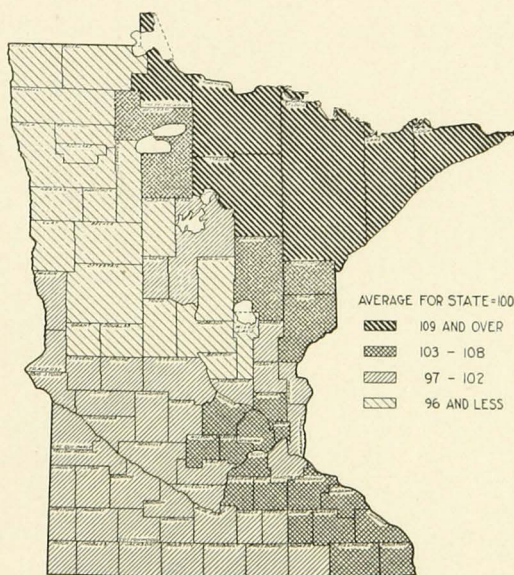


UNIVERSITY OF MINNESOTA
AGRICULTURAL EXPERIMENT STATION

LOCAL PRICES OF FARM CROPS IN MINNESOTA

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DIVISION OF AGRICULTURAL ECONOMICS



Relative Prices Received by Farmers for Seven Crops
in Minnesota, 1925 to 1929

UNIVERSITY FARM, ST. PAUL

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LOCAL PRICES OF FARM CROPS IN MINNESOTA

L. F. GAREY¹

INTRODUCTION

Most studies made of prices of farm commodities have dealt with the variations from year to year in a given market or area, and with factors responsible for the variations. Few studies have been made that dealt with variations in producers' prices in different localities. This bulletin deals with the latter type of study and is limited to the state of Minnesota.

The prices paid to farmers in Minnesota for a given product vary throughout the state. The variation in prices is characteristic with non-perishable as well as perishable commodities, and is of economic importance to the producer. It is the fundamental factor operative in the adjustment of agricultural production.

The prices for given commodities tend to group themselves into zone-like areas, indicating that there are certain factors common to all commodities that account for at least a part of the variation in the prices received by farmers. These factors have the same general effect on local prices, whether the corresponding price zones for the various commodities are in the same geographic location in the state or not.

The factors that appear to be common to all commodities in causing local variation in prices are the conditions governing production, quality of the product produced, and transportation costs.

Natural conditions that are most favorable for the production of a commodity usually result in a supply larger than is required for local needs. This has a tendency to lower the price in the heavy surplus-producing areas as compared with prices in other areas. Favorable conditions for its production may result in a commodity of high quality. For example, southwestern Minnesota is well suited to beef production and it produces a supply in excess of local needs. Cheap corn makes it possible, also, to produce a high quality of beef which more than offsets the disadvantage of long distance from market. Certain localities with a surplus have a high yearly price because of favorable outlets at seasons of heaviest production. This is particularly true in regions where summer resorts are numerous.

The surplus of feed crops in an area may be measured by the relationship of volume of feed crops to the amount of livestock. For most

¹ Acknowledgment is made to Dr. W. C. Waite and Dr. R. W. Cox for suggestions in the development of the manuscript.

feed crops, this involves only one or two kinds of livestock. The relationship of the amount of corn grown for grain to the number of hogs and beef cattle is a satisfactory measure of the surplus of corn. The relationship of oats to horses is a measure of the surplus of oats. The percentage of the crop shipped out of the county where grown is a convenient measure of the surplus of a particular crop and is applicable to both feed and cash crops. Both of these measures of surplus have been used in this analysis.

Differences in the quality of a product are responsible for some of the variation in local prices. Definite measures of quality in local production are generally lacking. Studies on quality, thus far, have dealt mostly with physical characteristics such as size, color, and smoothness. Statistical measurements of such factors are difficult to obtain. Local facilities for determining the quality of a product at the place of production are limited, and such differences in price as the producer might be entitled to receive are, therefore, often lost. Many differences in quality which are evident from year to year do not appear when a period of years is considered.

Transportation costs, which consist mostly of freight charges, are important in causing differences in local prices but sometimes are obscured in a measure by the operation of other forces. Any large metropolitan area, like the Twin Cities, serves as a receiving, processing, and consuming center. A large part of the agricultural production in this state finds an outlet through the Twin Cities in one of the ways mentioned, and the production areas that are farthest away have to bear the highest transportation cost when disposing of their surplus. It is difficult to determine the exact proportion of the production that goes to these centers or the locality from which it comes. Processing commodities into a more concentrated form, as is done in mills and packing plants, makes it possible for such commodities to bear higher transportation charges than they otherwise would. This makes the problem of price comparison with localities that do no processing more complex in considering the distance to the central market. In the main, the price received by the producer is relatively low with high freight charges and high with low freight charges.

The average distance by rail from shipping points within a county to Minneapolis and St. Paul has been used to indicate the freight charges from various localities in the state.

This study deals with the seven principal crops grown in Minnesota and covers the five crop-years from 1925 to 1929. A five-year period eliminates year-to-year differences in production and quality, leaving only the more permanent factors as a basis for analyzing differences in prices.

Prices for the same commodities have been assembled for the five-year crop period 1910 to 1915, and charts are presented to show the changes that have taken place. The changes in the prices of the various commodities are discussed under their respective heads.

The monthly prices used are those reported by farmers and others and represent the amounts received for the commodities on the fifteenth of each month.

THE PRICE OF CORN

The local market price of corn for the five-year period from November 1925 to October 1930, in the state, ranged from 61 cents per bushel in Bigstone County to 85 cents in St. Louis County, a variation of nearly 39 per cent. It was generally highest in the eastern part of the state and lowest in the west central and southwestern parts. The price of corn in the northwestern part of the state was neither high nor low when compared with other parts of the state.

In sections where a large amount of corn was raised, the price from county to county varied only one to three cents a bushel, but where a small amount was raised the variation in prices was much greater. This large variation may have been the result of some local condition or of differences in quality. As a rule quotations within the county did not vary greatly.

Figures 1 and 2 show the prices of corn in the state for the two five-year periods, November 1910 to October 1915 and November 1925 to October 1930. The price was lower in the earlier period, about 20 cents per bushel lower in the high-priced areas and 15 cents lower in the low-priced areas. In both periods the high-priced areas were in the same geographic location in the state, but the low-priced area in the south-central part of the state in the earlier period had moved southwestward 15 years later. The price in the northwestern part of the state increased less during this time than in any other part, the increase being greatest in the northeast and southwest. (See Table 1.)

Table 1
Changes in Local Prices of Corn in Different Parts of the State Between the Five-Year Periods, November 1910 to October 1915 and November 1925 to October 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
November 1910–October 1915.....	59	59	56	52
November 1925–October 1930.....	78	70	78	67
Difference	19	11	15	22

The smaller increase in the northwestern part of the state was partly due to an increase in the use of barley as a feed crop. The feeding value of barley to hogs and cattle for fattening purposes is nearly equal to that of corn, and its increased use has lessened the relative demand for corn in this part of the state. Another important reason for the smaller increase was an increase in freight rates, which lowers prices most in sections farthest from market.

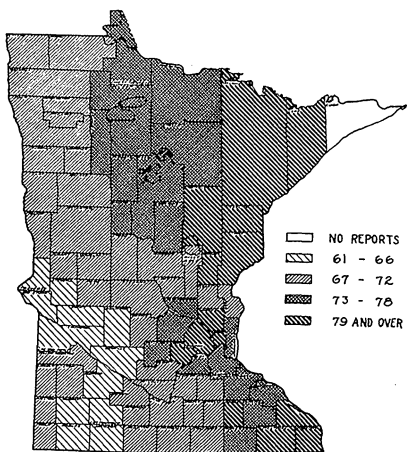


Fig. 1. Price of Corn for the Five-Year Period, November 1925 to October 1930

Note the low price which prevailed in the heavy surplus-producing area in the southwestern part of the state.

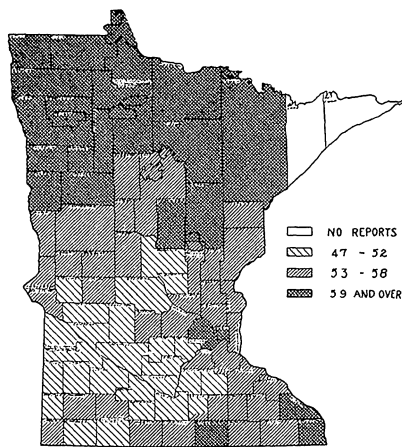


Fig. 2. Price of Corn for the Five-Year Period, November 1910 to October 1915

The low-priced area was much larger than in Fig. 1.

