*		
Wheat, fall-plowed, stack-threshed	$16.33	$11.68	$4.65	40.0
Oats, fall-plowed, stack-threshed	16.54	12.92	3.62	28.0
Barley, fall-plowed, stack-threshed	15.81	12.06	3.75	31.0
Rye, fall-plowed, shock-threshed	15.28	11.73	3.55	30.5
Corn, cut, shocked, and hauled from field	19.03	15.65	3.38	21.5
Corn, husked from standing stalks	19.28	15.42	3.86	25.0
Corn, cut, shocked, and husked from shocks	21.50	18.60	2.90	15.5
Corn, cut, shocked, and shredded	22.25	17.85	4.40	24.5
Fodder corn, cut, shocked and hauled	18.04	15.74	2.30	14.5
Silage, siloed	23.53	20.39	3.14	15.5
Potatoes, machine production	45.37	33.08	12.29	37.0
Hay, clover and timothy, first crop	11.22	7.51	3.71	49.0
Hay, millet	17.34	13.38	3.96	29.5
Hay, wild	8.67	7.30	1.37	18.7
Timothy seed	7.54	6.80	0.74	11.0
Clover seed	9.61	8.35	1.26	15.0

*The 1908-1912 cost has been increased to include manuring cost so as to be comparable with the 1913-1917 cost.

To bring the comparison of cost down to the same farms and to single years, the cost per acre of crops at Halstad for 1912 is compared with the cost for 1917. Table XL shows this comparison, with the increase in percentages of the principal crops.

TABLE XL

COMPARISON OF COST PER ACRE FOR 1912 AND 1917, HALSTAD

Crop	Cost per acre		Percentage increase 1917 over 1912
	1912	1917	
Wheat, fall-plowed, stack-threshed	$11.59	$17.81	53
Corn, cut, shocked, and hauled	15.22	18.02	18
Corn, husked from standing stalks	15.00	19.62	31
Fodder corn, cut and shocked in field	14.19	17.15	21
Fodder corn, cut, shocked, and hauled	15.85	18.84	19
Silage, siloed	18.92	21.01	11
Oats, fall-plowed, stack-threshed	11.45	17.63	54
Barley, fall-plowed, stack-threshed	13.47	16.66	24
Rye, fall-plowed, stack-threshed	11.17	16.08	44
Hay, clover and timothy, first crop	6.37	9.81	54

The average increase for all crops is approximately thirty per cent, similar to the comparison of the two five-year periods.

The greatest increase is in wheat, oats, and hay. The manuring cost is included in the figures for both years.

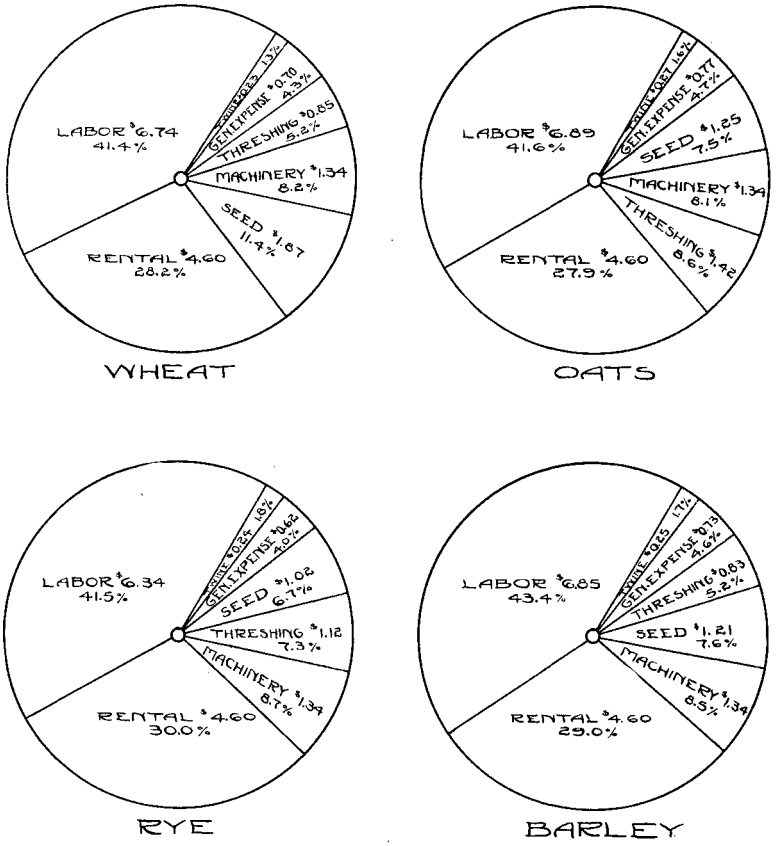

Fig. 3. Distribution of Cost per Acre, in Dollars and Percentages, of Grain Crops, 1913-1917

