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Bulletin 244 May, 1930

Types of Farming in Nebraska

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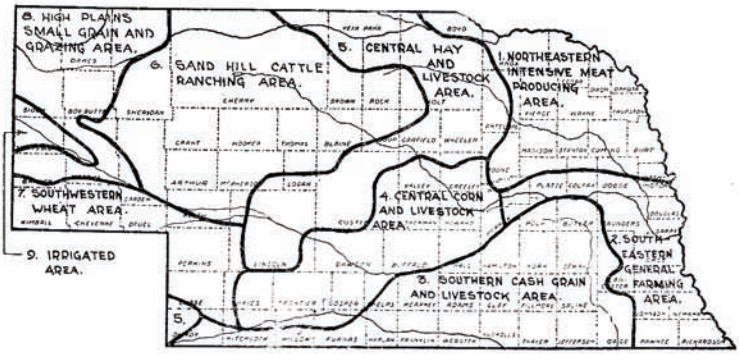

TYPE-OF-FARMING AREAS—BASED ON DIFFERENCES IN THE PREVAILING FARMING SYSTEMS IN THE STATE

THE UNIVERSITY OF NEBRASKA
COLLEGE OF AGRICULTURE
EXPERIMENT STATION
LINCOLN
W. W. BURR, Director

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Types of Farming in Nebraska

HAROLD HEDGES AND F. F. ELLIOTT[1]

"Type of farming" as used in this bulletin is a term descriptive of a group of farms similar in size and enterprise combination. Thus a group of farms having the same kind, quantity, and proportion of crops and livestock may be said to be following the same type of farming. The term "type-of-farming area" refers to an area within which there is a high degree of uniformity in the type of farming practiced and in the physical and economic conditions under which production takes place. This should not be understood to mean that there is absolute uniformity either in farming systems or in other conditions. Such uniformity is rarely if ever found in an area of any considerable size. It is necessary, therefore, to define a type-of-farming area in terms of the farming system which is dominant in the area.

Differentiating the agriculture of a state into areas in this way affords a much clearer picture of the conditions in different parts. It further gives county agents and other agencies advising the farmer a better idea of the limits within which specific recommendations may apply, and also affords a more accurate basis for making such recommendations. Such a study likewise provides a background of information for those engaged in agricultural problems of the state in that it defines the areas within which the problems of production and marketing are similar and further provides a basis for determining the effect which changing economic conditions are likely to have upon particular systems of farming. Just how this works out in a specific case is illustrated in the latter part of the bulletin.

The data used as a basis for this analysis have been obtained from the following sources: State and Federal Division of Agricultural Statistics; Conservation and Survey Division, University of Nebraska; Reports of the State Board of Agriculture and the Bureau of Labor; Department of Agronomy, Nebraska Agricultural Experiment Station; Bureau of the Census, United States Department of Commerce; Weather Bureau and Bureau of Agricultural Economics of the United States Department of Agriculture.

[1] Special acknowledgment is made to A. W. Medlar and R. H. Cole, Nebraska College of Agriculture, for many valuable suggestions in making the study; to W. L. Austin, Chief Statistician for Agriculture, Bureau of the Census, for cooperation in making special tabulations of 1925 census data; and to A. E. Anderson, state and federal statistician for Nebraska, for making available special livestock and crop data. Credit is also due G. E. Condra, Director of the Division of Conservation and Soil Survey, and J. C. Russel, Department of Agronomy, University of Nebraska, for information on the soils and topography of Nebraska, and T. A. Blair, Weather Bureau, Lincoln, Nebraska, for climatological data.

GEOGRAPHY OF NEBRASKA'S AGRICULTURE

Nebraska is primarily an agricultural state—more so, perhaps, than any other state of the Union. According to the 1920 federal census, 41 per cent of all persons gainfully employed in the state were engaged in agriculture, forestry, and animal husbandry. For the United States as a whole 26 per cent were engaged in such pursuits. Furthermore, of those gainfully employed in manufacturing and mechanical industries, in trade and in service occupations, the majority are engaged in handling and processing farm products or in giving service to those so engaged and to farmers. Thus, it is evident that a large majority of Nebraska's population are dependent directly or indirectly upon the agriculture of the state for their living.

LAND UTILIZATION

Land may be utilized in other ways than for crop and livestock production. Forestry is a possible use for land, but Nebraska is not naturally a forest area and possibilities along this line seem quite limited. There is a limited need of land for industrial, business, and residential purposes. Still other possible uses of land and water surface are for recreational purposes, such as hunting and fishing, or perhaps for fur-farming or mining, but any extensive use of Nebraska land for such purposes appears unlikely.

Our main interest is in the utilization of the land of the state for agricultural purposes, and the discussion which follows deals with how and why it is so utilized. In 1927, 48,208,000 acres, or 98 per cent of the total land area of Nebraska, was reported as land in farms. Much of the farm land of the state, however, remains uncultivated, a large proportion from necessity because of the lay of the land or the nature of the soil. Figure 1 furnishes a detailed picture of the situation in Nebraska as regards the proportion of the farm land that is cultivated.[2] The data were secured from the reports of assessors for 1927 and were on a township basis.

For the state as a whole, 37 per cent of the land in farms was under cultivation in 1927, leaving 63 per cent which was utilized for wild hay production, pasture, farmsteads, and woodland, or was idle. In the eastern third of the state from 50 to 90 per cent of the farm land of the townships was under cultivation. In the Sand Hill area of northern Nebraska, where the land is used mainly for grazing and production of wild hay, many townships reported less than 5 per cent of the farm area under cultivation.

[2] Cultivated land does not include the acreage in wild hay—land which has never been plowed.

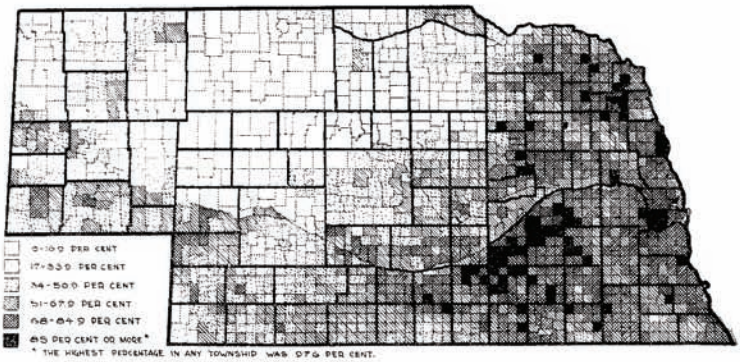


FIGURE 1.—The percentage of Nebraska farm land that was under cultivation in 1927, by townships.

A map appearing later in the bulletin (Figure 9, page 14) shows that the proportion of pasture land is highest where the percentage under cultivation is lowest, as might be expected. A matter of interest, as it may affect future agricultural development, is the area of pasture and hay land which is tillable and may some day come under cultivation if economic conditions warrant. The largest areas of this potentially tillable land are in the extreme western and southwestern counties of the state. Increasing acreages have recently been and are being brought under cultivation in those counties (See Table 1, page 29).

THE CROPPING SYSTEM

Nebraska does not have a large variety of important crops. Her crop production is confined mainly to the staple grain and forage crops. Corn, wheat, oats, alfalfa, and wild hay are of such importance that each occupied a million or more acres of Nebraska farm land in 1927. In that year, which was not unusual as regards crop acreages, 49 per cent of the cultivated area of the state was occupied by corn, 20 per cent by wheat, 13½ per cent by oats, and 7 per cent by alfalfa. The acreage of wild hay, which is not classed as a cultivated crop, was nearly two and one-half times that of alfalfa, being 3,056,000 acres in 1927.

According to the 1925 federal census, the acreage in pasture in 1924 was 46 per cent of all land in farms. That percentage has probably not changed materially since 1924 but may have declined slightly, as indicated above, due to some expansion of the cultivated acreage in western Nebraska. Practically the only means of utilizing pasture land is thru livestock. Furthermore livestock usually provides the best means for economic utilization of the feed grain and forage

crops, which occupy such a large proportion of the farm area of Nebraska. That such Nebraska crops are disposed of largely thru livestock is evident from the small proportions of the crops that are marketed in their original form. For the five-year period, 1923 to 1927, the average proportions of the feed grains and hay that were marketed as such were as follows: corn, 25.6 per cent; oats, 14.9 per cent; barley, 14.4 per cent; all hay, 3.8 per cent.[3] Much of this marketed grain and hay was fed on other Nebraska farms. By far the major part of Nebraska feed crops moved to market in the form of livestock or livestock products.

The assessors' data on crop acreages make it possible to show the geographical distribution of Nebraska's leading crops by townships. As previously indicated, the data for 1927 were used, and that year was not unusual as regards crop acreages. The acreage of each crop in each township is expressed as a percentage of the total land in farms. On the maps which follow (Figures 2 to 8) as in Figure 1, the townships are divided into six groups classified according to the concentration of the crop under consideration. The dark-shaded areas indicate a relatively high concentration of the crop while the light-shaded and unshaded portions indicate that the crop is of little importance as compared with other sections of the state. It is well to note that the percentage grouping differs for each crop.

The explanation of the maps will deal mainly with the distribution of each crop in the state and only incidentally with the reasons for such distribution. A later section of the bulletin will be given over to a more detailed discussion of why the cropping system has come to be as it is.

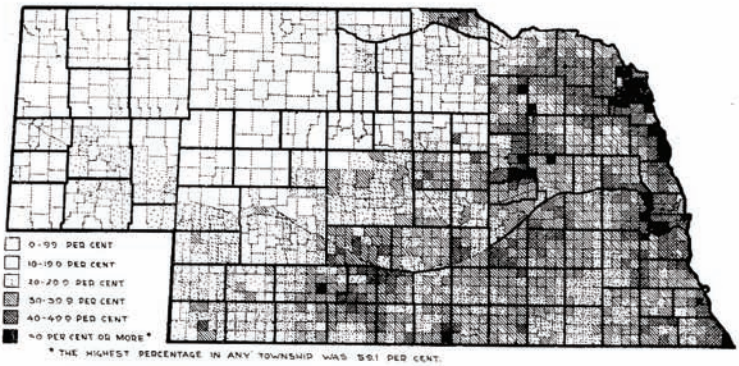


FIGURE 2.—The percentage of Nebraska farm land in corn in 1927, by townships.

[3] Data from Nebraska Agricultural Statistics. 1928.

THE CORN ENTERPRISE IN NEBRASKA

Corn stands in first place among Nebraska farm crops, occupying more than twice the area devoted to any other crop except the grass of the pasture land and native meadow, and having a gross value greater than that of any other crop. In 1927, it occupied 18½ per cent of the land in farms and 49 per cent of the cultivated area of the state. Figure 2 gives evidence that corn is not of equal importance in all sections of the state. It holds a dominant position in the agriculture of eastern Nebraska and is but little less important in central and southern Nebraska. In the north central and western parts of the state, it holds a less dominant place in the cropping system.

Figure 2 shows that the largest area of concentrated corn production is in northeastern Nebraska, extending westward from the Missouri river with the greatest density near the river. In this area several of the townships had from 50 to 60 per cent of their farm land in corn and a much larger number had 40 to 50 per cent. There are several other smaller areas having a high concentration of corn production. One is in east central Nebraska in the lower Platte river valley. Another is somewhat north and east of the center of the state. Still another is along the Missouri river in southeastern Nebraska.

The north central and western parts of the state have the lowest percentage of the farm area in corn. This is largely accounted for by the small percentage of the land that is cultivated. If the percentage in corn were figured on the basis of cultivated acres instead of total farm area, corn would be found to be the principal cultivated crop in practically every part of the state except the "panhandle" section.[4]

Soil and topography are important factors influencing the corn acreage. Areas of concentrated corn production are favored by fertile soils, and in these areas the lay of the land is such that a large proportion of the farm land is under cultivation. Climate, as it may be favorable or unfavorable to high yields of corn, has its influence on the corn enterprise. Economic factors, such as production costs and prices, have their influence, too, since the relative yields and returns from corn and other crops have an important bearing on the choice of enterprises, and the place each occupies in the cropping system.

THE WHEAT ENTERPRISE IN NEBRASKA

Wheat is second in importance to corn as a grain crop, and as a cash crop is equally as important. In 1927, wheat oc-

[4] The "panhandle" section is that part of the state lying west of a line extending northward from the eastern boundary of Colorado.

cupied 20 per cent of the cultivated acreage and 7½ per cent of the total farm area of the state. It is primarily a cash grain crop. On the average about 85 per cent of the crop moves out of the county where grown and smaller portions are sold direct to local mills, so that the part of the crop utilized on the farm for other purposes than seed is quite negligible. Only in cases of abnormally narrow spreads between prices of wheat and feed grains is much wheat used for livestock feed in Nebraska. Experimental trials have shown ground wheat to be equal in value to corn, pound for pound, for fattening livestock.

Wheat is essentially a southern and western Nebraska crop. It is confined largely to the territory south of the Platte river.

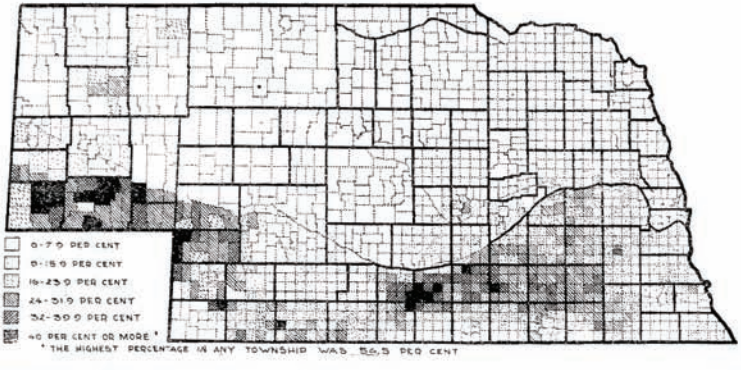


FIGURE 3.—The percentage of Nebraska farm land in wheat in 1927, by townships.

The only wheat area of importance north of the Platte valley is in the "panhandle" sections of the state. Figure 3 shows that the principal area of concentrated wheat production is in the southern tier of counties of the "panhandle" section and in the adjacent counties to the east. In some of the townships in those counties, more than 40 per cent of the farm land was occupied by wheat in 1927. If the percentage were determined on the basis of cultivated area, the dominance of the wheat enterprise would be even more evident. In several of the townships from 65 to 75 per cent of the cultivated land was occupied by wheat in 1927. A second area of some importance in wheat production is in the counties just south of the Platte river in south central Nebraska.

The two areas of concentrated wheat production have a land surface that is level to gently rolling in character, one area being in the high plains region, the other in the loess plains. Hard red winter wheat is the prevailing type grown in Nebraska, except in the northern counties of the "panhandle"

where hard red spring wheat is predominant. On the average, the yields of winter wheat are much higher than of spring wheat, the latter being preferred only in areas where the risk of winter killing is great. In western Nebraska spring wheat is sometimes planted to increase the total wheat acreage. In other words, spring seeding a part of the crop acreage gives better distribution of labor, and spring wheat is preferred among the spring-sown grains. Then, too, spring wheat often is seeded on abandoned winter wheat ground in western Nebraska in preference to other spring-seeded crops.

THE OATS ENTERPRISE IN NEBRASKA

Oats follow corn and wheat in importance as a grain crop in Nebraska. In 1927 oats occupied 13½ per cent of the cultivated land and 5 per cent of the farm area of the state. Production of oats is of most importance in the eastern third of the state, as Figure 4 shows. The area of concentrated oats production is in northeastern Nebraska where corn is the leading crop. The area may be considered as of two parts separated by the Elkhorn river valley.

The oats acreage of northeastern Nebraska is relatively larger on the rolling land of the loess hills region than on the alluvial land of the Missouri and Elkhorn river valleys. On

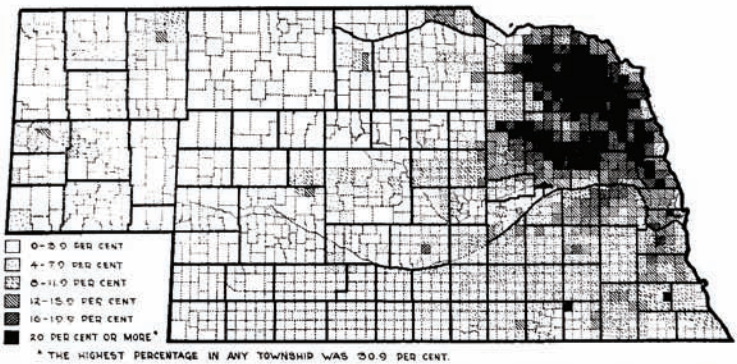


FIGURE 4.—The percentage of Nebraska farm land in oats in 1927, in townships.

the latter type of land, corn can be grown continuously for a longer period of years, with less danger of serious loss of fertility by erosion. Since it is a more profitable crop than oats, there is not the incentive to change as often to the less profitable crops of a short-time rotation. On the loess hills there is more need for the frequent use of oats in rotation and as a nurse crop for legumes since the land will not maintain its productivity so well under continuous cropping to corn.

In southeastern Nebraska, where oats are used to a less extent than in the northeastern part, the oats enterprise has fewer advantages over other small grains. Consequently oats receive less consideration and wheat more. In other areas than those discussed above, oats are used less extensively. Data presented in a later section of the bulletin showing trends in acreage give some evidence of a tendency to substitute barley for oats, particularly in the western part of the state.

THE BARLEY AND RYE ENTERPRISES IN NEBRASKA

From the standpoint of acreage, barley appears quite unimportant in Nebraska. It is deserving of some discussion, however, because of its increasing importance and because it holds a high place among the feed crops of western Nebraska. Some idea of the growing interest in barley among farmers is given by acreage figures of recent years. In 1925 the barley crop occupied 233,000 acres, in 1927, 259,000 acres, in 1928, 430,000 acres, and the estimated acreage for 1929 is 688,000.

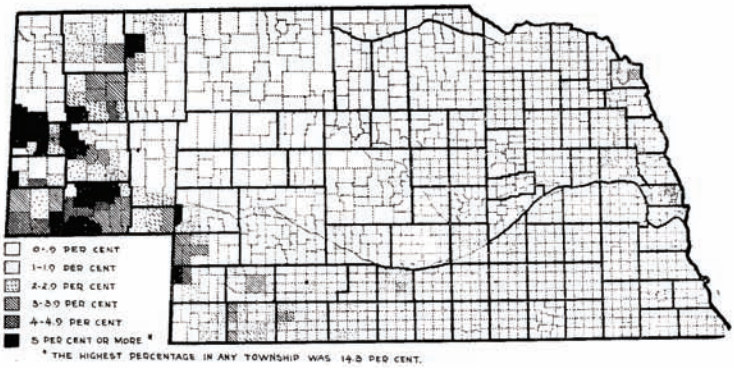


FIGURE 5.—The percentage of Nebraska farm land in barley in 1927, by townships.