Corn production.--In the southwestern part of the state the soil, temperature, and rainfall are all favorable to corn production. Where these factors are unfavorable, corn is not grown to any extent.

Where conditions permit successful corn production, the crop is the enterprise around which the farm business is organized. Other crops and the livestock enterprises are adjusted so as to fit into the scheme of production. While corn is grown primarily for feeding purposes, a part of the crop is sold in certain localities. With the improvement in machinery for handling the crop and the increase in the practice of hogging-off, the labor problem has been partially solved.

The acreage of corn in the state increased 140 per cent between 1910 and 1931, while the number of all livestock increased only 65 per cent. The result is a corn crop in excess of that needed on farms. The greatest increase occurred in the sections of the state that are well suited to its production. The surpluses have so reduced the price of corn, compared to livestock, that livestock feeding is more profitable than formerly in these surplus-producing areas.

Relation to hogs and cattle.—More than 50 per cent of the corn crop is fed to hogs and beef cattle. Most of it is fed in the form of grain and represents a merchantable product.

Corn as a grain crop is of little importance north of Traverse County in the western part of the state and Chisago County in the eastern part. The analysis of corn prices will therefore be limited to the portion of the state south of a line connecting the northern boundaries of those counties. This includes 54 counties, none of which had less than 12 per cent of its crop land devoted to corn production for the five-year period 1925 to 1929.

In general, the counties in the southern part of the state that harvested the largest number of acres of corn for grain per unit of hogs and beef cattle had the lowest price for corn. This was particularly true in the counties south of the Minnesota River, where corn is an important crop. Figure 3 shows the acres of corn harvested for grain per unit of hogs and beef cattle.

Table 2
Relation of Acres of Corn for Grain per Unit of Hogs and Beef Cattle to Price, Per Cent of Crop Land in Corn, and Per Cent of Crop Shipped Out of County in Important Corn Counties, 1925-29

Acres of corn per unit of hogs and beef cattle	Price of corn, cents per bu.	Per cent of	
		Crop land in corn	Crop shipped out of county
Under 1.00	76.1	8.1	1.5
1.00 to 1.74	74.5	15.7	4.3
1.75 to 2.49	67.0	26.0	13.5
2.50 and over	65.5	27.6	24.0

In the southwestern part of the state, the number of acres of corn harvested for grain per unit of hogs and beef cattle was higher than in the southeastern part. In the southeastern part of the state, where the production of dairy products is important, skim milk supplants corn to some extent in the rations for hogs and beef cattle. The same conditions exist in the east central part of the state, altho to a less degree. The number of acres of corn per unit of hogs and beef cattle was high in the counties in the western part of the state just north of the Minnesota River, when compared with other counties north of the river. The yield of corn in these counties is nearly as high as in the counties directly south of them. The high yield undoubtedly has had some influence on the acreage of corn in these counties.

Where the ratio of corn to hogs and beef cattle is high, a larger amount is shipped out of the county than where the ratio is low. The percentage of crop land occupied by corn is also greater where this ratio

is higher. The price is therefore determined on the export basis, which tends to keep the price down.

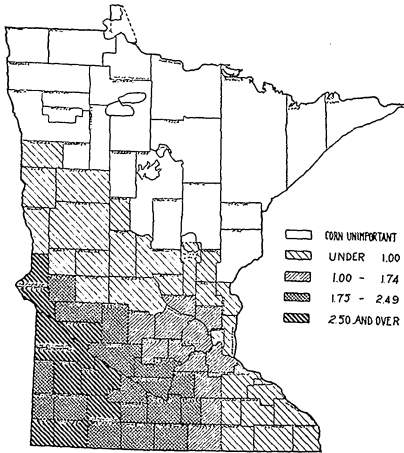


Fig. 3. Acres of Corn Harvested for Grain per Unit of Hogs and Beef for the Five-Year Period 1925 to 1929

One unit equals one head of beef cattle or 5 head of hogs. The highest number of acres per unit of beef and hogs was in the low-priced corn area.

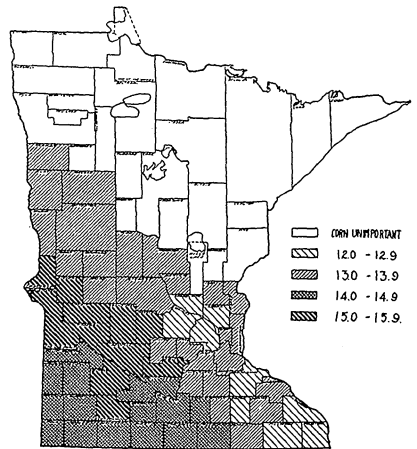


Fig. 4. Corn-Hog Ratio for the Five-Year Period 1925 to 1929

The ratio was high where corn was low-priced and low where corn was high-priced. See Fig. 1 for price of corn.

Corn-hog ratio.—It is difficult to analyze the price of corn without giving some consideration to the price of hogs. The relationship between corn and hog prices is expressed in the form of a ratio; namely, the bushels of corn required to equal in value the price of 100 pounds of hogs. This ratio may be high because of a comparatively high price of hogs, or because of a comparatively low price of corn, or because of a combination of a high price for hogs and a low price for corn. The corn-hog ratio is generally higher in some sections of Minnesota than in others. This higher ratio is due primarily to a comparatively lower price for corn rather than to a higher price for hogs. This indicates a corn crop in excess of that needed for feed.

Table 3
Variations in the Price of Corn and the Price of Hogs with Changes in the Corn-Hog Ratio in 54 Counties in Southern Minnesota, 1925-29

Ratio area	Price of corn		Price of hogs	
	Cents per bu.	Per cent of average price in 54 counties	Per cwt.	Per cent of average price in 54 counties
12.0-12.9	79	111	\$9.85	100
13.0-13.9	74	104	9.98	101
14.0-14.9	68	96	9.71	98
15.0-15.9	65	91	9.92	101
Average	71	100	\$9.86	100

In the 54 counties studied, the corn-hog ratio varied from 12.2 in Winona and Dodge counties, in the southeastern part of the state, to 16 in Lac qui Parle County in the western part. On the whole, the high corn-hog ratios are in the areas of low-priced corn and the low ratios in the areas of high-priced corn. Figure 4 shows the corn-hog ratio for the five-year period 1925 to 1929.

While there was some variation in the price of hogs among the different corn-hog ratio areas, the variation was not as great as in the price of corn (see Table 3). In the low ratio group, the price of corn was 11 per cent above the average for 54 counties, while the price of hogs was the same. In the next group, the price of corn was 4 per cent above the average and hogs one per cent. In the second highest group, the price of corn was 4 per cent below the average, and the price of hogs was only 2 per cent below. In the highest ratio group, the price of corn was 9 per cent below the average, while the price of hogs was one per cent above. It is evident, therefore, that the price of corn is more influential in determining the corn-hog ratio than is the price of hogs.

In general, the ratio was higher the greater the distance from market, because it is more economical to transport 100 pounds of hogs than 9 bushels of corn. With the freight rates now in effect in Minnesota, it would cost \$44.85 to transport a carload of hogs weighing 23,000 pounds 100 miles, while, for the same distance, it would cost \$126.50 to transport the amount of corn necessary to produce 23,000 pounds of hogs.

Shipments out of county.—The amount of corn shipped out of the county where grown varies from year to year. The largest proportion was 18 per cent in 1925, and the smallest was 8 per cent in 1931. The five-year average from 1925 to 1929 was 13 per cent.

The areas that shipped out the smallest proportion of the corn crop had the smallest proportion of the crop land in corn for grain and the fewest acres of corn per unit of hogs and beef cattle. The areas that shipped out the largest proportion had the largest percentage of crop land in corn and the largest acreage of corn per unit of hogs and beef cattle. This indicates that the proportion of livestock to the corn crop is not as well balanced in the areas that have large shipments out of the county as in the counties that have small shipments. On the other hand, the local price of corn is not affected greatly after a small proportion of the crop is shipped out of the county. It can be seen from Table 4 that the price of corn was practically the same in the last three groups. There was no noticeable effect on the price of corn after the shipments reached about 5 per cent. In certain counties where shipments are large, there is a large percentage of farm tenancy and the landlord requires that his share of the crop be sold.