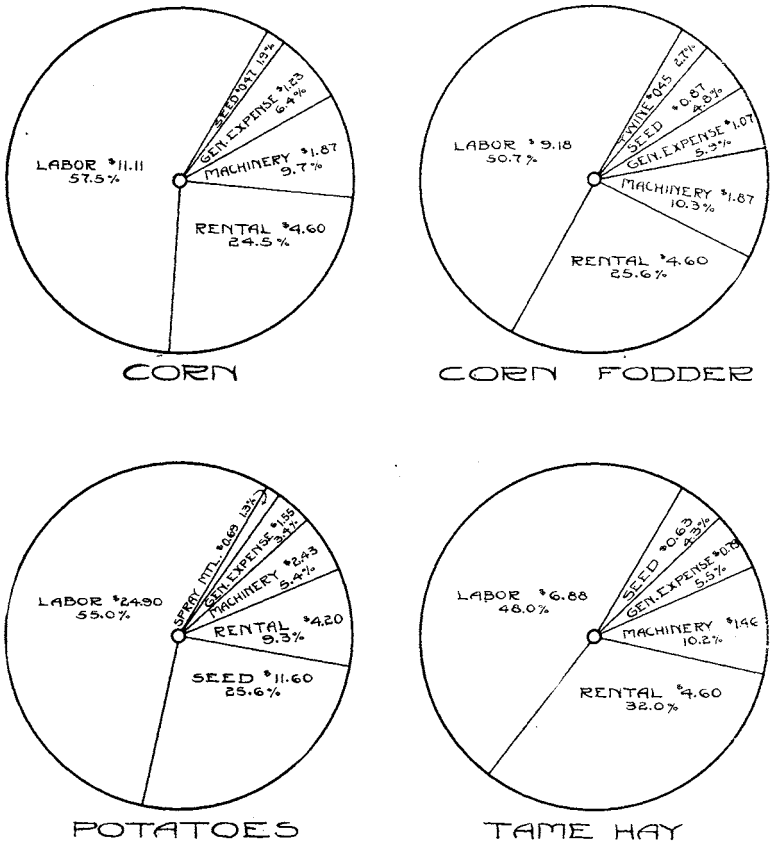

Fig. 4. Distribution of Cost per Acre, in Dollars and Percentages, of Field **Crops, 1913-1917**

YIELD NECESSARY TO COVER COST

TABLE XLI

YIELD PER ACRE NECESSARY TO COVER COST OF PRODUCTION, 1913-1917

Crop	Average cost per acre	Average farm price Dec. 1, 1913-1917	Required yield per acre to cover cost	Average state yields 1913-1917
		Per bu.	Bu.	Bu.
Wheat, fall-plowed	$16.33	$1.26	13.0	13.7
Oats, fall-plowed	16.54	0.43	38.3	34.4
Barley, fall-plowed	15.81	0.70	21.6	24.7
Rye, shock-threshed	15.28	1.02	15.0	18.1
Flax, stack-threshed	18.99	1.92	9.9	9.3
Corn, husked	19.28	0.71	27.2	32.3
Potatoes, machine production	45.37	0.69	65.6	100.0
		Per Ton	Tons	Tons
Hay, timothy and clover (first cutting)	11.22	7.64	1.4	1.8

Table XLI shows the amount of product necessary to equal the cost of production at the prices indicated. The average cost of production per acre is based on the total acreage and costs at Halstad and

Cokato for the years 1913-1917. Prices are extremely variable while the cost remains fairly constant, therefore a low price would require a larger yield of product and a high price a lower yield than here indicated. The average state yields per acre are also given to show the margin in yield above and below the estimated cost for the same period.

COST OF MARKETING GRAIN

The labor cost of hauling wheat, barley, and corn to market for the years 1913-1917 on the farms studied is presented in Table XLII, and for a haul of from three to four miles amounts to about 2.5 cents a bushel for wheat, 2 cents for barley, and 5.3 cents for corn. For small grain this is about 20 cents per ton mile, while for corn the cost is double this because of the time required to handle it per load and the smaller sized loads.

TABLE XLII
COST OF MARKETING GRAIN PER BUSHEL, 1913-1917

Crop	Bushels	Man hours	Horse hours	Labor cost per bushel	Average distance hauled	Labor cost per ton mile
				Cents	Miles	Cents
Wheat	25,613	1,651	3,057	2.4	4	20
Barley	5,049	228	428	1.9	3	21
Corn	2,825	389	732	5.3	4	47