Figure 5 indicates that the two areas of concentrated barley production are in the Nebraska "panhandle" section. One is the North Platte valley irrigated area, centering in Scotts Bluff county. The other is the southern tier of counties of this region. In a number of townships in these two areas, the farm land in barley ran from 10 to 14 per cent.

The tendency to substitute barley for oats in some sections of the state has already been mentioned. Costs of producing the two crops are practically the same, but barley will, on the average, produce many more pounds of feed to the acre. Taking the average state yields of the two grains for the five-year period, 1923-1927, barley produced 42 per cent more pounds of grain per acre than did oats. Such an advantage would offset many advantages which oats might have over

barley, and accounts, in large part at least, for the tendency to shift from oats to barley. Furthermore, the decrease in numbers of horses is reducing demand for oats while barley may be utilized as a fattening feed.

Another small grain crop, even less important than barley for the state as a whole, is of some significance in certain areas of the state. This crop is rye. In a belt bordering the Sand Hill section of Nebraska, rye is rather an important crop, occupying as high as 10 to 14 per cent of the farm area in a few townships in Holt and Antelope counties. The fact that the percentage of farm land that is cultivated is relatively low in the belt where rye is most common gives it more significance as a cultivated crop in such areas. Rye finds its greatest usefulness on soils of light texture or of low fertility.

THE ALFALFA ENTERPRISE IN NEBRASKA

Alfalfa is the leading hay crop of the state from the standpoint of tonnage produced. In 1927 it occupied about 2½ per cent of the farm land and 7 per cent of the cultivated area of the state. The main use of alfalfa and of other hay crops in Nebraska is as a part of the livestock ration. For the five-year period, 1923-1927, slightly less than 4 per cent of the hay crop of the state was reported as marketed and a large part of this went to livestock feeders within the state. However, the Platte valley is an important source of market alfalfa hay.

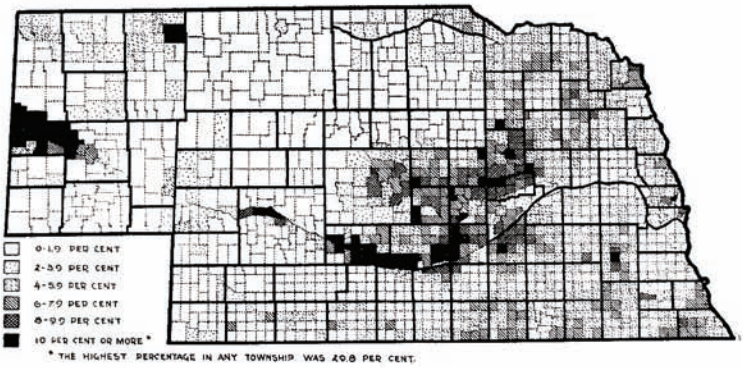


FIGURE 6.—The percentage of Nebraska farm land in alfalfa in 1927, by townships.

Figure 6 gives the geographical distribution of the alfalfa crop in percentage of total land in farms. Aside from the concentration of alfalfa production in the irrigated area of the North Platte valley, this crop is of most importance in the eastern half of the state. The largest area of concentrated

production is in central Nebraska in the Platte and lower Loup river valleys, where irrigation and subirrigation furnish an abundance of moisture. It is interesting to note that the alfalfa acreage of the western two-thirds of the state lies mainly along the course of streams or on other land where an underground supply of water is available. In eastern Nebraska where rainfall is less a limiting factor, much more alfalfa is found on upland.

THE WILD HAY ENTERPRISE IN NEBRASKA

Wild hay occupies more than twice the acreage that alfalfa does in Nebraska but in tonnage is somewhat less important. From the standpoint of feeding value, it ranks still further below alfalfa. In 1927, wild hay occupied 6.3 per cent of the farm land of the state. The acreage cut that year was somewhat greater than usual.

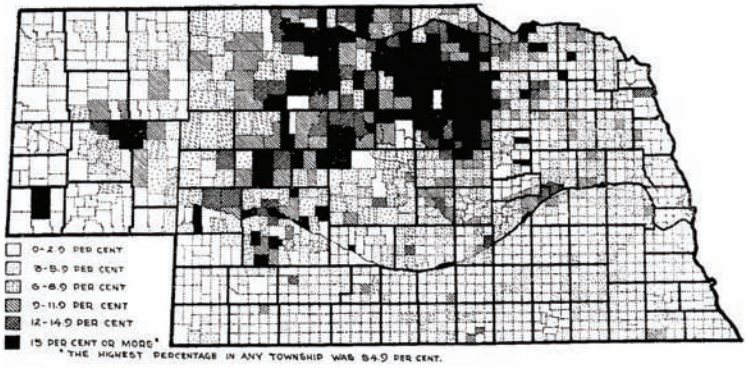


FIGURE 7.—The percentage of Nebraska farm land in wild hay in 1927, by townships.

Figure 7 indicates that the principal area of concentrated wild hay production is in north central Nebraska. This is an area of light soils, where it is highly essential to maintain a grass covering to prevent wind erosion and the development of "blow-outs." Such conditions necessitate a system of agriculture that will utilize to best advantage the native vegetation. This is done by grazing and the cutting of native grass hay.

The area centering in Rock and Holt counties is of considerable importance as a source of market hay of the prairie type, but lessened demand for prairie hay and increasing transportation costs have not been conducive to profits in the commercial hay business of that section in recent years.

ALL HAY AND OTHER FORAGE CROPS

Perhaps a better idea of the forage situation can be given by grouping the alfalfa and wild hay crops with such other forage crops as the sorghums, clovers, and millet. In 1927, about 10 per cent of the total farm land of the state was given over to the production of forage crops. Only in a few limited areas are the hay crops utilized as a source of cash income. In the main hay derives its value by conversion into livestock and livestock products.

Figure 8 gives the geographical distribution of the combined acres of forage crops expressed in percentage of the total land in farms. The commercial prairie hay section lying to the east of north central Nebraska shows the heaviest concentration of hay acreage. The other more limited areas of concentration lie along the Platte and North Platte rivers. The lowest percentage of farm land in hay is found in the high plains area of the "panhandle."

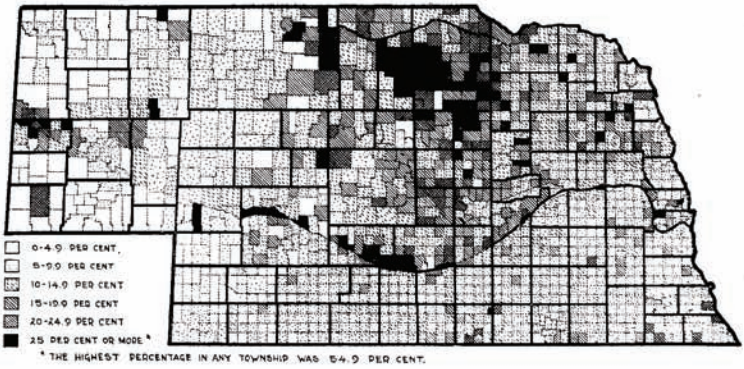


FIGURE 8.—The percentage of Nebraska farm land in hay and other forage crops in 1927, by townships.

The distribution of the alfalfa and wild hay acreages has been given in Figures 6 and 7. Of the other forage crops, sweet clover and other clovers find their greatest usefulness in the eastern half of the state. An interesting development of recent years has been the seeding of clovers on the native hay meadows of the Sand Hill area of the state—a practice which is becoming more and more common and is bringing about distinct improvement in the yield and quality of the hay. Millet and Sudan hays are produced most extensively in the central, south central, and southwestern counties. The sorghums are most extensively grown in the two southern tiers of counties in southwestern and south central Nebraska.

Sudan, the millets, and the sorghums are of particular value in the areas where summer drouth is a hazard.

THE PASTURE ENTERPRISE IN NEBRASKA

From the standpoint of acreage, pasture is highly important in Nebraska, but much less important when considered from the standpoint of feed units produced per acre. Figure 9 gives the percentage of farm land in pasture in 1924. Data from the assessors' reports used for most of the preceding maps gave no information on pasture acreage. It was necessary, therefore, to resort to the federal census of 1925, which gives the acreage in pasture for 1924 by counties. The situation as regards the proportion of pasture land has probably not shown any material change since the census year, 1924, except possibly in western Nebraska where there has been further breaking of native sod to expand crop production.

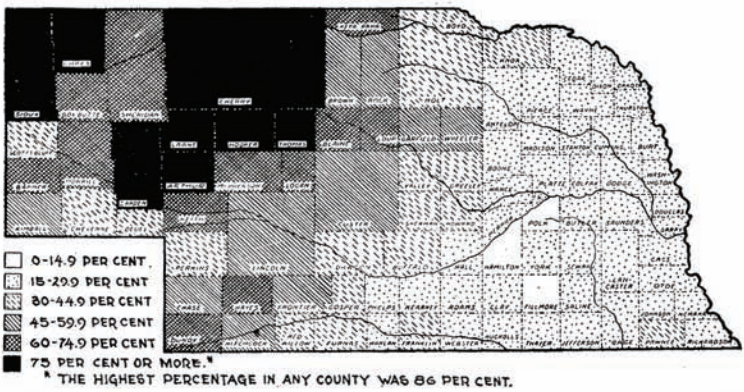


FIGURE 9.—The percentage of Nebraska farm land in pasture in 1924, by counties. (From 1925 census.)

The north central and northwestern counties show the highest proportions of land in pasture. Rough topography or soil of such character as to make tillage inadvisable is the main factor accounting for a high percentage of farm land in pasture. Southern and eastern counties are favored by a high percentage of tillable acres because of a heavier type of soil and climatic conditions which make for greater certainty of returns from the cultivated crops.

The chief vegetation of Nebraska's permanent pastures, particularly in the western two-thirds of the state, is the native wild grasses—bluestems, gramas, buffalo grass, panicums, wheat grasses, and a large variety of others. In eastern Nebraska blue grass has become the prevailing grass

in the permanent pasture. In the rotation pastures, sweet clover is becoming of increasing importance. Other crops used in pastures include other clovers, alfalfa, rye, and Sudan. In total acreage they are unimportant, but they hold a high place in certain areas.

CROP COMBINATIONS

The foregoing discussion has dealt mainly with the geographical distribution of the various crops over the state. The significance of each crop becomes more apparent when considered in relation to other enterprises. The different crop enterprises are fitted in together to make up the cropping system (see Figure 16, page 23).

What are the factors which determine the choice of enterprises in a particular region of the state? Why, for example, are corn and oats the dominant grain crops of northeastern Nebraska while in southeastern Nebraska wheat is about equally as important as oats? Such factors as soil and climatic conditions, relative yields, variability of yields, labor requirements, relation to livestock enterprises and the like have their influence. Following the discussion of the livestock enterprises, an explanation will be made of the different types of farming that have been adopted in different parts of Nebraska; and, as far as possible, the reasons why types are as they are will be given.

THE LIVESTOCK SYSTEM

Livestock holds an important place in Nebraska agriculture. As an average for the five-year period, 1923-1927, 75 per cent of the gross farm income of Nebraska farmers was derived from the sale of livestock and livestock products.[5] Nebraska's distance from markets necessitates the conversion of bulky farm crops into products of less volume in proportion to value in order to reduce transportation costs. This process is accomplished in part thru livestock.

As is true of the farm crops, the livestock enterprises are not of equal importance in all parts of the state. There are distinct differences in the geographical distribution of the several types of farm animals. Assessors' data on a township basis were not available for livestock, so other data on a county basis were used—namely, estimates of livestock numbers for January 1, 1928.[6] The data were worked out on the basis of number of head per 640 acres of farm land, and thus the relative concentration is shown for each class of livestock on the maps which follow (Figures 10 to 14).

[5] Data from Nebraska Agricultural Statistics, 1928.
[6] Data from Nebraska Agricultural Statistics, 1928.

THE HOG ENTERPRISE

Hog production is the most important livestock enterprise in Nebraska when measured in terms of gross farm income. For the five-year period, 1923-1927, 30 per cent of the gross farm income of Nebraska farmers was derived from hogs. Figure 10 shows that the distribution of hogs coincides fairly closely with the distribution of corn acreage. (Compare Figures 2 and 10.) The areas of densest hog production, however, do not correspond precisely with the areas having the highest concentration of corn production. Northeastern Nebraska is the most important area of hog production. Burt county had 327 head of hogs per section of land in 1928 and four other counties in that section of the state had over 250

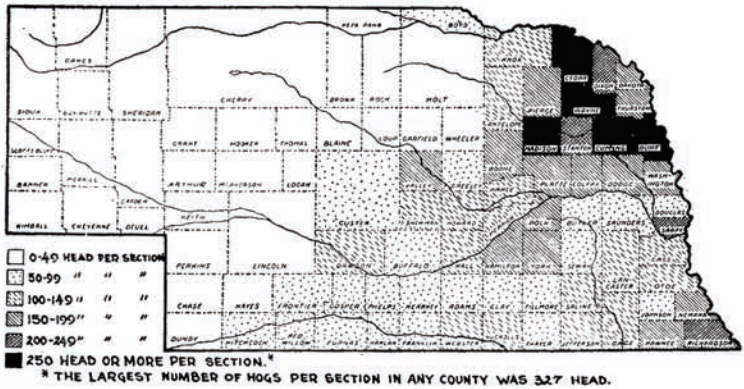


FIGURE 10.—The number of hogs per section (640 acres) of Nebraska farm land on January 1, 1928, by counties.

head per section. The Sand Hill section and western and southwestern Nebraska had the fewest hogs per section. The Sand Hill area is a region having a large percentage of hay and pasture land—and that not of very high productivity—and low production of feed grains. Western and southwestern Nebraska have more feed grain available but the types of hay and pasture are not as suitable for hog as for cattle production, because legumes are lacking.

The data used do not fully reflect the relative importance of hogs in different parts of the state. For example, in northern and northwestern Nebraska where feeder pig production is a common practice, marketing has been practically completed by January first, when estimates of numbers are made. In eastern Nebraska where production of slaughter hogs is the prevailing practice, a large proportion of the hogs on hand on January 1 are market hogs. However, a more satisfactory means of showing the geographical distribution of the hog enterprise is not at hand.

THE BEEF CATTLE ENTERPRISE

Beef cattle are almost as important a source of gross income of Nebraska farmers as are hogs. For the five-year period, 1923-1927, sales of cattle and calves made up 28 per cent of the gross income as compared with 30 per cent from hogs. The statistics available do not permit an entirely satisfactory reflection of the geographical distribution of beef cattle in Nebraska. The data which were used in preparing Figure 11 were the January 1, 1928, estimates of cattle other than milk cows.

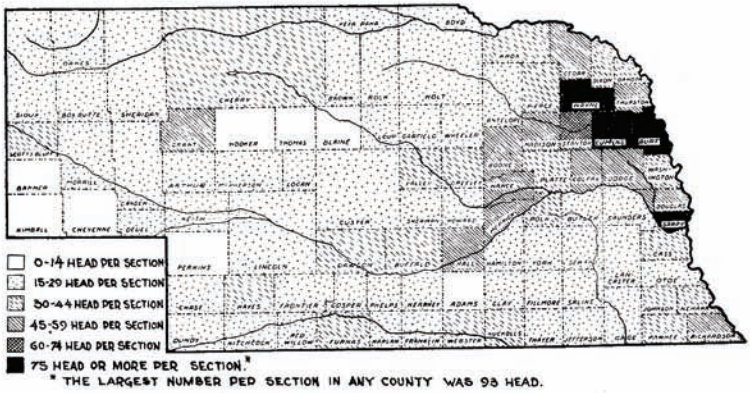


FIGURE 11.—The number of cattle other than milk cows per section (640 acres) of Nebraska farm land on January 1, 1928, by counties.

Such data do not permit a complete differentiation between the beef cattle and dairy enterprises. Furthermore, the data, being for the number of cattle on farms on January 1, do not give a true reflection of the relative importance of beef cattle in different sections of the state. For example, in the Sand Hill area, the number of cattle on January 1 is at about the low point of the year, being at the close of the fall movement of feeder and grass-fat cattle from the ranches. In the feeding areas of eastern Nebraska, the feed lots are ordinarily filled during the fall months. Most of the cattle on feed are still on hand on January 1 so the number on farms on that date would be unusually large. Hence, Figure 11 should be studied with such differences in mind.

Figure 11 shows by counties the number of cattle other than milk cows per section (640 acres) on January 1, 1928. The heavy concentration of beef cattle was in northeastern Nebraska, where the number of hogs per section was also highest. Another region of some importance is the area east, southeast, and south of the center of the state. Still another area of some concentration of beef cattle lies to the west of

north central Nebraska. This area is even more important than is indicated on the map for reasons explained in the preceding paragraph.[7]

The areas showing the fewest cattle per section were the southern "panhandle" and southwestern sections of the state where the quality of pasture is low, hay is scarce, and the proportion of land in feed grains is relatively small.

The kind and quantity of the feed grains, forage, and pasture largely determine the type of cattle enterprise—whether it is the production of feeding cattle, the raising and finishing of market cattle, or commercial feeding. The high proportion of farm land in hay and pasture in the Sand Hill section has resulted in the production of feeder cattle and, to a limited extent, of grass-fat cattle. The large production of feed grains, together with forage crops and pasture, has contributed to the development of commercial feeding, particularly in eastern Nebraska. A more detailed discussion of this phase of the subject will come later in the bulletin.

No statistics are available to indicate what proportion of the cattle marketed by Nebraska farmers come from outside the state. It is probably rather small. Data are available, however, to indicate what proportion of the cattle marketed from farms are produced locally. From statistics on cars of cattle forwarded and received at local shipping points,[8] it is found that for the four-year period, 1924-1927, between 35 and 40 per cent of the cattle forwarded from local stations were received there from other points. There were, however, wide differences between sections of the state, as data presented later will indicate.

THE DAIRY ENTERPRISE

Nebraska is seldom thought of as a dairy state and does not have any extensive area which might be considered a dairy section. However, the dairy enterprise is of considerable significance in many sections of the state even tho it may be supplementary to other more important enterprises. For the five-year period, 1923-1927, receipts from the sale of dairy products made up about 6 per cent of the gross income of Nebraska farmers. Since 1920, the dairy enterprise has gained rapidly in importance and in 1928 it ranked next to hogs and cattle among the livestock enterprises, providing 7 per cent of the gross farm income.

Figure 12 gives the geographical distribution, by counties, of milk cows expressed in number per section of land. The

[7] The unequal distribution in the Sand Hill counties may be due, in part, to the fact that cattle are counted in the counties where ranch headquarters are located.
[8] From Nebraska Agricultural Statistics, 1927.