Table 4
Relation of Shipment of Corn Out of County to Price of Corn, Per Cent of
Crop Land in Corn, and Acres of Corn per Unit of
Hogs and Beef Cattle, 1925-29

Per cent shipped out of county	Price of corn, cents per bushel	Per cent of crop land in corn for grain	Acres of corn per unit of hogs and beef cattle
1- 8	74.0	11.8	1.16
9-16	66.3	21.2	2.00
17-24	65.9	26.1	2.26
Over 24	66.5	31.0	2.38

In all probability, some of the counties with shipments up to 5 per cent imported some corn during the year, and so the price is a composite of import and export prices. This would be particularly true in the counties with very small exports. Such a price would be higher than if there were no imports. There are some exports as far north as Norman County, but the amount shipped out in the northern counties is small and the price is likely to be a combination of import and export prices. This has a tendency to make the average yearly price higher than in strictly surplus-producing areas.

Transportation.—In general, farmers who are far from market and produce a surplus of a commodity receive less for it than those who are close to market and produce a surplus. The difference in price is the difference in transportation charges, provided the quality of the product is the same. The price received is the central market price less the cost of transportation. So the farther a farmer is from market, the lower the price he receives for what he has to sell.

Conditions in territory near the Twin Cities do not make corn production for cash the first choice. Counties that export more than 17 per cent of their corn crop are more than 75 miles from Minneapolis. Eleven counties export more than 25 per cent of their crop. Four counties in the southwestern part of the state, Lincoln, Pipestone, Rock and Murray, export less than 25 per cent of the crop, are farther from Minneapolis, and have a slightly higher price than do adjoining counties. All of the corn shipped out of these counties may not have gone to the Minneapolis market, but may have been sold in deficit-producing areas or on the Chicago market. In deficit-producing areas, importations of some commodities are necessary, and the farther farmers are from sources of supply, the more they pay for such commodities. Because the surplus-producing areas are usually farthest from market, the farmers in these areas are the ones most affected by changes in freight rates.²

² Differences in transportation costs are reflected in land values; that is, land near markets has a location value. If given sufficient time, differences in transportation costs between localities are adjusted in this manner.

The price received for corn decreased as the distance to market increased (see Table 5). The measures of corn surplus, namely, acres of corn for grain per unit of hogs and beef cattle and per cent of crop shipped out of county, increased as the distance to market increased.

Table 5
Relation of Distance to Market to Price of Corn, Acres per Unit of Hogs and Beef Cattle, and Per Cent Shipped Out of County, 1925-29*

Miles to Minneapolis	Price, cents per bushel	Acres of corn for grain per unit of hogs and beef cattle	Per cent shipped out of county
Under 75	74.3	1.2	4.5
75-149	70.3	1.6	10.7
150 and over	68.5	2.4	14.8

* Fifty-four southern counties.

About one-third of the corn sold in Minnesota does not go to Minneapolis. Some of this is shipped to the western border of the cornbelt and is doubtless an added reason for larger surpluses in the southwestern part of the state.

THE PRICE OF BARLEY

The price farmers received for barley in the five-year period, August 1925 to July 1930, varied from 51 cents per bushel in the northwestern part of the state to 82 cents in the northeastern part, a variation of 61 per cent. The price in the southeastern counties was higher than in the central or southwestern counties. The variation in price was not great where conditions were suitable for the production of barley. This was particularly true in the counties in the northwestern part of the state, which had a variation of from one to two cents a bushel, and in the southeastern part which had a similar variation. Altho southwestern Minnesota is suited to barley production, the crop is not as important as in either the northwestern or southeastern parts because of greater competition from corn. The variation in price was approximately the same in the three regions.

The price of barley was higher for the state as a whole in the five-year period, August 1910 to July 1915, than in the five-year period, August 1925 to July 1930. There was less variation in price throughout the state in the earlier period. The greatest range in price in the earlier period was from 51 cents in Marshall County to 72 cents in Winona, a range of 21 cents, whereas in the later period the range was from 51 cents in several counties in the northwestern part of the state to 82 cents in Koochiching County, a range of 31 cents. Figures 5 and 6 show the price of barley in Minnesota for each of the two periods. The acreage of barley in the state increased about 12 per cent between the two periods.

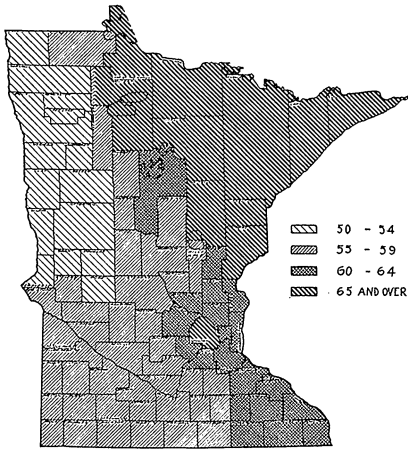


Fig. 5. Price of Barley for the Five-Year Period, August 1925 to July 1930
 Note the low price in the northwestern part of the state, a surplus-producing area far from market.

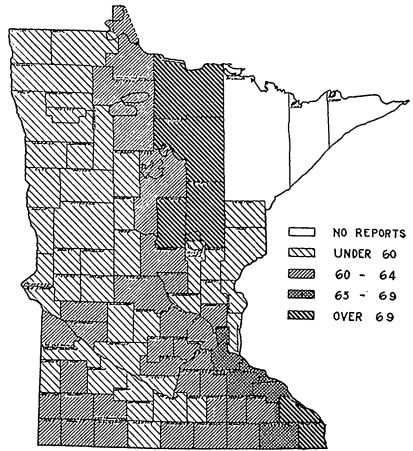


Fig. 6. Price of Barley for the Five-Year Period, August 1910 to July 1915
 The high-priced areas were less prominent than in Fig. 5.

There was a decrease of 36 per cent in the price of barley in 1918, and since that time the price has been relatively lower than that of any of the other small grains grown in the state. Since 1925 the use of barley for feeding livestock has increased, but the price has remained relatively lower than other feed grains.

Table 6
 Change in the Local Price of Barley in Different Parts of the State
 Between the Five-Year Periods, August 1910 to July 1915,
 and August 1925 to July 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
August 1910-July 1915	61.6	56.5	65.6	60.4
August 1925-July 1930	71.8	53.6	62.2	55.3
Difference	10.2	-2.9	-3.4	-5.1

There was a decrease in the price of barley in each section in the state except the northeastern (see Table 6). The price of barley previous to the passage of the prohibition act was influenced by the use of barley for malting purposes and since that time more by its use as a feed crop.

Barley production.—The growing season required for barley production is shorter than for wheat or oats. Barley is grown mostly

in regions with short growing seasons and sufficient moisture. It is grown in some high altitudes, under irrigation.

Barley can be grown in a wider range of temperature than other cereals. Where it is grown in the United States the summer temperature ranges from 52 degrees in the high altitudes of Colorado to 95 degrees in the Imperial Valley of California. Barley is drought-resistant and does not endure wet weather. It is grown mostly in sections of the United States that have a semi-arid to slightly humid climate.

Barley can be grown on poorer soils than wheat. In southeastern Minnesota there is a rather sharp division between the production of barley and wheat, particularly in the extreme southeastern counties, with the exception of Houston. In this particular section, barley is grown mostly on the older and more leached soils of the Iowa glaciation, while wheat is grown on the more recent Wisconsin glaciation.

Data on the acreage of barley or the number of livestock, by counties, are not available previous to 1917 except in the federal census reports. The 1925 census gives an increase in acreage over the 1910 census in the northeastern and northwestern parts of the state, and decreases in the southeastern and southwestern. The acreage in the state has increased about 23 per cent since 1910, but the increase has not been continuous. There was a decrease of nearly 40 per cent following the passage of the prohibition act in 1918. During the following six years the increase was slow. By 1925, varieties satisfactory for feeding were being developed, and the acreage began to increase. Barley now occupies about 12 per cent of the crop land.

Because of the climatic conditions in northwestern Minnesota and the Dakotas, barley occupies an important place in the cropping system. It occupies the same place as oats in the farm organization, as it has practically the same seasonal requirements. It serves well for a nurse crop and can be used in the feeding ration.

Relation to hogs and cattle.—Barley is a satisfactory feed for most classes of livestock, and during the past decade its utilization for this purpose has increased. Its feeding value is not equal to corn, but is greater than oats. The largest part of the crop that is fed goes to hogs, and the least to horses. Cattle are fed a larger portion of the crop than sheep.

In certain parts of the state where corn is not grown, but where conditions are suitable for barley production, the latter crop has had an important place in the hog and cattle ration.

The price of barley averaged the highest in counties having less than 0.25 of an acre of barley per unit of livestock, and decreased consistently as the acreage per unit of livestock increased. As the acres of barley

per unit of livestock increased, the percentage of the crop shipped out of the county increased (see Table 7). This indicates that if barley is a satisfactory feed for livestock in parts of the state where corn cannot be grown, there is room for considerable expansion in the kinds of livestock consuming this crop. The local price of barley follows the local price of corn very closely. The coefficient of correlation between the two was .90 on the basis of five-year average prices, 1925-29.

Table 7
Relation of Acres of Barley to Livestock, to Price of Barley, and Percentage Shipped out of County

Acres of barley per unit of livestock	Price, cents per bushel	Per cent of crop shipped out of county
Under 0.25	60	9.5
0.25-0.49	58	27.0
0.50-0.74	56	34.4
Over 0.74	54	36.4

Shipments out of county.—More than 50 per cent of the crop in several counties in the southwestern part of the state was shipped out of the county. These counties all had less than 8 per cent of their crop land in barley for the five-year period, 1925-29. In the northwestern part of the state, where more than 12 per cent of the crop land was in barley, less than 40 per cent of the crop was shipped out in all counties except Clay and Norman which shipped out 44 and 41 per cent of the crop, respectively. Because it is not needed for feed in the southwestern part of the state, corn being grown in sufficient quantities to meet most of the livestock needs, the shipments of barley were proportionately larger. In the northwestern part of the state, where corn is not grown so extensively, barley is used more as a feed.

In Goodhue, Wabasha, and Olmsted counties, in the southeastern part of the state, the proportion of crop land occupied by barley averaged 17 per cent, and 42 per cent of the crop was shipped out of the county. In these counties the price was unusually high, 63 cents per bushel as compared to 57 for the state. The price in these same counties, from 1910 to 1915, was 67 cents as compared to 60 for the state. These southeastern counties averaged about one-half an acre of barley per unit of livestock, which was approximately the same average as that in the southwestern part of the state, but only one-third as much as that in the Red River Valley counties.

The southeastern section of Minnesota has been important in the production of barley for many years. The type of barley grown in the early years was for brewing purposes. There is a large malting mill operating at Winona, which, no doubt, has some influence on the acreage

and price in that section of the state. The same is true of the other two heavy-producing areas in the United States, one near Milwaukee and one in California.

Table 8

Relation of Per Cent of Barley Shipped out of County to Price per Bushel, Per Cent of Crop Land Occupied by Barley, and Acres per Unit of Livestock

Per cent shipped out of county	Price, cents per bushel	Per cent of crop land in barley	Acres per unit of livestock
1-14	59.2	5.3	0.2
15-28	56.7	8.9	0.4
29-42	55.2	11.8	1.0
43 and over	56.2	8.8	0.5

The data in Table 8 indicate that adjustment of barley to livestock is difficult except to a limited extent. In counties that shipped out more than 42 per cent of the crop, the adjustment to livestock appears no better than where the shipments were considerably less.

The price of barley was not influenced much after shipments out of the county reached between 14 and 28 per cent. With the exception of a few counties in the southeastern part of the state, there was little change in the price after the shipments reached 18 per cent. The price in the southeastern counties was influenced to a greater extent by the quality of the barley for brewing purposes than in the other sections where the price was determined largely by its value for feeding purposes.

Transportation.—A large part of the barley sold in this state goes to the Minneapolis market. Table 9 indicates the relation of distance to Minneapolis to the price received by farmers.

Table 9

Relation of Distance to Minneapolis to Price of Barley, Acres per Unit of Livestock, and Per Cent Shipped out of County, 1925-29*

Miles to Minneapolis	Price, cents per bushel	Acres per unit of livestock	Per cent shipped out of county
Under 75	60.6	0.2	16.2
75-149	57.1	0.4	26.8
150-224	55.6	0.6	37.0
225 and over	52.4	1.2	25.4

* Only counties exporting barley included.

The differences in the price per bushel given in Table 10 are approximately the differences in freight charges. The acres of barley per unit of livestock increase as the distance to Minneapolis increases. The disadvantage to farmers far from market is in proportion to the degree of surplus resulting from the increased acreage. The group of counties 150 to 224 miles from Minneapolis is in the southwestern and western

parts of the state, where corn is an important crop. For this reason a larger percentage of the barley crop is shipped out of these counties than out of counties in the other groups.

THE PRICE OF OATS

The five-year average price of oats from August 1925 to July 1930 varied from 35 cents per bushel in the northwestern part of the state to 63 cents in the northeastern part, a variation of 80 per cent. The lowest-priced area includes the western border of the state from the Canadian boundary on the north to Lincoln and Murray counties on the south. The variation in price between the western part of the state and the southern and southeastern parts was from 2 to 6 cents a bushel. The variation from the western to the eastern part of the state was from 2 to 10 cents a bushel, and from the western to northeastern part from 10 to 28 cents.

The lowest-priced area for the five-year period, August 1910 to July 1915, was in the southwestern and western parts of the state. Since that time the low-priced area has moved northwestward. The high-priced area was, and still is, in the northeastern part of the state. This has always been a deficit-producing area in oat production, which accounts for the high price. The southeastern part of the state, in comparison with the other parts, occupied the same relative position with respect to the price of oats as it does at the present time. Figures 7 and 8 show the variation in price for the two periods.

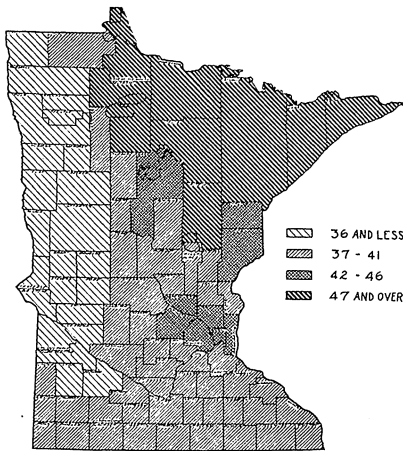


Fig. 7. Price of Oats for the Five-Year Period, August 1925 to July 1930

The western part of the state is a surplus-producing area and far from market.

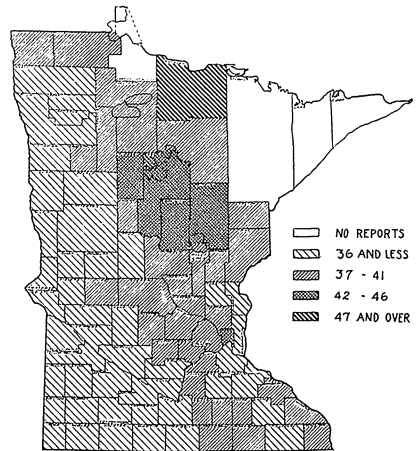


Fig. 8. Price of Oats for the Five-Year Period, August 1910 to July 1915

The relatively low-priced area is larger than in Fig. 7.

Table 10
Changes in the Local Price of Oats in Different Parts of the State between
the Five-Year Periods, August 1910 to July 1915 and
August 1925 to July 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
August 1910–July 1915	41	36	37	36
August 1925–July 1930	50	36	40	37
Difference	9	0	3	1

The greatest change in the price of oats during the 15-year period was in the northeastern part of the state, which had an increase of nine cents a bushel. The greater demand for oats in that region, owing to a more rapid increase of livestock in proportion to crop land than in other areas, was the primary reason for the greatest change in price. A similar increase, effective to a less degree, resulted in an increase of three cents a bushel in the southeastern part of the state. The change in the southwestern part of the state was only one cent a bushel. There was no change in the northwestern part.

Oat production.—Oats grow best in a cool, moist climate. The bulk of the crop is grown in the north central and northeastern parts of the United States. The acreage south of a line connecting the southern boundaries of Nebraska and Pennsylvania is comparatively small. The oat area extends but a short way into Nebraska and South Dakota, but because of cooler climate extends well across the northern part of North Dakota. From the standpoint of climate, oats are well adapted to Minnesota, except in the extreme northwestern part where precipitation is the limiting factor.