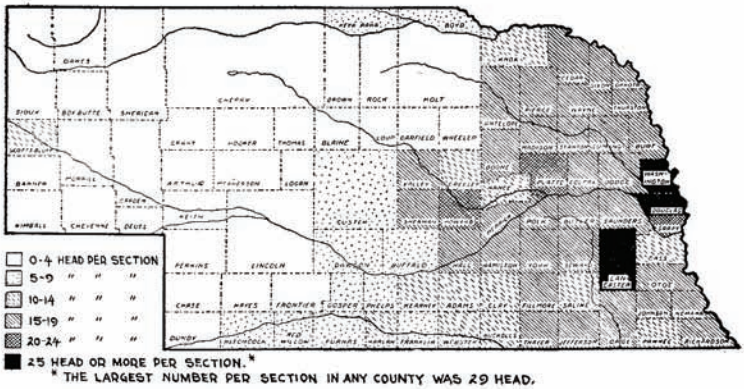


FIGURE 12.—The number of milk cows per section (640 acres) of Nebraska farm land on Januaary 1, 1928, by counties.

highest concentration of milk cows is in counties adjacent to large cities, namely, Douglas and Washington counties, near Omaha, and Lancaster county, in which Lincoln is located. Satisfactory whole milk markets have contributed to profitable dairying near the larger cities. Aside from the counties named above, the distribution of milk cows is fairly uniform in the eastern third of the state. The areas of low concentration are the north central, southwestern, and western counties (excepting Scotts Bluff county), the lowest being in the Sand Hill section.

Butterfat is the prevailing form in which dairy products are sold. Production of fluid milk is of major importance only near Omaha and Lincoln. Cheese manufacture is a growing industry in the North Platte valley, particularly in Scotts Bluff county. Thruout most of the state, however, cream is separated from the milk on the farm and sold on a butterfat basis. In some localities where dairying is important, the butter is manufactured in local creameries, but much more often the cream is assembled locally and shipped to centralized creameries where it is manufactured into butter.

THE POULTRY ENTERPRISE

Poultry ranked next below hogs and beef cattle among the livestock enterprises as a source of income during the five-year period, 1923-1927, but is now exceeded by dairying. For the five-year period, 1923-1927, sales of poultry products provided 6½ per cent of the gross income of Nebraska farmers. Commercial poultry farms are relatively unimportant in Nebraska. The great bulk of the poultry products is produced on farms where the enterprise is handled as a side line. In the majority of cases, the housewife cares for the poultry. It

furnishes the family with eggs and meat, and the surplus products are disposed of mainly to pay family expenses.

Figure 13 shows that the greatest concentration of poultry is in southeastern and east central Nebraska, and the number per section decreases rather rapidly toward the north and west thru the state. The greater number of farms, the larger feed supply, and the better markets are factors accounting for more poultry in eastern and southern Nebraska. Turkey

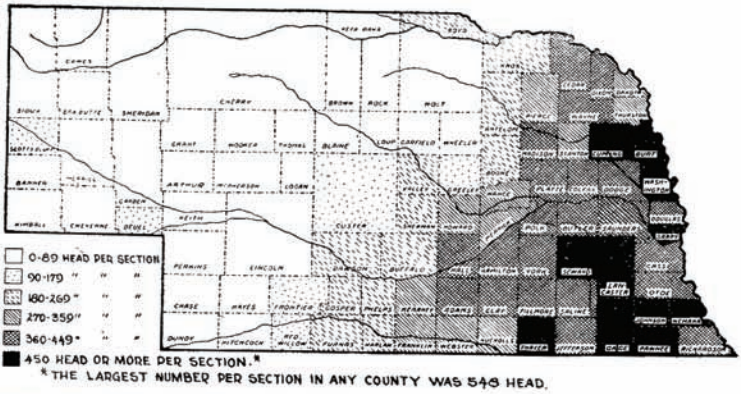


FIGURE 13.—The number of poultry per section (640 acres) of Nebraska farm land on January 1, 1928, by counties.

raising is on the increase and is of some importance in the North Platte valley of western Nebraska.

THE SHEEP ENTERPRISE

Sheep are of importance in only limited areas of the state. For the period from 1923 to 1927 about 3 per cent of the gross income of Nebraska farmers was derived from sheep. The phase of most importance is feeding for market. Sheep are shipped into certain feeding areas, largely from western range states, and finished. Since they are put into feed-lots in the fall and disposed of in the late winter and early spring, the January 1 figures for numbers on farms give undue emphasis to the feeding areas of the Platte valley. Figure 14 shows that Scotts Bluff, Merrick, and Sarpy counties are the most important feeding centers, but Hall, Nance, and Burt counties also have large commercial feeders of sheep.

Commercial sheep-feeding furnishes a means of marketing surplus feeds, usually to good advantage. Beet sugar by-products and alfalfa in the Scotts Bluff area and corn and alfalfa in the central and eastern Nebraska feeding sections are the basic rations.

General farm flocks of sheep are found most often in eastern and central Nebraska, and least often in the Sand

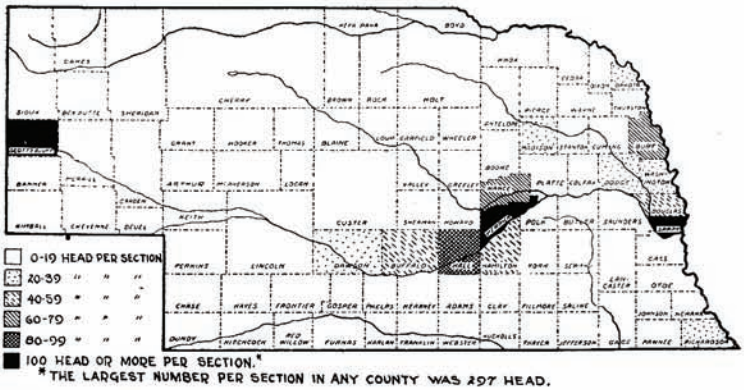


FIGURE 14.—The number of sheep per section (640 acres) of Nebraska farm land on January 1, 1928, by counties.

Hill area. The sale of wool and lambs furnishes the income. Sheep are often useful in utilizing farm feeds otherwise wasted, and in eradicating weeds.

COMBINATIONS OF CROP AND LIVESTOCK ENTERPRISES

The foregoing discussion has dealt mainly with the geographical distribution of the various crops and kinds of livestock over the state. The true significance of each crop and livestock enterprise becomes apparent only when considered in relation to others. The different enterprises fit in together to make the farming system. Just as Figures 2 to 14 show regional differences in distribution for individual crops and kinds of livestock, so there are distinct regional differences in the combinations of crops and livestock which make up farming systems. In Figure 15 is shown the way in which the crop and livestock enterprises are combined in the different counties of the state. There is also shown the way in which the counties tend to group themselves into areas of similar crop and livestock organizations.

The boundaries of type areas, however, do not conform to county lines. Figure 16, which is based on township data, shows a more accurate division of the state into areas which are rather distinct from each other in the nature of the cropping and livestock system which prevails in each. These have been designated as type-of-farming areas. The state has been divided into nine areas and to each a name has been given which is descriptive of the prevailing type of farming and the location in the state. The nine areas are: the Northeastern Intensive Meat Producing Area; the Southeastern General Farming Area; the Southern Cash Grain and Livestock Area; the Central Corn and Livestock Area; the Central

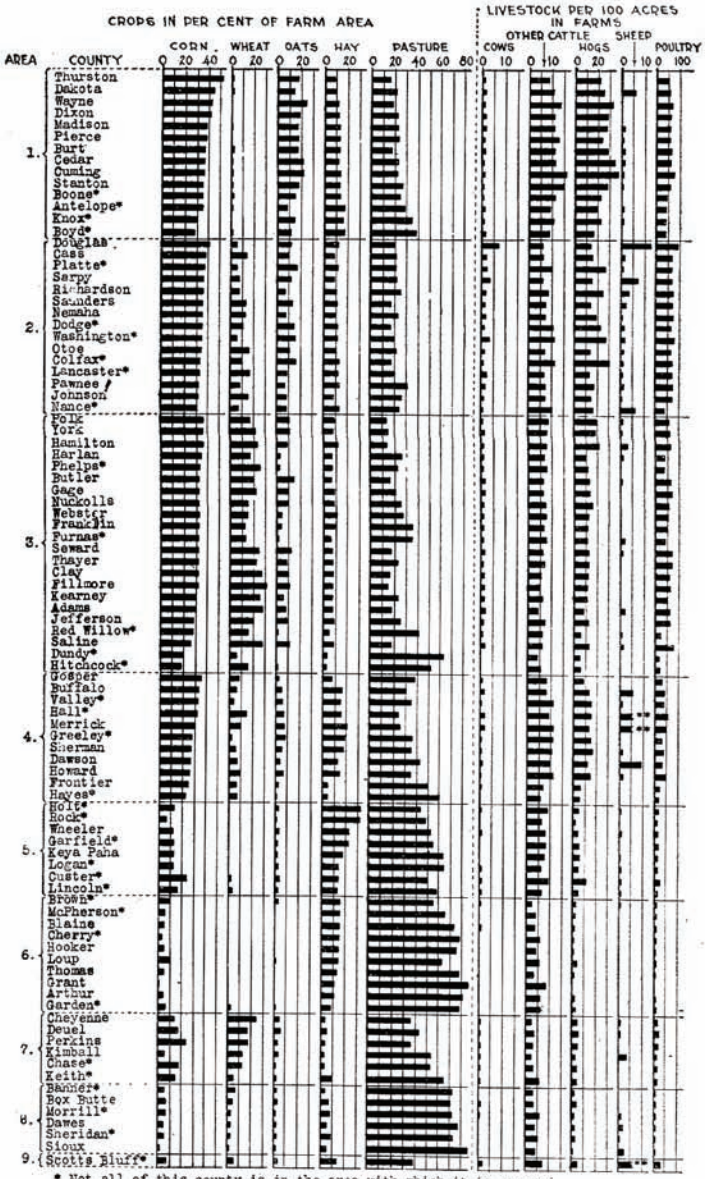
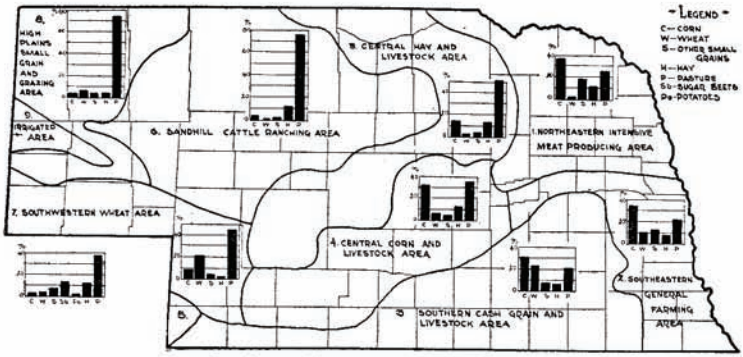


FIGURE 15.—Distribution of the crop area and kinds of livestock, by counties and type-of-farming areas in Nebraska. (1925 census data.)



Graph outside map refers to Area 9.

FIGURE 16.—Proportion of the land in farms devoted to the principal crops, by type-of-farming areas, in Nebraska in 1927.

Hay and Livestock Area; the Sand Hill Cattle Ranching Area; the Southwestern Wheat Area; the High Plains Small Grain and Grazing Area; and the Irrigated Area.

No sharply defined boundary lines can be drawn between the areas. In most instances the transition from one to another is gradual. Furthermore, the boundaries cannot be set permanently because changes in the economic conditions surrounding agriculture cause changes in farming systems. The differences lie mainly in the dominant enterprises and their relative importance in the farming systems. The discussion of the factors which account for the development of distinct types of farming in the different areas will be deferred for a time.

THE TYPE-OF-FARMING AREAS

What combinations of crop and livestock enterprises do we find in the nine areas into which the state has been divided?

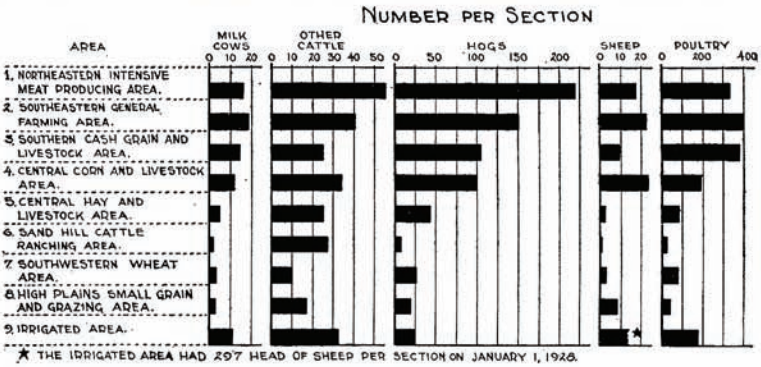


FIGURE 17.—Combinations of the livestock enterprises, by type-of-farming areas, in Nebraska on January 1, 1928.

What is the relation of enterprises to one another in each area? Figure 16 gives not only the division of the state into type areas but also the combination of crops within each area. The proportion of the farm acreage which each important crop occupies in each area is given in the small charts superimposed on the map. In Figure 17 is given similar information on the livestock enterprises and their relative importance in each area. Thus, by observing Figures 16 and 17, the significant differences in the cropping and livestock systems of the nine areas are seen.

HOGGING DOWN CORN IN THE NORTHEASTERN INTENSIVE MEAT PRODUCING AREA

NORTHEASTERN INTENSIVE MEAT PRODUCING AREA.—In this area the corn crop is of outstanding importance, occupying about 37 per cent of the farm area. Of the other grain crops, oats occupy about 17 per cent of the farm land. Barley and wheat occupy only a small part of the farm area. The hay acreage occupies about 12 per cent of the farm land, with tame hays of greatest importance from the standpoint of tonnage, and, in the southern part, in acreage as well. Twenty-five per cent of the farm land is used for pasture. The outstanding importance of both beef cattle and hogs provides the reason for calling it an intensively meat-producing area.

SOUTHEASTERN GENERAL FARMING AREA.—In this area is a cropping system which includes the same important crops found in the Northeastern Meat Producing Area with winter wheat as an additional crop of some importance. The latter crop is substituted for some of the oats and corn. Hay and pasture occupy a somewhat smaller proportion of the farm

area. Beef cattle and hogs are also less important than in Area 1 but still are major sources of income, while dairy cattle and poultry occupy a slightly larger place in the livestock system. Thus there is a wide diversity in the sources of income—hogs, beef cattle, cash grain, and dairy and poultry products—hence the name that is given the area.

SOUTHERN CASH GRAIN AND LIVESTOCK AREA.—Here the wheat enterprise has gained in importance over Area 2 and occupies about 22 per cent of the farm area. Corn remains the leading crop, however, occupying nearly a third of the farm land. Oats and hay are less important than in Areas 1 and 2, and the pasture land, while nearly as large in acreage, has a somewhat lower carrying capacity. The smaller hay and pasture acreages and their lower productivity account for the fact that there are fewer cattle in this than in the areas to the north and east. Feed grains are relatively plentiful, resulting in a somewhat higher ratio of hogs to cattle than in any other area of the state. The dairy and poultry enterprises have gained somewhat in importance relative to the other livestock enterprises. The importance of wheat as a cash grain, supplementing livestock as a source of income, accounts for the name given the area.

CENTRAL CORN AND LIVESTOCK AREA.—This area is characterized by having corn dominant among the cultivated crops. The hay enterprise is also quite important, more so than in

A TYPICAL LANDSCAPE IN THE SOUTHEASTERN GENERAL FARMING AREA. WHEAT IN THE FOREGROUND AND CORN, THE LEADING CROP OF THE AREA, IN THE BACKGROUND

the three areas already discussed. More than a third of the farm land is utilized as pasture, due to the rolling and somewhat broken character of the land surface. Beef cattle occupy a higher place among the livestock enterprises than in Areas 1, 2, or 3, as might be expected with hay and pasture occupying so much of the farm land, but dairying and hogs are also important sources of income. Sheep feeding is important in limited areas in the Platte valley. Livestock is more important in the northeastern than in the southwestern part of the area, largely because of the higher productivity of the hay and pasture land and greater certainty of crop production in the former.

THE LEVEL LOESS PLAINS OF THE SOUTHERN CASH GRAIN AND LIVESTOCK AREA

CENTRAL HAY AND LIVESTOCK AREA.—This area is distinguished by the dominance of hay and pasture in the cropping system. Hay occupies nearly 14 per cent of the farm land and pasture slightly more than 50 per cent. Hay is a cash crop in some sections of the northern part. Corn is the principal grain crop but small acreages of oats and rye (together with winter wheat in the southern part) are also grown. The beef cattle enterprise is the most important in the livestock system, with hogs, dairy cattle, and poultry added sources of income.

SAND HILL CATTLE RANCHING AREA.—This is essentially a cattle-producing region. With more than three-fourths of the farm land in pasture and most of the remainder utilized

for hay (because the soil is not adapted to cropping), the cattle enterprise is the logical one for the area. The hay, together with very limited quantities of grain, provides winter feed for a breeding herd. The nature of the vegetation is such that production of feeder cattle rather than grass-fat cattle is the rule in the area.

THE ROLLING TOPOGRAPHY OF THE CENTRAL CORN AND LIVESTOCK AREA. CORN IS THE LEADING FARM CROP

SOUTHWESTERN WHEAT AREA.—Here the wheat enterprise is dominant in the cropping system. There is a large proportion (45 per cent) of the farm land in pasture but its carrying capacity is quite low. The acreage in hay is also very small. Corn is the second grain crop in importance in the eastern part of the area but barley exceeds it in acreage in the western part. Livestock is of less importance than in any other area of the state. Beef cattle and hogs provide some income, but not nearly so large a proportion of the total as in areas farther east.

HIGH PLAINS SMALL GRAIN AND GRAZING AREA.—This area has a cropping system in which the small grains predominate among the cultivated crops. Wheat and barley are the leading small grains. Corn is of greatest importance along the eastern border of the area. Commercial potato growing is a major enterprise in limited sections. The high proportion of the farm land in pasture is utilized by beef cattle, and to a limited extent by sheep. Some hogs are raised. This area is in a period of rapid transition. More of the land is being

brought under cultivation. Crop farming is partially supplanting and materially changing cattle production in this region.

IRRIGATED AREA.—This area is confined in large part to Scotts Bluff county. Less extensive irrigated sections outside the area are found along the Platte river valley and in other river valleys of western Nebraska. In the North Platte district, sugar-beet production holds a high place in the cropping system, with small grains, alfalfa, potatoes, corn, and beans of less importance. Sheep feeding is a major livestock enterprise and, together with cattle feeding, offers a means of utilizing the by-products of the sugar beet industry and the hay and feed grains produced in the area. Dairying is an enterprise that is gaining. Hog production is relatively unimportant.

HISTORICAL DEVELOPMENT OF NEBRASKA'S AGRICULTURE

Nebraska of the twentieth century is totally different from Nebraska at the opening of the nineteenth century. Scattered bands of Indians made up the human population in that early day. Herds of bison roamed over the broad plains. But few white men had entered the present borders of the state and they despaired of its agricultural possibilities. It was described as a desert waste by many travelers who crossed its broad expanse. Geographers of that early day called the wide area west of the Missouri river the Great American Desert.

The great "desert waste" has been transformed since the first farmers settled in eastern Nebraska near the middle of the nineteenth century. Agriculture has been developed to such an extent that Nebraska has come to be a leading state in the production of farm products. That development is still in progress.

CHANGES IN UTILIZATION OF LAND

The first way in which Nebraska lands were utilized extensively by man was as a grazing area for cattle. Nebraska was a midway point on the old cattle trails which extended from Texas to Montana and the Dakotas. Where the trails crossed the lines of railroads which traversed the state, important loading points sprang up from which grass-fat cattle were shipped eastward to market. The passage of the Homestead Act of 1862 and other land-settlement legislation brought about a rapid settlement of the state. The sod was broken and cultivated crops came to occupy more and more of the land. More often than not the life of the early settlers was hard but the will to persevere and changes in farming

practices to conform with existing conditions carried most of them thru to better times.

Table 1 gives some idea of the course that land settlement and land utilization has taken since 1899 in the nine type-of-farming areas that are shown in Figure 16. Eastern and southern Nebraska were practically all settled prior to 1899 but agricultural development in the remainder of the state has been more recent. In Table 1 are shown the proportions of the total land area utilized in each of the following ways: (1) cultivated acres, (2) wild hay, (3) pasture, farmsteads, or idle land, and (4) land not in farms. The totals of culti-

TABLE 1. *Utilization of land area of Nebraska* [1]

Area	Land utilization	1899	1909	1919	1924	1928
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1. Northeastern intensive meat producing area	Cultivated area	48.2	51.1	53.3	53.9	62.4
	Wild hay	7.3	6.6	5.0	5.1	5.1
	Pasture, etc.[2]	32.8	32.1	29.7	30.4	28.4
	Land not in farms	11.7	10.2	12.0	10.6	4.1
2. Southeastern general farming area	Cultivated area	61.1	58.4	60.3	59.3	63.0
	Wild hay	6.5	4.6	3.5	3.2	3.1
	Pastures, etc[2]	26.6	29.4	27.0	26.9	32.1
	Land not in farms	5.8	7.6	9.2	10.6	1.8
3. Southern cash grain and livestock area	Cultivated area	62.6	63.7	65.9	64.8	67.1
	Wild hay	4.5	3.4	3.0	2.7	2.7
	Pastures, etc.[2]	29.5	28.7	25.6	25.1	28.1
	Land not in farms	3.4	4.2	5.5	7.4	2.1
4. Central corn and livestock area	Cultivated area	37.7	42.4	44.2	46.2	47.9
	Wild hay	4.7	6.1	5.7	5.0	4.9
	Pastures, etc.[2]	46.2	43.0	41.7	40.7	39.8
	Land not in farms	11.4	8.5	8.4	8.1	7.4
5. Central hay and livestock area	Cultivated area	11.7	15.7	19.6	20.9	22.0
	Wild hay	5.2	10.4	13.8	12.2	11.7
	Pastures, etc.[2]	33.3	54.0	53.3	46.3	63.3
	Land not in farms	49.8	19.9	13.3	20.6	3.0
6. Sand hill cattle ranching area	Cultivated area	.5	2.0	3.9	4.1	4.2
	Wild hay	3.9	8.3	10.5	10.5	11.0
	Pastures, etc.[2]	11.3	42.2	63.2	66.4	80.3
	Land not in farms	84.3	47.5	22.4	19.0	4.5
7. Southwestern wheat area	Cultivated area	4.0	8.0	22.0	30.3	37.2
	Wild hay	3.5	2.3	1.4	.8	.8
	Pastures, etc.[2]	40.9	41.9	47.5	41.7	59.0
	Land not in farms	51.6	47.8	29.1	27.2	3.0
8. High plains small grain and grazing area	Cultivated area	1.8	4.6	8.3	10.7	15.5
	Wild hay	1.7	4.0	2.9	2.3	2.1
	Pastures, etc.[2]	35.4	66.2	77.5	67.9	79.1
	Land not in farms	61.1	25.2	11.3	19.1	3.3
9. Irrigated area	Cultivated area	3.4	11.6	25.3	32.2	39.2
	Wild hay	3.4	5.1	2.1	2.1	1.7
	Pastures, etc.[2]	29.8	44.6	31.8	37.1	49.0
	Land not in farms	63.4	38.7	40.8	28.6	10.1

[1]Data for 1899, 1909, 1919, and 1924 are from the census reports. Data for 1928 are from Nebraska Agricultural Statistics and may not be strictly comparable.

[2]Pastures,etc. include pasture, farmsteads, and waste or idle land.

vated acres, of wild hay acreage, and of pasture, farmsteads, or idle land give the proportion of the total land area that is in farms.

The data for 1928 in Table 1 are not fully comparable to those for the other years indicated, especially as regards land not in farms. For the period from 1899 to 1924, as given by the federal census reports, no material changes are shown in Areas 1, 2, 3, and 4 in the proportion of land under cultivation. In the remaining five areas, increasing proportions of the land have come under cultivation, with the largest increases in Areas 7 and 9. The percentage of land area in wild hay decreased from 1899 to 1924 in Areas 1, 2, 3, 7, and 9, changed but little in Area 4, and increased in Areas 5 and 6. In Area 8 the proportion of land in wild hay has decreased since 1909.

The proportion of land in pastures, farmsteads, and waste and idle land has remained with but little change in Areas 1, 2, 3, 4, and 7. In the other areas, this percentage has increased since 1899 as the proportion of land not in farms has decreased.

The agriculture of eastern Nebraska is undoubtedly on a more stable basis than is that of western Nebraska and therefore less subject to material change. Even so, substantial changes in the agriculture of the eastern part of the state are well within the realm of possibility. Economic conditions may change and necessitate a shift in farming practices, or other situations may arise of sufficient import to alter the production program. It is therefore unwise to regard the agriculture of any area of the state as settled and unchangeable.

CHANGES IN SIZE OF FARMS

There has been a slight tendency for the size of farms to change somewhat, more apparent in some areas of the state than in others. Data are not available to permit a study of changes in size of farms by type areas prior to 1910. Figure 18, however, presents the census data on size groupings of Nebraska farms by type areas for the three census years, 1910, 1920, and 1925. In Area 1, the Northeastern Intensive Meat Producing Area, there has been a slight tendency for the farms of the main size grouping, 100 to 175 acres (120- and 160-acre farms, largely), to increase in number at the expense of farms of larger acreage. The prevailing size group of Area 2 is the same as in Area 1—the 100- to 175-acre farms. Again there was a slight increase from 1910 to 1925 in the number of farms in this group, while farms under 50 acres and over 500 acres decreased in number.

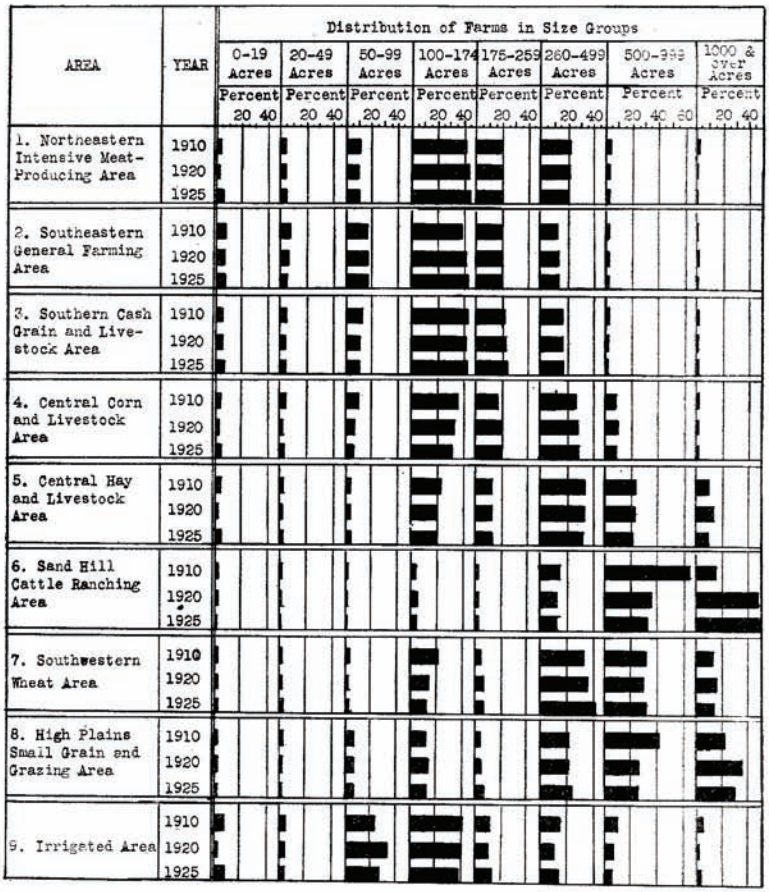


FIGURE 18.—Changes in the number of farms in each size group, by type-of-farming areas, as shown by federal census reports for Nebraska. The size of the groupings of the census do not permit showing in a fully satisfactory way the changes taking place in size of farms. For example, in the 260-499 acre group, both the 320 and 480 acre farms are included, so shifts from one size to the other might take place, and the group total would not show the change.

In Areas 3 and 4, there is a little trend toward farms of larger size. In Area 5 little change is shown, unless it is a slight decrease in the number of farms over 500 acres and a slight increase in the 175- to 259-acre group. A rather distinct change may be noted in Area 6 after 1910. The Kinkaid Act of 1904 permitted the homesteading of 640-acre tracts in the Sand Hill area so that in 1910 the number of farms in the 500- to 999-acre group was the largest. Since 1910, there

has been a strong tendency for individual holdings in the Sand Hills to increase in size.

In the Southwestern Wheat Area, farms over 175 acres in size have increased in number. In Area 8 farms of the 500- to 999-acre group decreased in number from 1910 to 1920, while the number of farms in size groups above and below the 500- to 999-acre group increased. From 1920 to 1925 farms from 175 to 500 acres in size increased at the expense of those of 1,000 acres and over. In the Irrigated Area the trend from 1910 to 1920 was toward farms of smaller acreage. From 1920 to 1925, farms from 175 to 499 acres in size gained in numbers, while the number in the size groups containing 80- and 640-acre farms decreased.

CHANGES IN THE CROPPING SYSTEMS

The cropping system which prevails in a type area is constantly subject to modification. The same proportions of the cultivated land are not devoted to the individual crops year after year. Growing conditions may cause modifications. Winter killing may reduce the wheat acreage, and the abandoned acreage may be put into oats or corn. Adverse weather at planting time may cut the corn acreage somewhat. Such changes are usually only for a season and a return to the normal acreage is made the following year.

There are other factors, however, that may have more permanent effect on the cropping system. Such factors as insect pests, plant diseases, development of improved methods of production, discovery of new varieties of crops or new uses for products, and finally, changes in price relationships may bring about lasting modifications in cropping systems. A later section of the bulletin will discuss such factors in greater detail.

Figures 19, 20, and 21 show the changes in the cropping systems of the nine type areas since 1910. The area devoted to each crop is expressed in percentage of the total acreage in the principal cultivated crops for each year. Thus, the variations in the width of the bands extending across the chart for each area give evidence of the changes in the relative importance of the principal crops of the area.

In the Northeastern Intensive Meat Producing Area, the wheat acreage has decreased materially since 1910. (See Figure 19.) Alfalfa gained in acreage from 1910 to 1916 but there has been little change since. Corn has gained more than oats from the decrease in wheat acreage. In the Southeastern General Farming Area the trend of wheat acreage has likewise been downward since 1910, while the corn acreage has gained. (See Figure 19.) Oats have shown no material change in acreage since 1910. In Area 3, the

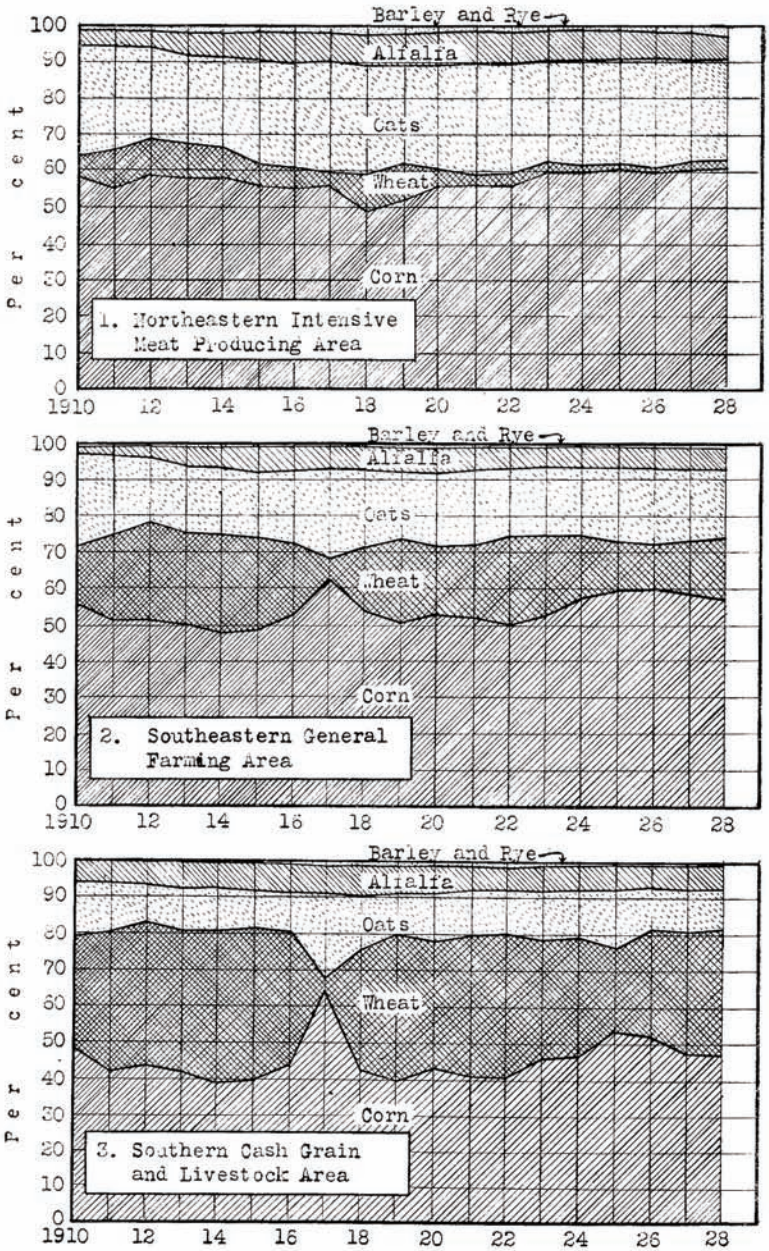
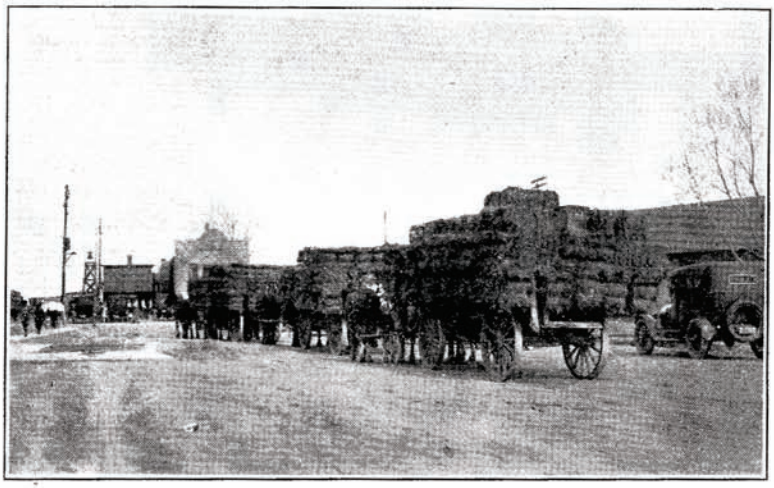


FIGURE 19.—Changes in the cropping systems of Areas 1, 2, and 3 from 1910 to 1928.

Southern Cash Grain and Livestock Area, year-to-year variations in acreages of the leading crop are more in evidence. Wheat seems to have lost in acreage since 1922, while corn has gained. (See Figure 19.) The acreages of oats and alfalfa have shown no material changes in the 19-year period.

The trend of wheat acreage has been distinctly downward in Area 4, with corn substituted. Alfalfa has gained somewhat in importance since 1910, while the oats acreage has shown no substantial change. (See Figure 20.) In Area 5, the farm land is occupied mainly by pasture and native hay, as Figure 16 shows. Of the cultivated crops, however, corn is most important. The corn acreage declined slightly until about 1918, but since then has increased until it comprises a larger part of the cultivated acreage than in 1910. The wheat acreage first increased and then declined as the corn acreage changed. The oats acreage, however, increased until 1918 and has decreased slightly since then, while the alfalfa acreage has shown little change.



HAY ON ITS WAY TO MARKET IN THE COMMERCIAL HAY SECTION OF THE CENTRAL HAY AND LIVESTOCK AREA

The Sand Hill Cattle Ranching Area has but little farm land in cultivated crops, but some rather significant changes in acreages have occurred since 1910. (See Figure 20.) There have been substantial decreases in the corn, oats, and wheat acreages in the 19-year period, while the rye and alfalfa acreages have tended to increase. The variations in the rye acreage from year to year are rather marked.