Oats are less exacting in soil requirements than the other small grains and can be grown on a variety of soils. The only soils in which the crop shows an immediate response are those rich in humus, providing plenty of moisture is available. From the standpoint of soils, the crop is fairly well adapted to all parts of Minnesota that are suitable for cultivation. On some of the poor soils in the state, the yield is remarkably good because of favorable climatic conditions.

Since 1910, the acreage of oats in the state has increased 35 per cent. The increase was continuous until 1925, except for 1917 and 1923 when there were slight decreases. There were 4,575,000 acres of oats in the state in 1932, which made the crop nearly as important as corn from the standpoint of acreage.

The oat crop has a satisfactory place in the farm organization because it does not conflict seriously with other crops for labor. A large

part of the crop is planted on corn ground, and where this practice is followed only a small amount of work is required for the preparation of the seedbed. In some sections the crop is used extensively for hay. It is frequently used as a nurse crop for legumes and is used both for feed and a cash crop. As a cash crop, it is the least profitable of the small grains. Horses consume nearly one-half of the crop and nearly four times as much as all other livestock together. A little less than one-third of the crop is shipped out of the county where grown.

Relation to livestock.—The acreage of oats in relation to number of horses is greatest in the lowest-priced oat areas and lowest in the highest-priced areas. The acreage of oats fed per horse is 0.75 of an acre in the northeastern part of the state, 1.04 acres in the southeastern part, 2.40 acres in the southwestern part, and 3.05 acres in the northwestern part.³ The large acreage in the northwestern area is due, in part, to the absence of other feed grains. In most counties the oat crop is in excess of that needed for horses. Because of the expansion of the dairy and hog enterprises, there has been a tendency to feed more of the oat crop on farms where it is produced.

In areas raising an amount of oats in excess of that needed for horses, the crop is low-priced. While some of the crop is consumed by other livestock, the shipments out of the county increase as the acres per horse increase.

The percentage of crop land occupied by oats is greatest in the southwestern part of the state, but the price is a little higher than in the northwestern part where the percentage of crop land occupied by oats is only about two-thirds as large. The lower price in the northwestern part of the state is accounted for mainly by the greater distance to market.

Table 11
Relation of Acres of Oats per Horse to Price of Oats, Percentage of Crop Land in Oats, and Percentage of Crop Shipped out of County, August 1925 to July 1929

Acres of oats per horse	Price, cents per bushel	Per cent of crop land in oats	Per cent of crop shipped out of county
Under 3.0	50	12.2	3.4
3.0-4.5	40	18.5	8.5
4.6-6.0	38	20.9	14.3
Over 6.0	37	26.9	31.1

As the acres of oats per horse increased, more of the crop land was in oats and more of the oat crop was shipped out of the county (see Table 11). The price averaged 10 or more cents higher where the acres

³ Unpublished data collected by G. A. Pond and G. A. Sallee.

of oats per horse were less than three than where they were three or more. This was because some counties did not raise sufficient oats for all livestock, and some was imported, which made the price a composite of import and export price, while counties with three or more acres per horse had a price determined entirely on an export basis. The percentage of the crop shipped out of the county increased rapidly after the requirements for horses and other livestock had been provided.

Of the small portion of the oat crop fed to livestock other than horses, more goes to cows than to any other class of livestock. The amount used for seed is approximately 60 per cent of that fed to all livestock except horses. The same general relationship indicated in Table 11 exists when all livestock is considered.

Shipments out of county.—With the exception of 10 of the north central and northeastern counties, there are shipments of oats out of every county in the state. The largest amount is shipped out of the southwestern part, where the percentage of crop land in oats is the greatest.

Table 12

Relation of Oats Shipped out of County to Price, Percentage of Crop Land in Oats, and Acres per Horse, August 1925 to July 1929

Per cent shipped out of county	Price, cents per bushel	Per cent of crop land in oats	Acres of oats per horse
None	53	11.7	2.0
2-10	40	19.4	4.0
11-19	38	19.4	4.7
20-28	37	22.0	5.9
29 and over	37	29.1	7.3

The percentage of crop land occupied by oats averaged 11.7 for the counties that shipped out no oats and increased continuously as the percentage shipped out of the county increased. The acres of oats per horse increased with increased shipments of oats out of the county. The price of oats decreased as the shipment out of the county increased.

There was little change in the price of oats after shipments out of the county reached about 15 per cent of the total crop. The rate of decrease in price was much slower than that of corn, the price of which changed but little when more than 5 per cent of the crop was shipped out of the county.

Transportation.—More than 40 per cent of the oat crop in five counties in southwestern Minnesota was shipped out of the county where grown during the five-year period 1925-29. On the other hand, several counties in the northeastern part of the state imported some during the same period. The proportion of the crop shipped out of the county was greatest where the acreage grown per horse was greatest.

In general, the price of oats was lower as the distance to Minneapolis increased, providing there was a surplus of production. Table 13 indicates the relationship between distance to market and price of oats in Minnesota.

Table 13
Relation of Distance to Minneapolis to Price of Oats, Acres per Horse, and Per Cent Shipped out of County, August 1925 to July 1929*

Miles to Minneapolis	Price, cents per bushel	Acres of oats per horse	Per cent shipped out of county
Under 75	41.1	3.7	9.4
75-149	38.1	5.3	18.2
150-224	37.2	6.5	27.9
225 and over	35.6	5.4	15.7

* Only counties shipping oats included.

At some time during the period there were doubtless some imports into some of the counties which had some influence on the price. This would be true only in counties that exported comparatively small amounts, particularly in the east central part of the state.

As the distance to Minneapolis increased, the transportation charges increased and the price received by farmers decreased (see Table 13). The lowest price received was in the extreme northwestern part of the state, where the export of oats amounted to from 11 to 13 per cent of the crop. The counties that exported oats and were more than 224 miles from Minneapolis were limited to the northwestern counties. The percentage shipped out was less in these counties than in the other group of counties more than 75 miles from Minneapolis. The price did not decline much after 15 per cent of the crop was shipped out of the county, indicating that transportation is a more influential factor in determining the local price of oats than is the amount of surplus.

THE PRICE OF WHEAT

The local market price of wheat for the five-year period, July 1925 to June 1930, ranged from \$1.11 per bushel in Hubbard County to \$1.34 in Carlton County, a variation of 21 per cent. The lowest-priced areas were in the northwestern and southern parts of the state. The highest-priced area was in the northeastern part, which is a deficit wheat-producing area, the price being determined to some extent on an import rather than an export basis. In the west central part of the state, particularly in Stevens and Bigstone counties, the price was higher than in the surrounding counties. The price in general was highest around concentration points.

The price of wheat for the five-year period, July 1910 to June 1915,

varied from \$0.85 in Becker County to \$1.08 in Koochiching County, a variation of 28 per cent. The price was generally lowest throughout the entire western and the extreme southeastern parts of the state. The price was highest near the Twin Cities and in the north central part.

Table 14
Changes in the Price of Wheat in Different Sections of the State between the Five-Year Periods, July 1910 to June 1915 and July 1925 to June 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
July 1910-June 1915.....	99	91	93	91
July 1925-June 1930.....	128	117	118	118
Difference	29	26	25	27

The change in price from the earlier to the later period was much the same in all four sections of the state (see Table 14), and the increase in price in Minnesota was approximately the same as for the United States. In all sections except the northeastern, a surplus of wheat was produced in both periods, altho the surplus was smaller during the latter period. Figures 9 and 10 show the variation in the local price of wheat for the two five-year periods, July 1910 to June 1915 and July 1925 to June 1930.

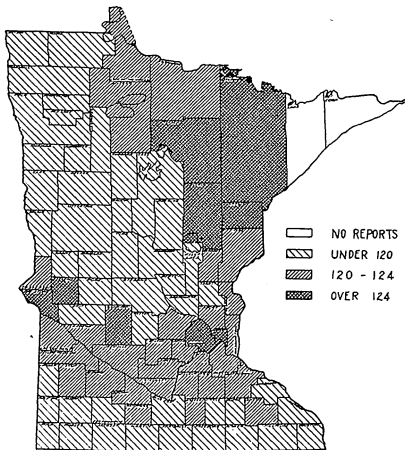


Fig. 9. Price of Wheat for the Five-Year Period, July 1925 to June 1930

Note the low price in the northwestern part of the state, a surplus-producing area, and the higher price in the west central part, an area of higher protein content in wheat.

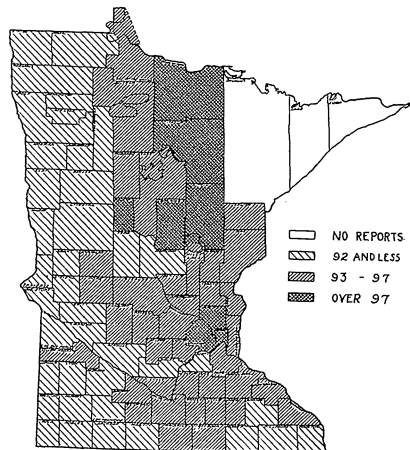


Fig. 10. Price of Wheat for the Five-Year Period, July 1910 to June 1915

The western and southern parts of the state were important wheat-producing areas during this period.

Wheat production.—Wheat is grown on a variety of soils. With favorable climatic conditions, highest yields are obtained on soils of high fertility and fine texture. Black soils, rich in nitrates, like those found in the western and northwestern parts of the state, produce a wheat of high gluten content. Part of this high gluten content may be due to favorable climatic conditions. Because of certain soil and surface conditions, wheat is of little importance in northeastern Minnesota. The production is heaviest in the central and western counties.

About two-thirds of the wheat in Minnesota is grown with less than 25 inches of precipitation. Where rainfall is heavy, rust and fungus diseases are more prevalent and have a greater influence on yields. Wheat is not grown in the lighter rainfall areas entirely because of the light rainfall, but partly because the heavier rainfall makes possible the production of feed crops which can out-compete wheat in the heavier rainfall areas.

In the wheat belt, all farm activities center around the wheat enterprise. In the spring wheat region, other crops can supplement wheat only to a limited extent because they require the same climatic conditions. Such crops are rye, flax, barley, and oats.

Since 1910 the acreage of spring wheat in Minnesota has decreased 73 per cent. The decrease has been steady, with the exception of 1918 and 1919 when there was an increase of approximately 25 per cent over that in 1917. There was very little winter wheat grown in Minnesota in 1910. The first report, in 1913, gave 50,000 acres as the acreage. In 1931, there were 163,000 acres reported. Most of the winter wheat is grown in the south central part of the state.

Value as feed.—Wheat is grown primarily as a cash crop. In regions where corn is not grown, or where the wheat is of low quality, the tendency is to feed more wheat. Wheat has a feeding value greater than that of corn, pound for pound. It contains 3 per cent more protein, a little more carbohydrates, and 25 per cent less fat. The feeding value of wheat, in pounds of wheat to pounds of corn, is 1.00 for poultry and sheep, 1.05 for hogs, and 1.15 for beef cattle.⁴ It will likely become more important as a feed crop as people become more accustomed to feeding it. When wheat is used for feeding, the amount for sale is reduced. This tends to increase the price of wheat and to reduce the price of other feed crops.

Protein content.—The percentage of protein in wheat is an important factor in determining the price because of its influence on the milling quality. There are price schedules listing the premiums paid, based on the protein content, but they are not followed rigidly. With

⁴ U.S.D.A. Yearbook, 1923, p. 130.

a protein content of 12.27 for each of the crop years 1927-28 and 1929-30, the premium paid in Kansas City during the former year was 18.7 cents per bushel higher than in the latter. With a protein content of 13.26 for the crop year 1926-27, the premium paid on the Minneapolis market was 4.9 cents higher than for the crop year 1928-29 which had a protein content of 13.34. The protein content of wheat not only varies from year to year, but between counties and localities. Climatic and soil conditions influence it to a marked degree. Other factors said to influence protein content are: (1) The sample of wheat taken is not always representative; (2) all tests are not computed on the same moisture basis; (3) the sample is not always cleaned and prepared in the same way; and (4) the equipment for testing is not uniform.⁵

The weight per bushel may offset any price advantage a higher protein content wheat may have. Number 1 wheat, because of the weight per bushel factor, may sell for more than a lower grade of wheat which has a higher protein content. The premium is usually the same for all grades of wheat, but the price is affected by the weight per bushel.

Fig. 11 shows the 1925-29 five-year average protein test of wheat by counties in Minnesota. Tests were made from 32,857 cars of wheat.⁶

Mills strive for a uniform protein content in their principal brands of flour, the protein content varying from 11.0 to 11.5 per cent. To get such a content, they must maintain an average of 12.0 to 12.5 per cent of protein in their wheat. A premium of 2 or 3 cents a bushel is often paid for each per cent protein above 12.0.

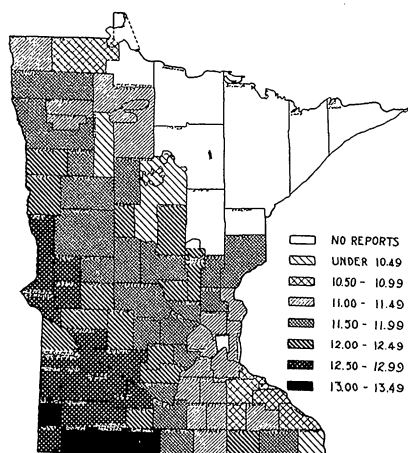


Fig. 11. Percentage of Protein in Wheat for the Five Crop Years 1925 to 1929

In western Minnesota wheat containing about the percentage of protein desired by millers is grown.

The protein content and weight per bushel are not the only factors determining the local price of wheat. Distance to market is important. The general tendency is for the price of high protein wheat to be higher than for low protein wheat when the marketing cost is approximately the same. This is indicated in Table 15, in which the local price of

⁵ Northwestern Miller, June 1, 1932.

⁶ State Inspection Department.

wheat is higher with a protein test of 12 per cent or more than when under 12 per cent, with the same distance to market.

Table 15
Relation of Percentage of Protein to Price of Wheat for the Five Crops, 1925 to 1929, in Zones the Same Distance to Market

Per cent protein	Miles to Minneapolis							
	Under 75		75-149		150-224		225-299	
	Under 12	12 and over	Under 12	12 and over	Under 12	12 and over	Under 12	12 and over
Price per bushel, cents	121	123	118	120	117	120	118	119
Average per cent protein	11.4	12.6	11.4	12.5	11.5	12.8	11.1	12.1

THE PRICE OF RYE

The local market price of rye for the five-year period, July 1925 to June 1930, ranged from 80 cents per bushel in the northwestern part of the state to 99 cents in Itasca County, a range of 24 per cent. It was generally lowest in the southern, western, and northwestern parts of the state, and highest in the eastern part. In the extreme southeastern part the price was higher than in the other sections where rye was important. Very little rye is grown in northeastern Minnesota, and no quotations are given for this area.

Because of a decided preference for bread made from wheat flour, rye is not in much demand for bread-making purposes, and its importance in relation to other grains has declined. Its place in the local cropping plan is determined by various other uses that can be made of it.

The price for the five-year period, July 1910 to June 1915, varied from 62 cents in Wilkin and Lincoln counties to 75 cents in Mower County, a variation of 21 per cent. A larger proportion of the southern part of the state was in the high-priced area in this period than in the later five-year period. Figures 12 and 13 show the variation in the local price of rye for the five-year periods, July 1910 to June 1915 and July 1925 to June 1930.

Table 16
Changes in the Price of Rye in Different Sections of the State between the Five-Year Periods, July 1910 to June 1915 and July 1925 to June 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
July 1910-June 1915	70	64	70	68
July 1925-June 1930	90	81	85	82
Difference	20	17	15	14

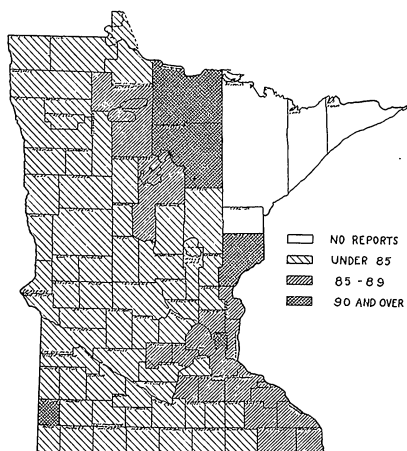


Fig. 12. Price of Rye for the Five-Year Period, July 1925 to June 1930
The relatively low-priced area covered most of the state.