Of the important crops in the Southwestern Wheat Area, wheat, the leading crop, has shown rather unusual variations

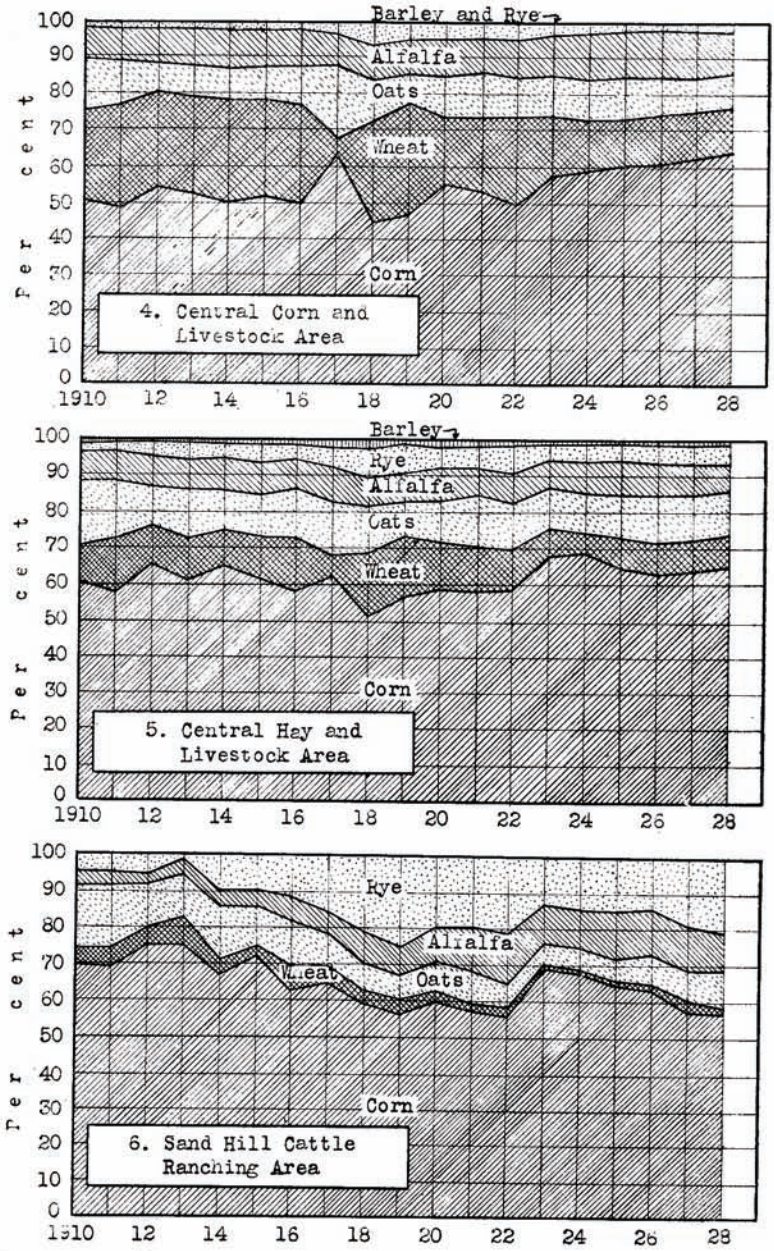


FIGURE 20.—Changes in the cropping systems of Areas 4, 5, and 6 from 1910 to 1928.

in acreage—due in part to the varying extent of winter killing. (See Figure 21.) It gained rapidly in acreage from 1910 to 1919, while the corn and oats acreages were declining. Then came gains in both oats and corn until 1923. Following that year, wheat gained in acreage, mainly at the expense of corn. Another significant development since 1921 has been the replacement of much of the oats by barley.

In the High Plains Small Grain and Grazing Area, the increase in wheat acreage from 1910 to 1918 was largely at the expense of oats, and the increase since 1924 has been largely at the expense of corn. (See Figure 21.) Rye and alfalfa are two crops which gained in importance until about 1918 but have decreased in relative importance, if not in acreage, since then. It will be recalled from Table 1 that the cultivated acreage in Area 8 has nearly tripled since 1910, so changes in relative importance of the cultivated crops have seldom been in the nature of decreases in acreage, but instead one crop has gained in acreage faster than another. One interesting development in Area 8 has been the increasing acreage in barley, which is being substituted for oats and corn as a feed crop.

The Irrigated Area is another where the cultivated acreage has increased rapidly since 1910. (See Figure 21.) Sugar beets and barley are the two crops that have gained in importance relative to other crops since 1910, while alfalfa and oats have declined in importance. Wheat gained until about 1922 but has lost, in percentage of cultivated acreage, since then. Corn and potatoes have shown several periods of increases and decreases within the 19 years shown in Figure 21.

CHANGES IN THE LIVESTOCK SYSTEM

The livestock systems of the nine areas of the state are subject to change, just as are the cropping systems. There are variations from year to year due to changing feed conditions. There are cyclical changes—changes over a period of years—which are the result of periods of prosperity or adversity to which the enterprise is subject and of the way in which farmers react to them. For example, there are cycles of three to five years in the hog industry—production expands for perhaps two years and then declines for perhaps two years. Table 2 shows the changes in the numbers of the several kinds of livestock since 1910 by five-year periods for each of the nine type areas.

Our interest here is in more than the year-to-year variations and the cyclical fluctuations which result from changing feed conditions and price relationships. We wish to determine if possible any long-time trends in production or changes in the relative importance of the several livestock enterprises.

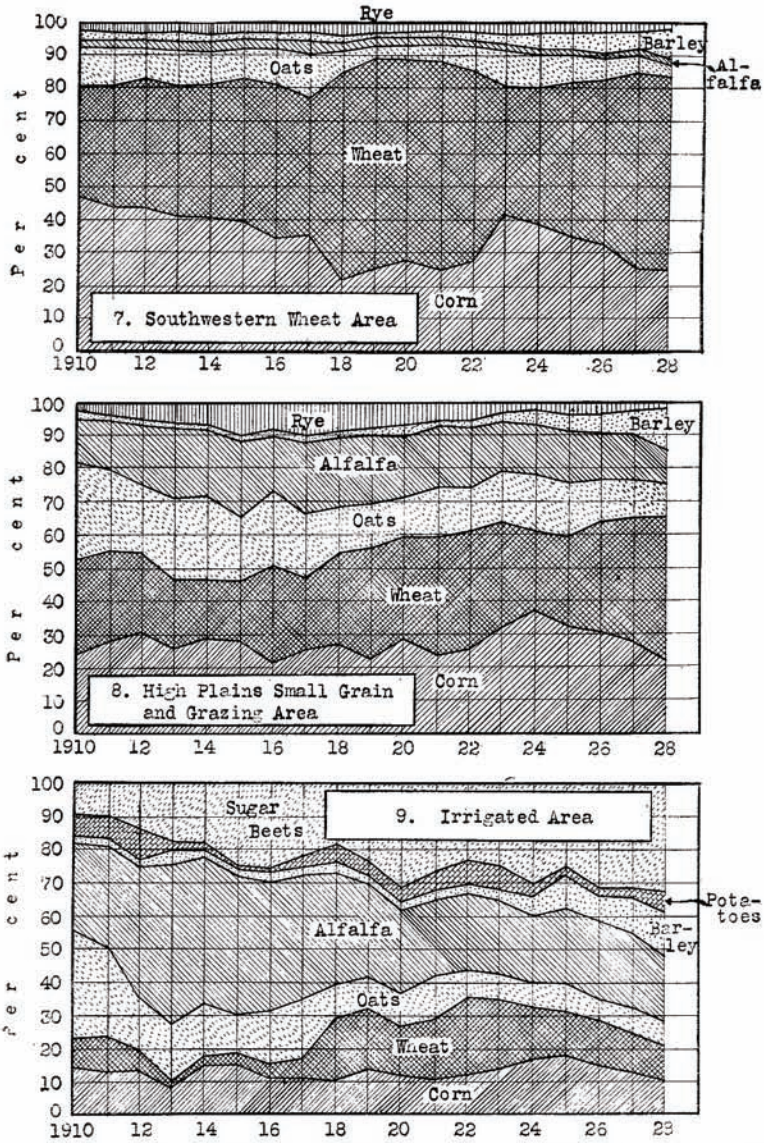


FIGURE 21.—Changes in the cropping systems of Areas 7, 8, and 9 from 1910 to 1928.

TABLE 2. *The number of livestock per section (640 acres) of Nebraska farm land by five-year periods (except 1925-1928). Data are for number assessed on April 1* [1]

Area	5-year period	Milk cows[2]	Other cattle	Hogs	Sheep	Poultry (dozens)
1. Northeastern intensive meat producing area	1910-14	16.3	46.2	71.6	3.2	18.5
	1915-19	15.0	54.8	82.4	3.2	21.3
	1920-24	12.0	50.0	94.9	2.1	20.1
	1925-28	11.5	47.8	79.5	3.0	21.1
2. Southeastern general farming area	1910-14	18.8	32.8	61.9	5.7	27.0
	1915-19	16.8	38.9	61.2	6.1	27.6
	1920-24	13.3	38.9	67.6	6.0	27.4
	1925-28	12.4	34.5	56.7	6.2	25.8
3. Southern cash grain and livestock area	1910-14	14.5	24.2	46.3	2.3	22.9
	1915-19	13.7	31.6	42.2	3.1	23.9
	1920-24	11.2	27.2	45.1	2.3	23.4
	1925-28	10.3	23.0	39.3	2.6	23.8
4. Central corn and livestock area	1910-14	11.9	28.3	40.1	9.3	13.9
	1915-19	11.9	42.0	36.9	7.2	15.6
	1920-24	9.7	39.8	46.8	10.0	15.1
	1925-28	8.6	32.4	39.9	6.4	13.8
5. Central hay and livestock area	1910-14	8.0	34.3	25.6	1.5	5.9
	1915-19	6.2	39.4	19.1	1.2	6.1
	1920-24	5.5	37.9	24.0	1.3	6.3
	1925-28	3.4	26.2	15.6	1.6	5.1
6. Sand hill cattle ranching area	1910-14	2.5	39.4	3.3	2.8	2.6
	1915-19	2.6	42.9	3.6	0.5	1.8
	1920-24	1.3	39.7	4.5	0.5	1.8
	1925-28	0.8	27.4	2.8	0.3	1.1
7. Southwestern wheat area	1910-14	5.2	23.4	10.2	7.2	7.4
	1915-19	4.3	24.9	10.6	3.0	6.4
	1920-24	3.2	14.5	13.6	1.6	5.7
	1925-28	2.4	10.0	9.6	1.9	4.6
8. High plains small grain and grazing area	1910-14	2.8	23.8	2.9	8.0	2.6
	1915-19	2.5	35.0	5.1	6.7	2.8
	1920-24	1.9	23.8	7.1	4.3	3.0
	1925-28	1.5	17.2	6.8	4.8	2.4
9. Irrigated area	1910-14	6.9	32.7	17.6	63.5	10.5
	1915-19	7.7	52.9	24.0	73.4	11.7
	1920-24	8.3	32.8	14.4	21.7	15.4
	1925-28	6.9	23.2	8.8	19.3	11.0

[1]The data used here are not the same as in Figure 17. In that figure, estimated numbers on January 1 were used. In this table assessed numbers on April 1 are used, so the numbers especially of hogs) per unit of area are smaller.

[2]There is little doubt but that the number of high-producing cows is larger now than in earlier years, altho the total number of milk cows has decreased.

A previous discussion has dealt with the place of each enterprise in the livestock system of each area. The data are hardly adequate enough to permit very definite statements regarding long-time trends in production. Instead of discussing changes in each area, attention will be called only to certain fundamental changes that seem to have taken place in some of the areas.

Table 2 shows some gain in the importance of the hog enterprise in Area 1. Recalling the changes in the cropping system in this area, hogs have gained in importance as the corn and alfalfa acreages have increased. In Area 5 both the hog and

cattle enterprises seem to have declined somewhat in importance since the early part of the 19-year period. The cattle and sheep enterprises are much less important in Area 7 than in the days before the sod was broken and wheat assumed a major place in the farming system. The same holds true in Area 8, and in addition the hog enterprise has gained materially in importance.

The unusual changes that seem to have taken place in the cattle and sheep numbers in Area 9 are probably due in large part to the inadequacy of the data. The cattle and sheep feeding enterprises are very important in this irrigated section, both classes of livestock being shipped in in large numbers for feeding. Differences in the extent of feeding, in the time of marketing, and the time at which a count of numbers was taken could cause material changes in the recorded number on hand. The hog enterprise in Area 9 has declined somewhat in importance while the poultry enterprise has gained.

FACTORS IN THE AGRICULTURAL DEVELOPMENT OF NEBRASKA

GENERAL CONSIDERATIONS

In any area or region there are fairly well defined reasons why its agriculture has developed as it has. This is not to say, of course, that the development in a particular direction has always been a wise one or that the farming systems followed at any particular time are in complete or perfect adjustment. It does mean that farmers have made a conscious effort to

CATTLE IN THE NEBRASKA SAND HILL AREA

adapt their organizations and practices to the conditions of production confronting them in an attempt to get a maximum utilization of the resources at their command.

Following their economic interest, consequently, farmers have sought to economize on their productive resources by producing those commodities which will yield them a maximum of value for the resources used. In doing so they necessarily depend upon securing from others commodities and services which they themselves are at a comparative disadvantage in producing. The consequence of such a development obviously is that farmers in divergent areas or regions will follow different lines of production.

Looking at the agriculture of Nebraska from this point of view it will be found that the development here has taken a similar course. Farmers in different parts of the state have apparently made an effort to adjust their organizations and practices to the physical and economic conditions prevailing. This adjustment has proceeded to the point where the agriculture of the state can be segregated, as we have seen, into nine distinct types of farming.

In order that the reader may have a better understanding of the basis for this segregation, a rather detailed discussion is given of the apparent effect which the various physical and economic factors have had in determining the organizations and practices followed in different parts of the state.

In general it may be said that types of farming result from two general groups of factors. On the one hand are included that large body of factors, physical and biological in character, such as soil type, topography, drainage, rainfall, evaporation, insect pests, diseases, and adaptation of plants and animals. On the other hand are those of an economic nature such as availability of labor and capital, relative prices of farm products, relative cost of the items needed for production, and changes in technique.

EFFECT OF PHYSICAL FACTORS

SOIL.—The character of the soil affects types of farming chiefly thru its influence upon the crops which may be grown. Certain crops are particularly affected by the texture of the soil, others by its chemical content, and others by its water-holding capacity. It is not so much, however, a question of absolute adaptability as of relative adaptability. That is, most crops will make some sort of growth on almost any type of soil but one may do better than another on a particular type and because of this fact will be given preference. The character of a soil with respect to its depth and permanency also will affect the type of farming. The fact that a soil is thin, resulting either from a basic lack of plant food material

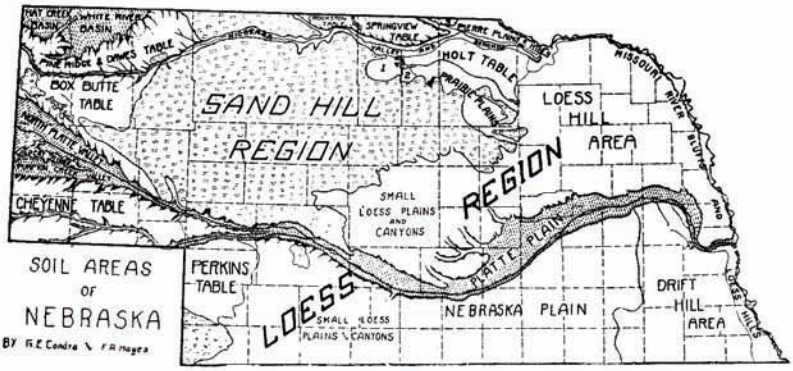


FIGURE 22.—Soil areas of Nebraska. (Courtesy of the Conservation and Survey Division.)

or from continuous cropping, may demand that a particular type of farming be followed in order that there may be a greater degree of permanency to the agriculture.

The ranching type of farming followed in the Sand Hills is illustrative of this fact. If a reasonable degree of permanency is to be attained in this area it is necessary that the land be left in the native grasses and that they in turn be not overgrazed; otherwise blowing ensues and the country is seriously damaged.

The principal soil areas of Nebraska are shown in Figure 22. A comparison of this figure with Figure 16 shows very distinctly the influence of the character of the soil upon the farming types. In numerous cases the boundaries of the nine type-of-farming areas coincide quite closely with the boundaries of the major soil areas. In fact, soil differences are more important than any other factor in accounting for the different farming types found in Nebraska.

TOPOGRAPHY.—The character of the land surface also has an important bearing upon the type of farming followed. This comes about not only as it affects the facility with which labor and machinery are handled but also as it determines the particular crop or livestock organization adopted. The possibility of sheet erosion oftentimes governs to a considerable degree the extent to which intertilled crops may be grown successfully for any length of time. Likewise if the terrain is uneven and broken with a fairly large proportion of non-tillable pasture land, it becomes necessary, for complete utilization, to follow a type of farming in which livestock plays a greater part than would be necessary were the surface less rugged. This latter factor has had, as we shall see, a rather important influence in parts of Nebraska.

CLIMATE.—Climate, including rainfall, temperature, and evaporation, likewise plays an important part in determining types of farming. Rainfall, both in absolute amount and in seasonal distribution, governs, to some extent, the choice of a cropping system. The variation in rainfall from year to year is also of great importance. This is particularly true in those areas or regions where the average amount of rainfall approaches the minimum for successful crop production. In the western two-thirds of Nebraska this problem of adequate rainfall is ever present. The annual rainfall in the northwestern part of the state averages only 16 inches. (See Figure 23 and Table 3.) In this low rainfall, together with its tendency to vary from year to year, is found in part the explanation for the particular types of farming found there. Cropping systems and cultural practices are followed which minimize the influence of this climatic factor as much as possible.

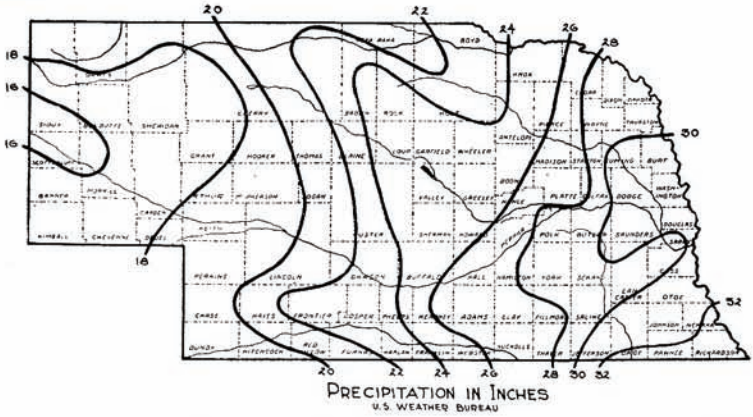


FIGURE 23.—Rainfall map of Nebraska. The average annual precipitation increases from 16 inches in western to 32 inches in southeastern Nebraska.