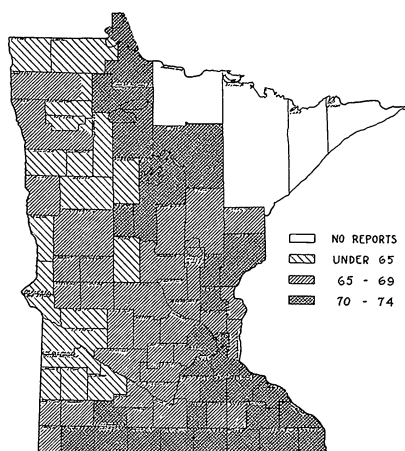


Fig. 13. Price of Rye for the Five-Year Period, July 1910 to June 1915
The relatively low-priced area was smaller than that shown in Fig. 12.

In all sections of the state, there was an increase in the price from the earlier to the later period. The greatest increase was in the northeastern part of the state, where it amounted to 20 cents a bushel. The difference in the amount of increase between this and the surplus-producing area in the western part of the state is equal approximately to the transportation cost from Duluth to points in the northeastern part of the state. There was a change of 17 cents a bushel in the northwestern part of the state between the two periods. Rye was used more for feed in the latter period, which, no doubt, had an influence on the price. The change throughout the southern part of the state was about the same, rye there not being very important either as a cash crop or for feed.

Rye production.—In general, rye is grown mostly in regions with a cool climate. Most of it is grown south of a mean winter temperature line of 15 degrees F. and north of a mean summer temperature line of 75 degrees F. Yields are largest in the cooler climates where rainfall is sufficient.

Rye is usually grown on sandy or poor soils because it will do better on those soils than wheat and other small grains. But, like other small grains, it thrives best on fertile soils and in some places competes with them for the occupancy of the best land. Rye is frequently grown to aid in building up a run-down soil. In some places it is sown in the corn or stubble field in the fall and plowed under in the spring as a green manure crop. It is sometimes used as a soil binder to prevent erosion.

The value of rye straw for bedding and packing has been influential in maintaining an acreage of the crop in sections in which it is well adapted.

In 1922 the acreage of rye in Minnesota was 1,154,000 acres, the largest in the history of the state. By 1932 the acreage had declined 73 per cent. When prices are high, rye is produced in the northwestern part of the state as a cash crop and competes with wheat and other small grains. Winter wheat has replaced rye to a considerable extent in the southern part of the state.

Rye occupies the same place as wheat in the farm organization. It requires about the same amount of labor as wheat and the cost of production is practically the same. Its varied uses give it a wider range of adaptability in the farming system than most other small grains.

THE PRICE OF FLAX

The price of flax for the five-year period, September 1925 to August 1930, varied from \$2.10 a bushel in Cass County to \$2.41 in Beltrami County, a variation of 15 per cent. This is a rather wide variation, as all flax seed except that retained for seed is sold, and the distance to market should be the principal factor influencing the variation in price. Many counties import some seed, making the average yearly prices higher than if there were only exports.

The price of flax for the five-year period, September 1910 to August 1915, varied from \$1.59 a bushel in Kittson County to \$1.84 in Anoka County, a variation of 16 per cent. It was highest in the northeastern part of the state, westward through Wadena and Ottertail counties. The low-priced areas were in the southern, central, and extreme northwestern parts of the state. The price was higher in the west central part of the state than in some counties closer to Minneapolis. Figures 14 and 15 show the price of flax for the two five-year periods.

Table 17
Changes in the Price of Flax in Different Sections of the State between the
Five-Year Periods, September 1910 to August 1915 and
September 1925 to August 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
August 1910–July 1915.....	180	167	164	164
August 1925–July 1930.....	229	221	226	221
Difference	49	54	62	57

The increase from the early to the late period varied from 49 cents a bushel in the northeastern part of the state to 62 cents in the southeastern part. The differences in price among the surplus flax-producing areas are in line with the differences in transportation charges from these areas to Minneapolis, where the oil mills are located. During this same interval, the tariff on flax increased 15 cents a bushel, which doubtless accounted for some of the increase in price.

There are two high-priced flax areas. One is in the north central part of the state and the other in the southeastern part. The low-priced areas are in the southwestern and northwestern parts of the state, where the production is greatest. The low-priced area in the northern part of the state has moved northwestward during the last 15 years. The southern part of the state has become a comparatively higher-priced area during this period. Figures 14 and 15 show the variation in the price of flax for the two five-year periods, September 1925 to August 1929 and September 1910 to August 1915.

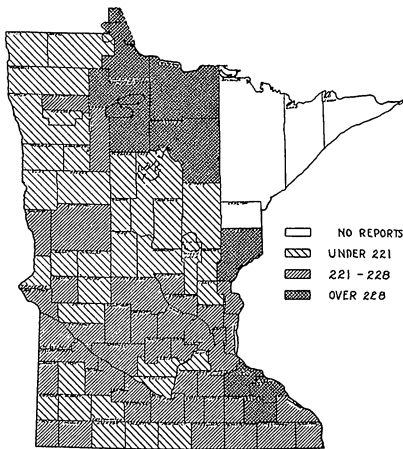


Fig. 14. Price of Flax for the Five-Year Period, September 1925 to August 1930

The low prices in the northwestern and southwestern parts of the state are in areas of heaviest production and far from market.

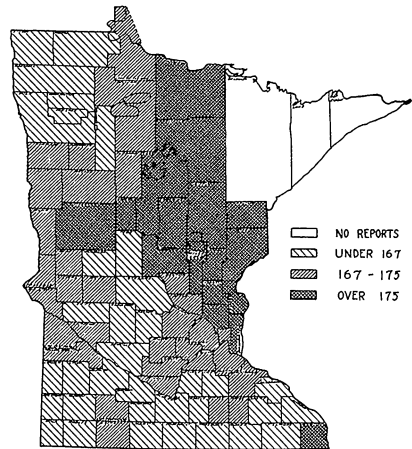


Fig. 15. Price of Flax for the Five-Year Period, September 1910 to August 1915

A larger portion of southern Minnesota was in the relatively low-priced area that is shown in Fig. 14.

Flax production.—Flax in this country is produced primarily for the seed. It is adapted to a variety of climatic conditions, but thrives best where summer temperatures are cool and even. Plenty of moisture during the growing period and drier conditions during the ripening period are climatic factors favorable for flax production.

Loam or clay soils are best suited for flax growing, particularly if they have moisture-retaining power. Because of disease, it has been a

common practice to plant flax in sod. Where it is used in a rotation, it follows a sod-forming crop like clover or timothy.

In 1910 there were 377,000 acres of flax in Minnesota. There was a decrease during the war period, but since 1920 there has been a marked increase. The 1931 acreage was 861,000, the largest ever reported for Minnesota.

During the five-year period, 1925 to 1929, Minnesota produced approximately one-third of the flax grown in the United States. During this same period the imports of flax into this country were just about equal to the production.

Factors affecting local price of flax.—Flax seed is crushed for the oil it contains and oil cake is the by-product. The demand for oil cake has practically no effect on the price of flax seed. During the period 1908 to 1923, the average monthly price of flax varied inversely to the rate of marketing. Two-thirds of the flax crop is marketed during September, October, and November, and most of the flax is sold under one grade.

The most significant factor affecting prices received by farmers appears to be the cost of transportation. All the flax raised is sold except that retained for seeding the following year. This amount is too small to influence the price. Where the seed is imported, the price is likely to be higher than where there is no importation.

Table 18 gives the price received by farmers in Minnesota according to the average distance from the shipping points in a county to Minneapolis.

Table 18
Relation of Distance to Market to Price of Flax Received by Farmers in Minnesota, Five-Year Period, September 1925 to August 1929

Distance from Minneapolis	Average of September, October, and November prices	Five-year average
Under 75 miles	\$2.26	\$2.23
75-149	2.25	2.22
150-224	2.26	2.22
225-229	2.24	2.22
300 and over	\$2.22	\$2.25

The effect of distance to market on the price of flax received by farmers is best shown by the average of September, October, and November prices, as most of the crop is marketed during these three months. Importation of seed into the north central part of the state raises the average yearly price for the period September 1925 to August 1929 above that for the state as a whole.

THE PRICE OF POTATOES

The local price of potatoes in Minnesota for the five-year period, August 1925 to July 1930, varied from \$0.84 per bushel in Roseau County to \$1.40 in Dodge County. This was a variation of 66 $\frac{2}{3}$ per cent. In general, the price was highest in the southern part of the state and lowest in the northwestern and north central parts. The southeastern part is a deficit potato-producing area, and the northwestern part is a surplus-producing area.

The price of potatoes for the five-year period, August 1910 to July 1915, ranged from \$0.40 in Todd County to \$0.78 in Cottonwood and Faribault counties, a range of 95 per cent. The low-priced area was less pronounced in the northwestern part of the state during the earlier period, and the high-priced areas were in the south central and extreme northeastern parts. The price of potatoes in the northeastern part of the state in general was higher in the earlier than in the later period. Figures 16 and 17 show the variation in the price of potatoes for the five-year periods, August 1925 to July 1929 and August 1910 to July 1915.

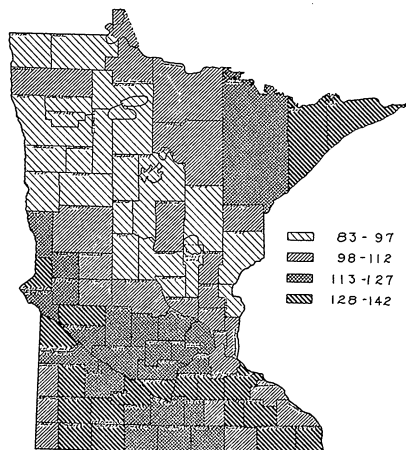


Fig. 16. Price of Potatoes for the Five-Year Period, August 1925 to July 1930

The low price in the north central and northwestern parts of the state was due to the surplus production in these areas.

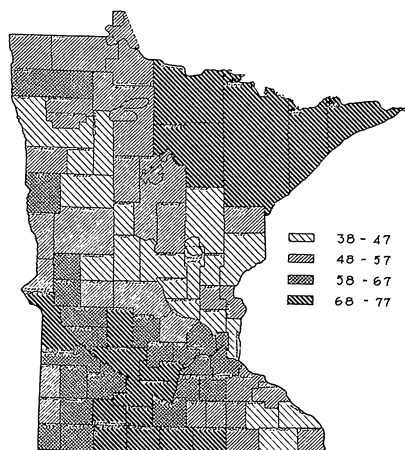


Fig. 17. Price of Potatoes for the Five-Year Period, August 1910 to July 1915

The low-priced area in the north central part of the state was in the surplus-producing area. The northwestern part of the state was not an important commercial area during this period.

There was an increase in the price of potatoes in all sections of the state from the early to the late five-year period. The increase was the least in the surplus-producing area in the northwestern part of the state. One reason for a greater increase in the southeastern and southwestern

parts, which are deficit-producing areas, was an increase in freight rates. This would tend to increase the price faster in deficit than in surplus-producing areas.

Table 19
Changes in the Price of Potatoes in Different Sections of the State between the Five-Year Periods, August 1910 to July 1915 and August 1925 to July 1930

Five-year period	Location in state			
	Northeastern	Northwestern	Southeastern	Southwestern
	cents per bu.	cents per bu.	cents per bu.	cents per bu.
August 1910-July 1915.....	59	54	51	65
August 1925-July 1930.....	104	95	125	125
Difference	45	41	74	60

The production of potatoes in the northwestern and northeastern parts of the state increased between 1910 and 1930, while there was little change in production in the southern part. Clay County, in northwestern Minnesota, was not a heavy-producing county during the earlier period, but during the later period was the heaviest-producing county in the state.

Potato production.—Potatoes are grown in every county in the United States, except one, but the enterprise is most profitable where natural conditions are favorable for their production. Potatoes mature in a short season and can be grown farther north than any crop except barley and timothy. They can be grown in southern climates in the late winter months, when the price for new potatoes permits shipments to northern cities. They can be grown on a variety of soils with sufficient drainage and water supply. Altho the crop is somewhat bulky, it is not highly perishable, and is sometimes shipped long distances. Idaho potatoes are shipped as far east as New York City and as far south as Jacksonville, Florida. The higher price received in such markets is an inducement to ship long distances.

A large part of Minnesota is adapted to potato production, but because cool temperatures are more preferable for potatoes than for other crops, potato production on a commercial basis is limited largely to the eastern and northern parts of the state.

Transportation.—An important factor in determining the price of potatoes in surplus-producing areas is the distance to market. In most years all of the crop is sold except that retained for seed and home consumption. Occasionally the price is so low that some of the crop is fed to livestock.

In deficit or light potato-producing counties there was not any significant relationship between distance to market and price. Imports at

certain seasons of the year made it impossible to make a comparison of these counties with the commercial and semi-commercial counties as the price was sometimes an import price and sometimes an export price.

Another important factor in determining the variation in the local price of potatoes is the surplus. Large surpluses lower the price more than small surpluses. These relationships are indicated in Table 20.

Table 20
Relation of Surplus Production of Potatoes per Capita to Price of Potatoes per Bushel, 1925-29

Miles from Minneapolis	Bushels per capita over those needed for home consumption		
	Under 10	10 to 19	20 and over
	cents	cents	cents
Under 80	122	104	100
80-159	122	102	99
160 and over	120	96	96
Average	121.5	98.2	97.9

The price varied, according to the surplus per capita, from 22 per cent, when the distance to Minneapolis was less than 80 miles, to 25 per cent, when the distance was 160 miles or more. Altho the difference in the amount of variation is not great, the data indicate a greater variation in the price of potatoes in areas far from market with varying amounts of surplus than in areas close to market with the same variation in surplus. Surpluses as well as distance should be considered when studying the variation in local prices of potatoes.

The problem of storage.—The prices Minnesota farmers receive for potatoes vary from season to season, depending on the size of the crop in Minnesota and in the United States. If the crop is large, there is little speculative demand and buyers are hard to suit, which results in low prices. If the production is small, buyers are looking for potatoes of all kinds, regardless of grade, and prices are likely to be high.

In general, there are two heavy surplus-producing areas in Minnesota, one in the northwestern part of the state, in Clay, Norman, and Polk counties, and one just north of the Twin Cities, in Anoka, Isanti, and Chisago counties. Other counties in northern Minnesota ship potatoes, but not as large a proportion of the crop as do the counties mentioned. Nearly all of southwestern Minnesota is a deficit potato-producing area. A few counties close to the Twin Cities produce fewer potatoes than are consumed.

Many farmers in Minnesota store their potatoes underground throughout the winter. The cash expense of storage is small as there is very little capital invested in such storehouses. An important item in storage is shrinkage. Farmers storing potatoes from fall to spring can

count on approximately a 15 per cent shrinkage. They must therefore receive about an 18 per cent higher price in the spring than in the fall to make storage pay. Table 21 gives price percentages for December, March, and May, based on the October price, in Minnesota in two surplus- and two deficit-producing areas in good and poor potato-producing years.

Table 21
Price Percentages Based on the October Local Price of Potatoes

	October	December	March	May
Five Good Years				
Surplus areas				
Far from market—northwest.....	100	96	81	85
Close to market—east central.....	100	92	80	94
Deficit areas				
Far from market—northwest.....	100	90	97	90
Close to market—east central.....	100	91	95	87
Five Poor Years				
Surplus areas				
Far from Market—northwest.....	100	122	158	182
Close to market—east central.....	100	121	164	188
Deficit areas				
Far from market—northwest.....	100	108	126	193
Close to market—east central.....	100	114	124	146

The average price for five good years, as determined from the total production of potatoes, decreased 19 per cent from December to March in the three heavy potato-producing counties, Clay, Norman and Polk, in the northwestern part of the state. The price the following May was 15 per cent less. The decreases in price in three surplus-producing counties in the east central part of the state for the same years, from October to December, March, and May were 8, 20, and 6 per cent, respectively. Under such conditions, it would not pay growers to store surpluses for future sale, because they would not only receive a lower price but would lose about 15 per cent of their crop through shrinkage. On the other hand, the person who has to buy potatoes can well afford to postpone buying until spring.

The average price for five poor years in the northwest surplus-producing counties increased 58 per cent from October to the following March and 82 per cent to the following May. In the east central surplus-producing counties, the December price was 21 per cent above that for October, the March price was 64 per cent above, and the May price 88 per cent above. The data indicate that, where a surplus is grown, late selling is most profitable for farmers having small crops. On the other hand, in years of low production, those who have to buy potatoes can ordinarily afford to lay in their supplies early.