Closely allied with the rainfall factor is that of evaporation and temperature. It is not the total amount of rainfall which is so important as it is the amount which is effective. That which is effective is determined largely by the amount of evaporation and run-off. In areas where the atmosphere is dry and more or less wind prevails, evaporation is likely to be heavy. If this situation is accompanied by relatively high temperatures the amount of evaporation is increased. The run-off is determined by the nature of the topography, by the physical character of the soil, and by the character of the soil covering. It is also determined, of course, by both the amount of the rainfall and the way it falls—there being less

TABLE 3. *Annual and seasonal rainfall at selected stations in the nine type-of-farming areas of Nebraska. Data from U. S. Weather Bureau*

Area	Reporting stations	Average annual rainfall			Average seasonal rainfall[1]		
		No. of yrs. of record	Amount	Coefficient of variation[2]	No. of yrs. of record	Amount	Coefficient of variation[2]
		Years	*Inches*	*Per cent*	*Years*	*Inches*	*Per cent*
1. Northeastern intensive meat producing area	Hartington	23	27.5	22	23	21.0	24
	Norfolk	25	28.3	19	25	21.9	24
	Tekamah	25	29.6	17	25	21.9	23
2. Southeastern general farming area	Columbus	24	27.5	18	25	20.9	23
	Ashland	21	26.4	21	21	19.9	25
	Auburn	24	33.6	18	25	24.7	26
3. Southern cash grain and livestock area	York	24	26.9	20	24	19.8	26
	Fairbury	25	29.7	22	25	22.4	22
	Minden	24	23.6	18	25	17.8	30
	Alma	25	21.7	27	25	17.5	27
4. Central corn and livestock area	St. Paul	25	24.1	23	25	19.2	26
	Lexington	23	22.7	26	24	17.1	32
	Curtis	16	21.4	29	19	17.4	32
5. Central hay and livestock area	Ewing	21	23.8	21	24	18.7	25
	Broken Bow	20	23.6	20	24	19.0	23
	North Platte	25	18.9	28	25	14.5	30
6. Sand hill cattle ranching area	Valentine	25	19.2	21	25	14.7	24
	Halsey	24	21.1	23	25	16.8	24
7. Southwestern wheat area	Madrid	20	20.6	28	24	15.5	32
	Kimball	22	17.1	24	24	12.8	25
8. High plains small grain and grazing area	Hay Springs	23	20.9	20	25	15.3	23
	Bridgeport	24	16.8	20	25	12.6	23
	Harrison	10	20.2	26	13	15.7	28
9. Irrigated area	Scottsbluff	24	16.6	27	24	12.6	31

[1]Seasonal rainfall is that falling during the growing season—April to September inclusive.

[2]The coefficient of variation is a measure of the extent that rainfall varies from year to year (See footnote, Table 5).

run-off from a slow, gentle rain than from a cloudburst. Whatever the situation, these factors play a part in determining what is ultimately done in the way of farming.

Temperature plays a part in still another way. It is in many cases the most important factor governing the presence or absence of a particular crop in a certain area. Unless the growing season is long enough to insure the maturity of the crop under normal conditions, then the crop is not grown. (In Figure 24 is shown the average length of growing season in different parts of Nebraska.)

Variations in temperature resulting in alternate freezing and thawing also are quite important in determining the extent to which a crop is grown. This is particularly true of winter wheat, which has difficulty in withstanding such extremes. It should be pointed out, however, that temperature

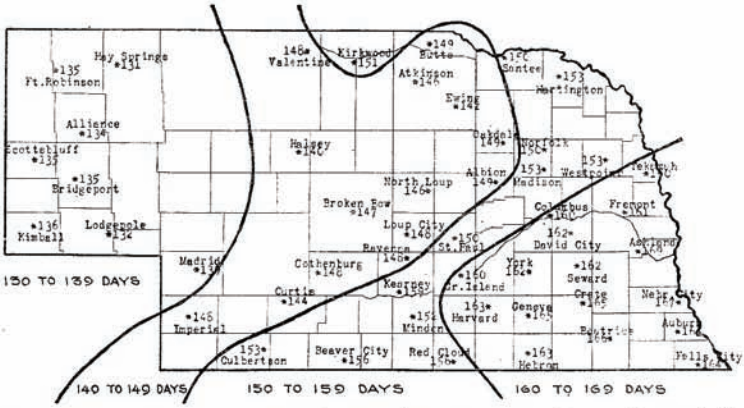
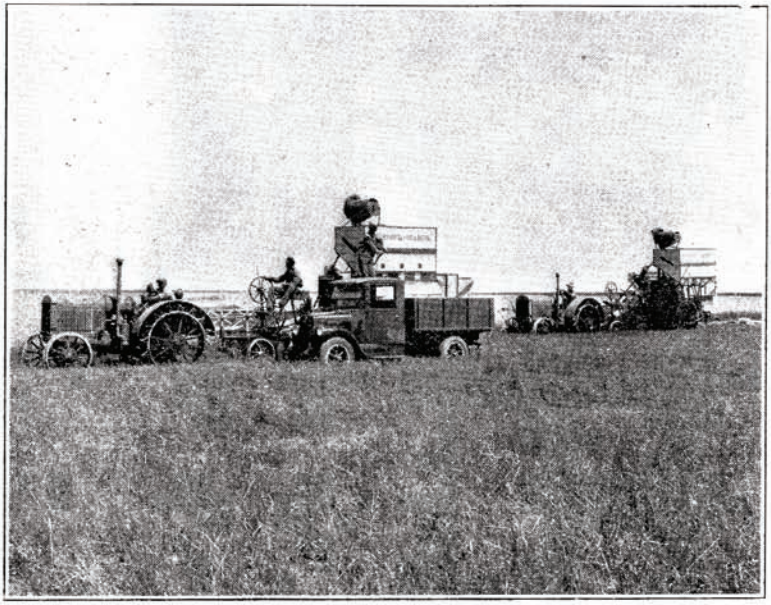


FIGURE 24.—Average length of growing season. Reporting stations and the average number of days between the last killing frost of spring and the first killing frost of fall for each are indicated on the map.

is not the only factor that brings about this result, as associated with it are both precipitation and the character of the soil.

BIOLOGICAL FACTORS.—In addition to the foregoing there is another set of factors, biological in nature, which affect types of farming or which force changes in types. They may be grouped under these headings: pests, diseases, and adaptation. While with the advancement of scientific discovery the pests and diseases are sooner or later held in check fairly well, they nevertheless are important in determining what is done. For example, fall seeding of alfalfa is often impossible because of grasshoppers; or seeding of winter wheat must be delayed because of danger of Hessian fly infestation. The development or bringing in of new varieties or new crops may entirely change the type of farming of a particular area. For example, the development of adapted varieties of wheat has had much to do with the extension of wheat production into western Nebraska.

Since the effect of all these factors—soil, topography, climate, pests, diseases, and adaptation—is ultimately reflected in the yield of crops, farmers probably gauge their actions on the physical side more by the relative yield of crops than by any other one thing. But farmers are not interested alone in the relative yield of crops for a particular year. They are just as much or more interested in knowing how variable these yields are over a period of years. It is the relative dependability of yields which probably carries most weight in determining what combination of crops to grow from the long-time standpoint.



HARVESTING WHEAT IN THE SOUTHWESTERN WHEAT AREA. THE COMBINED HARVESTER-THRESHER IS IN COMMON USE.

EFFECT OF ECONOMIC FACTORS

Obviously, however, farmers do not and cannot stop with a consideration of physical and biological factors in coming to a final decision as to what their system of farming shall be. They must know in addition whether the crop or livestock enterprises yielding the maximum in physical units will also yield the maximum in value units. In other words they want to know which enterprise or combination of enterprises will yield the maximum of returns in dollars and cents for the resources used.

It is at this point that economic considerations come into the picture in determining what is done. Two crops may be equally adapted to the physical conditions within an area yet not be at all comparable from the standpoint of net returns. The price of one may be entirely out of line due to conditions of production in other parts of the world or due to changes in demand. Likewise, from the standpoint of economy in production one enterprise may require a much smaller amount of labor and also its labor demands may fit in better with the labor demands of other enterprises included in the farming system. Due to the growing habits of different crops, certain of them fit together into a farming system better than do

A CERTIFIED SEED POTATO FIELD IN DAWES COUNTY OF THE HIGH PLAINS SMALL GRAIN AND GRAZING AREA

others. Because of this fact it is advantageous to combine those enterprises which demand attention at different seasons of the year and thereby avoid peak loads of labor as far as possible.

To insure a more complete utilization of waste and low-grade feeds, untillable pasture, family labor, etc., farmers often get into a system of farming by the addition of supplementary enterprises which they would not handle were they differently circumstanced. The promise of the additional return to be gained is a sufficient urge to effect the change.

Other factors of economic importance which have been given considerable prominence in discussions of factors affecting types of farming are transportation facilities, freight rates, and markets. That these factors exert an important influence in this direction cannot be doubted, yet, since their effect is reflected either in the prices at which the products sell or in the costs at which they are produced, their influence is ultimately one of price and is measured in that way.

In order to minimize the effect of long hauls or high freight rates, farmers in areas remote from market centers tend to produce those commodities which are produced at low cost and have a high value per unit of weight and a low degree of perishability. In the period of violent price disturbance following the World War, prices of farm products fell more rapidly than did freight rates and other costs. Farmers were pinched severely until they could readjust their farming to meet the new situation. Unless the physical conditions were

such that they could shift readily to more profitable alternatives the effect was very severe and even forced some out of farming altogether.

Another factor which has an influence upon types of farming and which comes about thru its effect upon cost and returns is that of invention and changes in technique. The introduction of a new method or a new machine such as the combined harvester-thresher may so cheapen the costs of production in areas where the machine is adapted that it becomes profitable to grow the crop on grades of land which before were submarginal.[9] The result may be that production will expand to the point where the price is so lowered that farmers in competing areas are forced out. In other words, the price of that particular commodity may be so reduced that farmers in competing areas find that the returns which can be obtained from it relative to the returns to be expected from alternative enterprises in the area are so low as to make it advantageous to shift from it to another type of farming. Clearly, then, we see that economic factors play quite an important part in determining types of farming.

With this general discussion of the way in which physical, biological, and economic factors affect types of farming as a background we are now ready to understand better the effect each has had in determining the types of farming in Nebraska.

SPECIFIC CONDITIONS DETERMINING THE TYPE OF FARMING IN EACH AREA IN NEBRASKA

NORTHEASTERN INTENSIVE MEAT PRODUCING AREA (AREA 1)

Reference to Figures 16 and 17 will reveal that this part of Nebraska is an area producing large quantities of corn, oats, beef cattle, and hogs. Both corn and oats occupy a larger proportion of the farm area here than in any other section of the state. Likewise more beef cattle and hogs are found here per unit of area (square mile) than in any other part of the state. Our problem is to explain why this situation exists. Let us begin by considering first the cropping system.

Corn occupies close to 37 per cent of the farm area in this section, which is around 2 per cent more than in any other area of the state. This high percentage of corn is a result of a number of factors which are highly favorable to corn production. In the first place the loess hill soil is found here which, because of its physical and chemical properties, is a soil upon which corn does well. Added to this is a favorable rainfall, both from the standpoint of absolute amount and seasonal distribution, as well as a favorable summer temperature. These factors have resulted in good corn yields—higher than in any other part of the state.

[9] Submarginal land is land which will not, over a period of years, produce crops large enough to pay the costs of producing them.

In Table 4 are given the yields of the important crops that have been secured during the past 19 years in each of the nine areas of the state. Not only are yields shown for normal years but also for years when conditions were very favorable and very unfavorable. In Areas 1, 3, and 4, yields are given for two parts of each area, because of rather wide variations between the two parts of each of those three areas.

But yields alone do not tell the whole story. In addition to obtaining higher yields of corn this area also has less variability in yields than other areas of the state. (See Table 5.) This is particularly true in the southeastern part of the area where yields in poor years do not go quite so low as, and in good years go higher than, in other areas of the state. To put the variability in yields on a more accurate mathematical basis and also to permit a more direct comparison of variability between different crops in the same area as well as between the same crops in different areas, standard deviations and coefficients of variation were calculated for each of the important crops in each area of the state. In Table 5 it will be seen that corn yields have varied on the average in this area about 21 per cent from the average yield of the period 1910-28. This compares with a variation of 25 per cent in Area 2 in southeastern Nebraska, 41 per cent in Area 3, and 35 per cent in Area 4.

By comparing the yields and variability of corn with other crops grown in the same area, much the same situation is found. Corn yields were, on the whole, higher and less variable than the yields of other crops.

This situation results in corn producing not only a larger amount of total feed units than any other crop but also in returning a larger net income for the resources used. Because corn has a comparative advantage over other crops, it occupies a larger proportion of the farm area than any other crop. Because of the seasonal labor demands of the corn crop, however, farmers find that, if the corn acreage is pushed too high, they have a peak load of labor during ground preparation or cultivation which adds to their labor costs. Hence, from the standpoint of returns from the whole farm business, they find it advantageous to supplement the corn acreage with other crops which require labor at other seasons of the year.

In this area oats and hay are the principal crops grown in conjunction with corn. Barley, also, is grown to some extent, as is wheat in a limited way. Why, it may be asked, are oats grown instead of wheat? The principal reason seems to be that oats, being a spring crop, fit in better with corn in this area than does winter wheat, which is difficult to put in with corn utilized as it is. Oats fit in well with corn for seasonal labor demands. Oats are also a good nurse crop for red

TABLE 4. *Yield of important crops, by type-of-farming areas, in poor, good, and normal years 1910-1928*

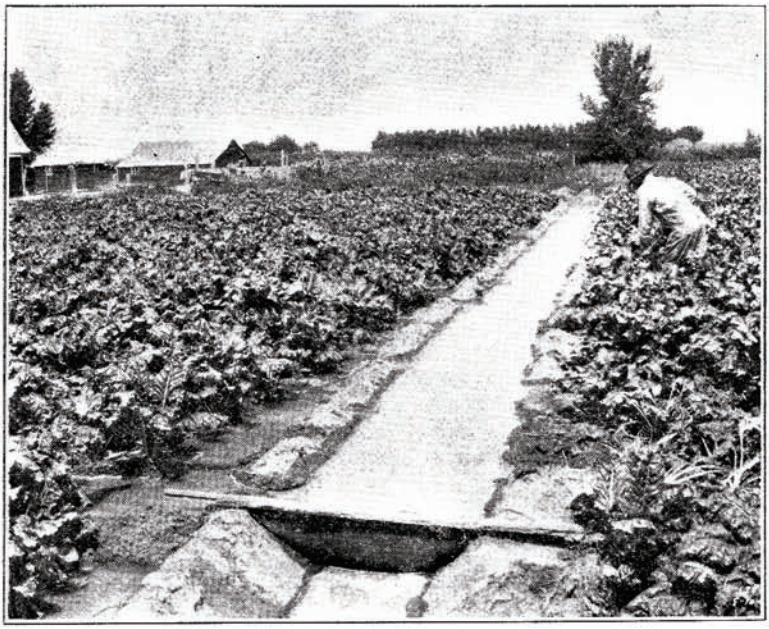
	Corn			Wheat			Oats			Barley			Rye			Alfalfa			Wild hay		
	Poor years	Good years	Normal years	Poor years	Good years	Normal years	Poor years	Good years	Normal years	Poor years	Good years	Normal years	Poor years	Good years	Normal years	Poor years	Good years	Normal years	Poor years	Good years	Normal years
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
1. Northeastern intensive meat producing area																					
a. Northern and western part	22	38	32	10	20	15	20	40	29	18	33	26	11	20	15	2.0	3.5	2.6	.75	1.75	1.25
b. Southeastern part	27	42	36	10	23	18	24	41	31	24	35	30	14	23	18	2.4	3.8	3.0	.9	1.9	1.4
2. Southeastern general farming area	19	41	34	12	22	17	20	41	31	20	33	29	14	23	18	2.4	3.8	3.0	.9	1.6	1.3
3. Southern cash grain and livestock area																					
a. Northeastern part	11	38	30	10	23	17	14	42	32	18	35	29	13	22	18	2.0	3.7	2.8	.7	1.5	1.2
b. Southern and western part	5	33	21	8	19	14	11	35	24	12	31	24	10	20	15	1.6	3.3	2.4	.5	1.5	1.0
4. Central corn and livestock area																					
a. Northeastern part	14	33	25	10	20	15	18	36	30	10	30	23	8	19	14	1.8	3.2	2.4	.6	1.2	.9
b. Southwestern part	11	30	19	8	18	12	12	35	25	15	30	24	10	20	15	1.9	3.3	2.7	.5	1.3	.8
5. Central hay and livestock area	12	30	24	8	17	12	15	34	25	15	27	23	9	16	12	1.5	3.1	2.5	.5	1.2	.9
6. Sand hill cattle ranching area	17	26	21	9	18	12	17	31	25	15	24	20	10	17	12	1.8	3.0	2.5	.6	1.3	.9
7 Southwestern wheat area	12	30	20	10	22	16	15	40	26	15	33	25	9	19	14	1.5	3.0	2.25	.5	1.0	.75
8. High plains small grain and grazing area	14	27	21	10	20	14	17	36	28	13	33	24	10	20	15	1.5	3.0	2.0	.5	1.0	.75
9. Irrigated area	20	32	26	16	28	22	..	50	40	..	46	39	..	22	17	2.5	3.5	3.0	...	1.5	.9

TABLE 5. *Average yields and variability of yields of the principal Nebraska farm crops for 1910-1928 by type-of-farming areas*

AREA Items	Wheat	Corn	Oats	Barley	Rye	Alfalfa	Wild hay
1. Northeastern intensive meat producing area							
Average yield (*Bu. or ton*)	16.0	32.4	30.3	27.5	17.1	2.83	1.30
Standard deviation[1] (*Bu. or ton*)	3.8	6.6	7.3	5.7	3.7	.53	.29
Coefficient of variation[2] (*Per cent*)	24	21	24	21	21	19	23
2. Southeastern general farming area							
Average yield (*Bu. or ton*)	17.2	31.6	30.9	27.4	18.5	3.02	1.27
Standard deviation[1] (*Bu. or ton*)	3.6	7.8	7.7	5.8	3.7	.58	.23
Coefficient of variation[2] (*Per cent*)	21	25	25	21	20	19	18
3. Southern cash grain and livestock area							
Average yield (*Bu. or ton*)	14.8	23.8	28.8	25.7	16.0	2.54	1.01
Standard deviation[1] (*Bu. or ton*)	4.4	9.6	9.9	6.9	4.1	.61	.29
Coefficient of variation[2] (*Per cent*)	30	41	35	28	26	24	29
4. Central corn and livestock area							
Average yield (*Bu. or ton*)	13.4	22.2	26.8	22.6	14.6	2.50	.93
Standard deviation[1] (*Bu. or ton*)	4.3	7.6	8.1	6.6	3.9	.49	.26
Coefficient of variation[2] (*Per cent*)	32	35	30	30	27	20	28
5. Central hay and livestock area							
Average yield (*Bu. or ton*)	12.4	21.9	24.6	21.8	12.4	2.37	.84
Standard deviation[1] (*Bu. or ton*)	3.4	5.4	6.0	5.3	2.9	.45	.23
Coefficient of variation[2] (*Per cent*)	27	25	24	24	23	20	27
6. Sand hill cattle ranching area							
Average yield (*Bu. or ton*)	13.1	21.3	24.1	20.1	13.4	2.16	.91
Standard deviation[1] (*Bu. or ton*)	3.9	4.8	5.4	3.8	3.3	.52	.26
Coefficient of variation[2] (*Per cent*)	29	22	22	19	25	24	28
7. Southwestern wheat area							
Average yield (*Bu. or ton*)	15.2	20.3	27.6	24.6	14.2	2.36	.89
Standard deviation[1] (*Bu. or ton*)	4.9	6.6	8.6	7.8	3.7	.66	.31
Coefficient of variation[2] (*Per cent*)	33	32	32	32	26	28	36
8. High plains small grain and grazing area							
Average yield (*Bu. or ton*)	15.3	20.5	27.9	24.1	14.5	2.20	.81
Standard deviation[1] (*Bu. or ton*)	4.0	4.5	9.2	7.7	3.7	.57	.22
Coefficient of variation[2] (*Per cent*)	26	22	33	32	26	27	26
9. Irrigated area							
Average yield (*Bu. or ton*)	23.1	26.5	44.8	42.1	18.3	3.09	1.17
Standard deviation[1] (*Bu. or ton*)	4.0	5.4	5.2	5.6	3.6	.42	.51
Coefficient of variation[2] (*Per cent*)	17	20	12	13	20	14	44

[1]Standard deviation is a measure of the extent to which the yearly yields tend to deviate from the average yield (for a 19-year period in this case.) It is computed as follows: Standard deviation $= \sqrt{\frac{\Sigma d^2}{N}}$

[2]Coefficient of variation in yield is computed by relating the standard deviation in yield to the 19-year average yield per acre. The formula is: Coefficient of variation $= \frac{S.\ D.}{m} \times 100$. This computation affords a comparison of the variability in yields among crops and among areas.



SUGAR BEETS ARE THE LEADING CROP IN THE IRRIGATED AREA

clover, sweet clover, and alfalfa. The straw supplies winter bedding and roughage and can be substituted for hay.

Soils and climatic factors are mainly responsible for the choice of the corn enterprise over wheat, but there are other reasons for the small acreage of wheat in Area 1. If winter wheat were grown instead of oats it would be necessary either to cut more corn or to drill wheat in the corn rows. Farmers have not found it advantageous to cut much corn in this area. Very little is put into silos, probably because high-yielding legumes, oat straw, and stalk fields supply roughage more cheaply than silage. Hence, they utilize the corn as a concentrate to produce meat and supplement it with cheap legume forage. It is more difficult to drill wheat in corn rows in this area than in other sections of Nebraska where the practice is more general. This is due in part to the fact that corn grows taller here and also to the fact that the heavier rainfall results in more weed and grass growth, thereby adding to the difficulty of getting a good seed bed.

While the data in Table 5 do not show it, wheat yields are probably more variable in this area than are oat yields. Winter wheat is not a dependable crop, due to winter killing. The results in Table 5 are calculated from yields on harvested

acreage and hence do not take into consideration the amount of abandonment. Were the abandoned acreage included the percentage variability would be greatly increased and would unquestionably show that wheat yields are more variable than oat yields in this area. The uncertainty of the crop, due to the hazard of winter killing, is one factor which discourages the growing of winter wheat.

The hay acreage occupies about 12 per cent of the farm area and is composed largely of legumes. The legumes are high yielding and conserve soil fertility. The large amount of sheet erosion makes fertility maintenance a constant problem. A large proportion of the legumes are annuals and biennials. Such a legume as red clover fits in better with the last corn cultivation and small grain harvest, and gives a better chance for a seed crop. By growing red clover and sweet clover farmers are able to get over their land with legumes in a shorter period of time. Sweet clover, because seed is cheap and a stand is easy to get, is an ideal crop for soil improvement. It fits in well with the livestock system as a pasture crop and helps to maintain fertility.

In the livestock system of Area 1, the hog and beef cattle enterprises are highly important—more so than in any other area of the state. In 1928 there were from 55 to 60 cattle and around 220 head of hogs per square mile in this area. This is distinctly a livestock country. The corn and oats are largely fed and but little is sold for cash. The explanation seems to lie in the fact that it is easier to maintain a permanent agriculture in this area with livestock than with a grain system of farming, and to the fact that livestock is essential to a complete utilization of all the resources. Because of the unevenness in terrain a certain amount of permanent pasture is necessitated, as is the growing of legumes to aid in the maintenance of fertility. To utilize this hay and pasture, livestock is essential; also, by providing winter labor, it affords a more efficient operating unit; also, it provides a market for low-grade grains and waste feeds which otherwise would not be completely utilized, if at all.

Beef cattle and hogs are the principal kinds of livestock because the area is one which produces a large amount of the concentrated fat-producing feeds which are necessary for meat production. Corn is the principal crop and this, supplemented with legume hay, is an excellent fattening ration. Large numbers of feeder cattle are shipped in and finished. Table 6 shows that about 45 per cent of the cattle shipped out of Area 1 were shipped in from other points during the four-year period, 1924-1927, leaving 55 per cent that were raised within the area. There is the further economy of hogs fol-

lowing cattle, which is a common practice in this region. The extra grain produced is fed to hogs or sold for cash.

SOUTHEASTERN GENERAL FARMING AREA (AREA 2)

The farming in this area is characterized by a somewhat lower proportion of the farm area in corn, oats, and hay than in the area just discussed. Corn occupies about 35 per cent and oats 12 per cent of the farm area as compared with 37 per cent and 17 per cent respectively in Area 1. Wheat, on the other hand, occupies about 10 per cent of the farm area here, whereas, in Area 1 the acreage of this crop is negligible. In fact the division line between Areas 1 and 2 was determined largely on the basis of wheat acreage.

TABLE 6. *The proportion of the number of hogs and cattle forwarded from local stations that were shipped in to such stations* [1]

Area	Kind of livestock	Years				
		1924	1925	1926	1927	4-year average
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*
1. Northeastern intensive meat producing area	Hogs	1.2	5.9	5.3	5.4	4.2
	Cattle	45.3	46.0	39.2	51.2	45.1
2. Southeastern general farming area	Hogs	4.1	5.5	7.6	9.7	6.4
	Cattle	51.9	59.2	57.3	70.3	58.8
3. Southern cash grain and livestock area	Hogs	2.8	2.5	2.9	5.3	3.2
	Cattle	38.4	35.2	22.6	42.4	33.6
4. Central corn and livestock area	Hogs	2.2	4.3	3.9	4.0	3.5
	Cattle	50.5	36.9	31.5	48.3	41.3
5. Central hay and livestock area	Hogs	2.0	2.1	1.3	3.5	2.2
	Cattle	37.8	19.6	18.1	24.1	24.1
6. Sand hill cattle ranching area	Hogs	1.0	3.8	4.5	2.9	3.0
	Cattle	17.9	15.5	13.8	11.5	14.6
7. Southwestern wheat area	Hogs	7.0	7.1	8.6	4.6	6.9
	Cattle	34.3	11.6	14.2	18.7	19.5
8. High plains small grain and grazing area	Hogs	9.6	13.4	17.4	13.7	13.2
	Cattle	12.1	8.5	16.1	9.4	11.8
9. Irrigated area	Hogs	2.5	4.5	3.6	3.4	3.5
	Cattle	68.9	80.7	53.8	55.5	62.6

[1]Data from Nebraska Agricultural Statistics give cars forwarded from and received at local railroad stations. The estimated number of head per car forwarded were: hogs, 76 head; cattle 24 head. The estimated number per car received were: hogs, 120 head; cattle, 31 head.

Corn yields are a little lower in this area than in Area 1, and also are not quite so certain. There is an average variation of 25 per cent in yields here as compared with only 21 per cent variation in Area 1. (See Table 5.) This difference in corn yields has reduced the advantage which corn has over other crops and is at least partly responsible for the lower acreage in this area.

The increase in wheat acreage has come at the expense of both corn and oats. Wheat is a rather uncertain crop in Area 1 but in this area it is more dependable than either corn or oats. Wheat yields have an average variability of only 21 per cent, which is 4 per cent lower than for the other two crops. Due in part to this low variability in yields it becomes a profitable crop, in fact a much more profitable crop than oats.

Oats are grown for the work stock and for the young livestock. The crop, because of the seasonal demands for labor, also fits in well with the corn crop and gives a better labor distribution than could be obtained without it. It also facilitates getting the land from corn to winter wheat.

Beef cattle and hogs are the dominant kinds of livestock. The unevenness of the terrain again makes some permanent pasture a necessity. To utilize this it is necessary to keep livestock. Beef cattle are kept rather than dairy cattle, due chiefly to the character of the feeds produced. The ratio of the corn to the oats acreage is still decidedly in favor of corn, which means a large amount of fattening feed. This favors meat production, giving beef cattle an advantage over dairy cattle. This does not mean, of course, that beef cattle are kept to the complete exclusion of dairy cattle. In fact, considerable dairying is done around Omaha and Lincoln, which afford good markets, but for the area as a whole beef cattle are dominant. As between beef cattle and hogs there are relatively more beef cattle than in Area 1, the number of the latter being gauged largely by the need to utilize the pasture and hay area. The additional corn available beyond that needed to finish the cattle is fed to hogs.

SOUTHERN CASH GRAIN AND LIVESTOCK AREA (AREA 3)

In this area there is a further decline in the proportion of the farm area devoted to corn, oats, and hay, and a decided increase in the wheat acreage as compared with Areas 1 and 2. Corn occupies about 31, oats about 8, and hay and other forage crops about 9 per cent of the farm area. Wheat occupies 22 per cent of the farm acreage, which is materially larger than in Areas 1 and 2.

In general, the land of Area 3 is quite level—more level than in any other area of the state. This, together with suitable soils, is favorable to wheat production. The boundaries were determined largely on the basis of wheat acreage; here it occupies a larger proportion of the farm land than in any of the adjoining areas.

The decline in the relative importance of corn in this area is due both to lower relative yields and to greater variability in yields. The rainfall, particularly in the southern and

southwestern parts, is lower and the variation from year to year is greater than in Areas 1 and 2. (See Table 3.) There is also more evaporation. Corn yields vary as much as 41 per cent from their long-time average. (See Table 5.) This is not only very high relative to the variability of corn in other areas but is high relative to the variability of other crops grown in this same area. Oats, for example, have a variability of 35 per cent while the variability in wheat yields is only 30.

This situation results in reducing still more the comparative advantage of corn over wheat with the result that the wheat acreage increases relative to both the corn and oats acreages. The relatively low yield of oats, coupled with their high variability, results in returns from the crop which do not compare at all favorably with the returns from wheat in southern and western counties of this area. The oats acreage consequently is largely determined by work-stock requirements and, probably in part, by the increased facility oats give for getting from corn into wheat, especially in the northern and eastern parts of the area.

In the southern and western parts of this area considerable winter wheat is seeded in corn fields with one-row drills. Soil conditions are favorable for this practice. Both weeds and grass are also less a problem than in Areas 1 and 2, because of a lower summer rainfall. Another factor which may have some bearing is the less rank growth of the corn.

The hay acreage is slightly less than in Area 2 and the yields are likewise lower. The legume acreage is small—there is less alfalfa on the upland. Seeding alfalfa back on old alfalfa ground has been found to give poor results except in subirrigated valleys. Farmers, however, will probably continue to grow a fairly high percentage of this crop at least until the yields decline to a greater extent than they have to date since it yields more than native hay.

Barley increases in importance relative to oats, particularly in the western part of the area. Barley not only produces more pounds of feed per acre but also is a more dependable crop. For this reason, it is being substituted increasingly for oats. The uncertainty in corn yields may also be a factor in the increasing barley acreage. Since barley is a more fattening feed than oats, it can be substituted for corn.

Cattle are somewhat less important relative to hogs in this area than in Area 2. The number is determined by the pasture and hay area. The low productivity of the hay and pasture land results in a decrease in cattle and the smaller amount of corn results in a decrease in hogs. In Figure 17 it will be observed that the number of cattle per square mile is materially below the number in Areas 1 and 2, yet the relative

hay and pasture acreages have not changed a great deal. The carrying capacity of the pasture, except in the extremely northeastern part of the area, is considerably less than in the areas to the east and north.

Dairy cattle are relatively more important in this area than in Areas 1 and 2. Dairying fits in as a supplementary enterprise with wheat and utilizes family labor without adding to the out-of-pocket costs. It contributes to the stability of income and helps pay the minor expenses. Feeding in the southern and western parts of the area is localized in valleys where alfalfa is found.

There is more feed grain sold—particularly corn—in this area than in either Areas 1 or 2. Just why this practice has developed is difficult to explain. It possibly may be due to the uncertainty of the rainfall, which increases the feeding hazard. In dry years with a shortage in both pastures and feed grains it becomes necessary to liquidate livestock. This is usually done at a big sacrifice, with the livestock in an unfinished state, resulting in heavy losses. To avoid this hazard farmers tend to understock rather than overstock; hence, they have excess feed grain to sell in nearly all years, particularly in the years of good crops.

CENTRAL CORN AND LIVESTOCK AREA (AREA 4)

This area is characterized by a further decline in the relative importance of corn and oats as compared with Areas 1 and 2, and in wheat and oats as compared with Area 3. There is an increase in the relative importance of hay and pasture as compared with all three areas. Conditions within Area 4 are somewhat variable, so it may be well to consider different parts of the area separately, namely, (1) that part lying north of the Platte river valley, (2) the Platte river valley, and (3) the area to the south and west of the Platte river valley.

North of the Platte river valley the conditions are somewhat similar to those found to the northeast in Area 1, but the land is more broken and hardly as productive. Corn, oats, beef cattle, and hogs are the important enterprises. There is not as much livestock feeding as in Area 1. The land being more broken, there is more pasture. This has resulted in somewhat more cattle raising and less emphasis on feeding. (See Table 6.) Good legume hay is produced and this fits in well with both the breeding and feeding systems prevailing.

In that part of Area 4 which lies in the Platte valley, alfalfa is a leading crop, due to the presence of a liberal water supply furnished by irrigation and subirrigation. This part of the valley is an important source of commercial supplies of

alfalfa hay. Cattle and sheep feeding operations are carried on quite extensively at various points in the valley.

In the southwestern part of Area 4, corn is easily the leading crop, but some wheat is grown. The acreage of hay, particularly of legume hay, is quite limited and pastures are of low carrying capacity. Consequently the livestock enterprises are much less important than in other parts of Area 4. While a good many cattle are found here it is probable that the area is understocked and the broken, untillable land is not completely utilized. It would seem advantageous to increase livestock numbers somewhat. Because of the feed hazard due to uncertainty of crops, this would necessitate the carrying over of feed reserves from good crop years, but would increase the stability of farming. Soil and topography favor corn over wheat, making corn the more dependable crop. Furthermore, wheat suffers from soil blowing. Lacking sufficient livestock to utilize all the grain grown in this part of the area, a large volume of corn is shipped out to market.

For Area 4 as a whole, corn and oats are more certain crops than in Area 3 to the south and also are more certain than wheat. While Table 5 shows wheat yields slightly less variable than corn the same situation is found here as in the northeast, where winter killing is quite a hazard. As was explained in the discussion of that area, the variability coefficient is based on yields from harvested acreage and does not take the abandonment into consideration. Were it reckoned with, the variability for wheat no doubt would be considerably higher than is shown in the table.

CENTRAL HAY AND LIVESTOCK AREA (AREA 5)

In this area we find conditions quite different from those found in the areas we have been discussing. This is a transition area between the Sand Hills and the farming country to the east and south. Less dependence is placed upon crop farming and more upon hay production and grazing. Conditions vary somewhat in different parts of the area. In the northern part hay and pasture are decidedly dominant, while in the southwestern part there is more grain farming.

The reason for this area being utilized mainly for hay production and grazing hinges quite largely on the question of physical adaptation. There is a large variety of soils, but all of them are of a more or less sandy texture and relatively low in water-holding capacity. This area is characterized by an undulating topography. In some sections there are flat level stretches locally known as "hay flats". These "flats" produce excellent hay but are of little value for anything else.

The light nature of the soil renders it very susceptible to blowing. Serious damage results if it is left bare; hence, it

is necessary to keep a grass covering on it to prevent blowing. This situation precludes any serious attempts at crop farming. There are certain spots, however, with a heavier type of soil which are adapted to crop farming and this is practiced in a limited way.

The material decline in horse numbers in the United States, with the consequent curtailment in demand for prairie hay, has depressed prices for that type. Farmers, in an attempt to broaden their market, are seeding both alsike and red clover in the prairie meadows. By producing mixed legume hay they stand a better chance to market it to the dairymen in Minnesota, Wisconsin, Michigan, and other states.

The conditions in this area are such that the dairy enterprise may some time become of greater importance. The abundance of hay and pasture, with the limited amount of grain, lend themselves to this type of farming. There is relatively so much more hay than pasture that more hay is produced than can be fed to the beef cattle which the pastures will carry. The lack of grains precludes feeding. With more legumes in the meadows they can be pastured by cows which will more profitably utilize the limited amount of grain available than will beef cattle. Furthermore, dairying will provide more hours of production labor.

In the southwestern part of the area, in Lincoln and Custer counties, there is more crop farming. There are fewer wet valleys and less subirrigated land. Hay consequently is not so dominant. There is a higher percentage of arable land, and more corn and other crops are grown. Cattle are the principal livestock and they utilize the pasture and such grain as is grown. Dairying is increasing in importance.

THE SAND HILL CATTLE RANCHING AREA (AREA 6) [10]

The Sand Hill country is characterized by low-lying dunes which at a distance present a billowy appearance. There is very little surface drainage because the porous soil absorbs the moisture readily. Between the hills are numberous small basins widening out at times into rather large valleys. In many of these valleys the water table rises above the surface, forming marshes and lakes. Many of these are utilized for trapping and hunting.

The soil of the area is very fine sand which is lacking in organic matter and is quite susceptible to blowing when not covered by vegetation. If any considerable part of the surface is left bare for long at a time typical "blow-outs" develop. For these reasons it is not practicable to till the land in the

[10] For a more detailed discussion of the cattle ranching in the Sand Hills see Nebraska Bulletin 231, "Economic Aspects of the Cattle Industry of the Nebraska Sand Hills," by Harold Hedges.

region, except in limited areas. From this we get the explanation of why the land is utilized principally for grazing.

The soil must be kept covered by native grasses or else it blows away. The principal grasses found here are the bluestems, wheat grasses, and grama. These grasses, while very palatable, are not primarily of the type suitable for the production of grass-fat cattle; hence, cow herds are maintained and the young cattle from this area are usually sent to the corn belt for finishing before going to market.

Cattle are the primary livestock handled. Sheep are not so well adapted. They graze too closely in flocks, and tramp and graze the grass into the sand. This adds to the blowing hazard. Constant attention to prevent overstocking must be given for the same reason.

SOUTHWESTERN WHEAT AREA (AREA 7)

Wheat, relative to other crops, is more important in this area than in any other section of the state. Corn, barley, and oats are also grown but wheat occupies the dominant acreage. The reason that wheat is the most important crop hinges again largely upon the matter of physical adaptation. Soil type, topography, and climate all contribute to making this a wheat country. The soil is a medium-textured clay loam or silt loam which is particularly good for wheat. Because of the relatively low rainfall, wheat does better than corn, which requires for best growth a larger and a better distributed rainfall. The altitude in the western part of the area is too high for best success in corn production. More corn is found in the eastern part of the area, but here the soil is lighter, the altitude is lower, and the growing season is longer. All of these factors tend to favor corn, so that its advantage relative to wheat increases. Westward thru the area barley increases in relative importance, while corn decreases.

Another factor which has favored wheat is the level or gently rolling and unobstructed topography. This permits the use of big-scale machinery, such as combines, big drills, and big hitches, which in turn, thru lowering the unit costs of production, enable wheat to be grown with a very small expenditure of labor. Even tho the rainfall is low and yields uncertain, with these big-scale methods farmers can grow wheat with profit on low-grade land in this area. This has been a big factor in the expansion of the wheat area in this region during the past few years.

Kimball, Deuel, and Cheyenne counties grow some potatoes on a commercial scale. The high altitude with the cool nights favors potatoes. Disease has not been a serious problem as yet and fairly good yields are obtained.

The rough pasture land is utilized in a limited way by cattle. The pasture has a low carrying capacity; hence the number of cattle here is not very large. There are not many hogs produced in this area, due in large part to the low production of concentrated feeds and legume hay.

HIGH PLAINS SMALL GRAIN AND GRAZING AREA (AREA 8)

This area is quite variable in character and might be divided into several smaller areas. Furthermore, it is in a period of quite rapid change. Such a high proportion of the land is in pasture that the data do not show clearly the relative importance of the crops. In the discussion of the enterprises, the part of the area where each is of greatest importance will be mentioned. In general the agriculture of this area may be characterized as consisting of small grains, corn, and grazing. This is the spring wheat section of the state and also is an important barley area. These two are the dominant small grains except in Box Butte county, where winter wheat is the leading grain.

Despite the relatively high altitude, corn does fairly well in some parts of this area. The yields are low but the crop is quite certain. Reference to Table 5 will show that yields have a variability of only 22 per cent as compared with a variability of 26 per cent for wheat. Both, it will be further observed, are less variable than in Area 7. Most of the corn is in the eastern portion of the area and is grown principally on the sandier type of soils. Corn does better on this type of soil than does wheat. The sandier soil warms up more quickly in the spring, thus giving greater assurance for maturity of the corn crop. The altitude in the eastern portion where the corn is grown also is not so high as in other parts of the area.

Barley is grown more extensively than oats. Altho the barley yields are almost as variable as the oat yields (see Table 5), barley produces more pounds of feed per acre.

Alfalfa holds a high place among the cultivated crops of Area 8, particularly in the northern part. It is grown as a seed crop in Sheridan, Sioux, and Dawes counties. Box Butte county is the center of commercial potato production in the area—both table stock and certified seed being grown. The cool climate, good yields, and freedom from disease have contributed to making this section a certified seed area.

Cattle are the principal livestock found in Area 8. The rougher land is utilized almost entirely for grazing, Sioux county in particular being a cattle ranching section. In the western parts of this area, the grama and buffalo types of grass are quite common tho it is not a typically "short-

grass"[11] country. Such grasses are more suitable for producing grass-fat cattle than are the grasses of the Sand Hill area. In the sandier parts, cattle ranching is quite similar to that in the Sand Hills. Hog production has not been an important enterprise in the past but is becoming more so. In addition to hogs raised in the area, some are shipped in and fed out on barley and corn.

IRRIGATED AREA (AREA 9)

The availability of water and the fact that soil and topography are suitable for irrigation has resulted in making this area distinctly different from those already discussed. Irrigation has practically eliminated the hazard of limited rainfall. The high investment per acre of land has led to choice of major crops requiring much labor but giving large returns per acre. Legumes are grown extensively as a means of maintaining the soil, which is drawn on heavily by such crops as sugar beets, which yield large volumes of product. This has contributed toward making sugar beets the dominant enterprise and alfalfa second in importance. Corn, wheat, barley, oats, and potatoes are the other important crops, and increasing acreages of beans have been planted in recent years.

The large quantities of sugar beet by-products and alfalfa that are available have resulted in the development of commercial feeding of sheep and cattle on a large scale. Dairying is gaining in importance as a source of income.

THE INTERNAL ORGANIZATION OF NEBRASKA FARMS

This bulletin has thus far been devoted to discussing and explaining the geographical distribution of Nebraska's agriculture and the way in which the various crop and livestock enterprises fit together into farming systems in different parts of the state. From the analysis the state was divided into nine regions in each of which the type of farming followed is distinct from that followed in other areas. These areas were determined on the basis of similarity in the dominant crop and livestock organizations followed and on the uniformity in prevailing soil and climatic conditions. Whenever there was a distinct difference in these factors, this was presumed to represent the breaking off of one type and the beginning of another. From this it should not be deduced, however, that there is assumed to be complete uniformity in either organizations or physical conditions within each area.

FARMING SYSTEMS VARY WITHIN AS WELL AS BETWEEN DIFFERENT REGIONS

Physical and economic conditions within an area as a whole may favor the adoption of a particular combination of crops

[11] "Short-grass" is a term used to describe land of heavy soil types covered with the short grasses of the buffalo and grama types.

and livestock in preference to some other combination. In certain localities and on particular farms, however, these conditions may be sufficiently different to justify the adoption of an organization which varies quite widely from the prevailing one of the area. Because of local differences in soil type, topography, drainage, and the like, farmers may find it advantageous to get into a system of farming which is quite different from that followed by the majority of the farmers in the area.

Another reason why complete uniformity in farming systems is not found is the varying preferences and aptitudes of farmers. As is well known, farmers vary widely in their likes and dislikes and in the way they interpret given situations. Some farmers are more alert in seeking profits than others. They feel the acquisitive urge more keenly and will make rapid shifts in their production to take advantage of favorable situations. Other farmers are less "price sensitive." They are influenced more by custom and will follow along, doing about the same thing year after year, usually delaying from one to several years before making adjustments.

Still other factors causing variations in farming systems within a given area are conditions of tenure, degree of encumbrance, and variations in the family labor supply. Tenant operators, for example, do not always have complete freedom of choice in selecting either the amounts or proportions of the crop and livestock enterprises that they handle. Thru uncertainty as to the length of time they may have control of the farm, they also will not get into a particular rotation or follow a particular soil treatment which they would be disposed to do were their length of tenure more certain and secure. Likewise an encumbered operator who is heavily in debt will likely behave differently from one who has his farm paid for and is free of debt. The former will be disposed to push his resources to the utmost. He will be inclined to make shifts in production with changing prices if he sees a chance to increase his profits by so doing. The unencumbered owner on the other hand may not feel this urge to the same degree. This is particularly true if he has passed the prime of life. He is not so concerned then with getting the last dollar out of the farm, but will work along in a more leisurely way.

Farmers with a large supply of family labor are likely to get into a more intensive system of farming than they otherwise would follow were it necessary to hire the labor. This probably accounts in large part for certain cash grain farmers including dairying as a supplementary enterprise. They see a chance, thereby, to utilize some cheap family labor and increase their income.

These are some of the more important factors causing variations in farming systems in a particular area. That it is important to keep them in mind when considering the farming systems of an area or region seems obvious. Even tho there is a high degree of uniformity in physical conditions within an area, this uniformity does not necessarily lead to equal uniformity in the farming systems practiced.

It should not be inferred, however, that the farming systems are so different that each is in effect a law unto itself. Were minute differences considered, this probably would be true. In the same sense geneticists say there are no two organisms exactly alike, but there usually are enough things in common among them to permit grouping into common classes or groups. If minor differences are disregarded, this can be done with but negligible error. This tendency of the farming systems in an area to exhibit common group characteristics furnishes the basis for the tables and discussion which follow.

METHOD OF DETERMINING TYPICAL FARMING SYSTEMS AND MEANING OF A TYPICAL FARM

A special study was made of 1925 census data to learn more of the farming systems followed in different parts of the state. Acreage and livestock data were secured on every farm (about 7,500 in all) in approximately 90 townships scattered thruout the state. Analysis of these data was made to determine the character and variations in the farming systems in several parts of each of the nine type-of-farming areas of the state.

The farms in each representative township or group of townships were grouped on the basis of size and the most important enterprises. This grouped together the farms with about the same organization, that is, those following the same farming system. Thus, a typical farming system or typical farm is one which is representative of what is followed on a group of farms which are doing essentially the same thing.

Figure 25 illustrates such a grouping of farms. This figure shows a group of 83 160-acre farms in two adjoining townships of Cuming county in Area 1. Each set of horizontal lines across the chart represents the crop and livestock organization of a farm. Since corn is the most important crop of that section, the farms have been separated into three groups according to the proportion of farm land in corn. Within each group the farms have been arranged according to the number of sows.

It will be noted that corn occupies from 20 to 62 per cent of the land area of the different farms. In this connection it is well to keep in mind that these farms are all of the same

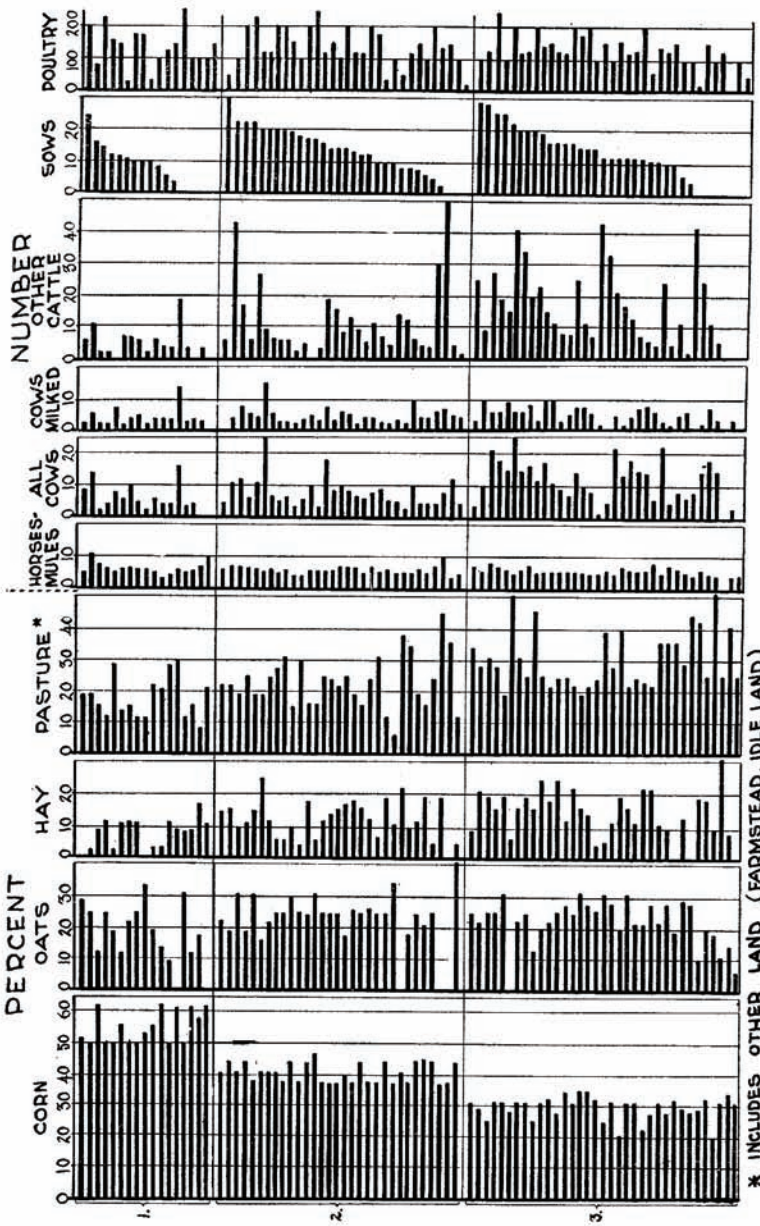


FIGURE 25.—The organization of 83 160-acre farms in Cuming county (Area 1). The farms are grouped on the basis of percentage of farm land in corn, and arrayed within each group on the basis of number of sows.

size—160 acres. With such wide variation in corn acreage, it is obvious that an average of all 83 farms would not be representative of the group. There are so many farms with both more or less corn than the average and so far removed from it that the average could never be taken as a substitute for them.

While the lack of a central tendency in the farms as a whole is clearly indicated, there is a more distinct central tendency in certain groups of them. Thus there are 17 out of the 83 farms, or 20 per cent of them, at the top of the chart which have about the same amount of corn, or an average of about 55 per cent of the farm area in corn. Just below these farms there is another group of 31 farms, or 37 per cent of the total, which have less corn—only 40 per cent of the farm area. Then finally there is a third group of 35 farms, or 43 per cent, which have still less corn or only 30 per cent of the farm area in corn.

There is less variation in both the oats and hay acreages. Thus the group at the top of the chart has on the average about 18 per cent of the farm area in oats and each of the other two groups has 22 per cent. The first group has about 8 per cent of the farm area in hay while the other two have 13 and 14 per cent respectively. With pasture, however, it is different; the pasture acreage varies inversely with that of corn. In the first group pasture occupies about 18 per cent of the farm area, in the second group 23 per cent, and in the third group 31 per cent. Thus the farms with a high acreage in corn have a low acreage in pasture and vice versa.

When we come to consider the livestock organization it will be noted that there is considerably more variation. Even tho the cropping systems of the farms of each group are quite uniform, the livestock systems are quite diverse. In fact with the exception of horses there are at least two livestock organizations found in each of the groups for the same cropping system. The chief variation is to be noted in the hogs. For this reason the farms in each group have been subarrayed on the number of sows handled. Thus in the first group there are some farms with from 10 to 15 sows and others with none at all. In the second group there are some farms with around 20 to 22 sows, another group with from 10 to 15; and a third with 5 or less. Likewise in the third group the same tendency is to be noted. There is slightly more uniformity in both the cows and other cattle.

By grouping these farms into typical groups in this way a much more precise knowledge of the prevailing organizations is obtained. Instead of grouping them all together to obtain a so-called average farm, they have been divided into three main groups, each of which is distinctive enough to be kept

separate. An average of each of these groups can be taken and it will be much more nearly representative of each of the farms in the group. In practice instead of taking the arithmetic mean of these groups a mode or median farm is taken. This modal or most common farm is what we term our typical farming system for a certain group. Thus, on this size of farm, instead of taking one farm as representative of the whole group, we actually set up three farms, each of which is representative of its particular group but is not representative of anything else.

Following this same procedure, "typical farms" are set up for each of the other sizes of farms. In this particular area twelve different organizations were set up for the six different sizes of farms, or an average of two organizations for each size of farm.

The way these appear when finally completed is shown in Table 7, which presents twelve typical farming systems followed in one part of Area 1. It may be well to call attention to the important things shown in Table 7 as well as in Tables 8 and 9, which present similar data for selected parts of Areas 2 and 3.[12]

At the top of Table 7, it will be noted, are shown the important sizes of farms found in this particular section. The first footnote at the bottom of the table indicates the relative frequency of these different sizes. Thus the 80-acre farms represent 11 per cent; the 120-acre farms, 11 per cent; the 160-acre farms, 39 per cent; the 200- and 240-acre farms, 8 per cent each; and the 320-acre farms, 7 per cent of the farms of all sizes. From this it will be seen that the 160-acre farm is by far the most important so far as numbers go.

On this size of farm there are three organizations commonly followed. These have been determined largely on the basis of the total amount of feed crops grown. Thus one group had 90 acres of feed crops, another 120 acres, and a third 140 acres of feed crops. The feed crops include corn, oats, and tame and wild hay. The acreage of these different crops as well as the number of the different classes of livestock may be observed by referring to the table.

The relative number of farmers following each of these organizations is shown in the line designated "Relative frequency of type." It will be noted that 16 per cent of the farmers on the 160-acre farms followed the first organization, 56 per cent the second, and 24 per cent the third.

For the other classes of farms, much the same sort of thing is found. On the 120-acre farms 38 per cent of the farmers

[12] Similar typical systems have been set up, based on special tabulations of the 1925 census, for other parts of Areas 1, 2, and 3, and for selected parts of the other six areas of the state, but space does not permit their inclusion.

TABLE 7. *Typical farming systems in the Elkhorn Valley in Area 1 (Cuming county); special tabulations, 1925 Census*

Item	Typical 80-acre farms[1]	Typical 120-acre farms[1]		Typical 160-acre farms[1]			Typical 200-acre farms[1]		Typical 240-acre farms[1]		Typical 320-acre farms[1]	
	Most common	Medium acreage in feed crops	Large acreage in feed crops	Small acreage in feed crops	Medium acreage in feed crops	Large acreage in feed crops	Small acreage in feed crops	Large acreage in feed crops	Small acreage in feed crops	Large acreage in feed crops	Small acreage in feed crops	Large acreage in feed crops
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
elative frequency of type	92	38	46	16	56	24	50	44	53	42	50	38
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Cropping system												
Feed crops	55(45-65)	75(65-85)	95(90-105)	90(70-100)	120(105-130)	140(135-145)	115(95-135)	170(145-185)	130(110-150)	180(170-200)	195(150-220)	250(240-275)
Corn	30	40	55	50	60	80	55	85	75	95	105	130
Oats	17	20	25	25	40	40	25	50	30	45	45	80
Tame hay	8	15	12	10	15	15	15	25	15	20	35	25
Wild hay			3	5	5	5	20	10	10	20	10	15
Wheat												
Pasture	20	40	20	60	35	15	75	25	95	50	105	60
Crop failure											10	
Other land	5	5	5	10	5	5	10	5	15	10	10	10
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Livestock system												
Horses	4	5	5	5	6	6	6	7	7	8	9	10
Cows[2]	5(0-12)	10(3-22)	11(3-24)	13(8-25)[3] 3(0-5)	15(10-25)[3] 6(0-8)	5(2-11)[3]	15(5-30)[3]	7(2-14)	16(9-30)[3]	10(7-16)[3]	18(3-35)[3]	18(5-32)[3]
Cows milked	5(0-8)	5(2-8)	5(1-8)	3(0-7)	6(0-15)	4(2-6)	6(2-8)	5(2-10)	5(1-7)	4(2-7)	4(2-13)	5(0-12)
Other cattle	4(0-9)	4(2-15)	5(0-15)	30(11-50) 3(0-5)	6(0-10) 18(11-35)	3(0-7) 25(14-30)	20(10-45)	5(3-9)	30(4-70)	16(7-37)	60(36-156) 6(0-13)	53(33-71)
Sows	8(0-15)	10(2-20)	13(3-30) 0	12(6-20) 0	17(12-30) 5(0-10)	12(5-20)	12(0-26)	18(5-40)	15(8-35)	20(7-90)	24(15-39) 2(0-5)	23(18-35)
Other hogs	0-60	6-70	0-60	25-100 0-15	15-80 0-12	15-100 0-10	0-70	25-140	2-100	50-130	39-176 0	4-140
Poultry	110	130	140	120	150	175	130	145	100	100	175	110
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Farms reporting tractors	4	11	9	0	30	0	0	12	50	37	12	50

[1]The farms of different sizes represent the following percentages of total farms: 80-acre farms, 11 per cent; 120-acre farms, 11 per cent; 160-acre farms, 39 per cent; 200-acre farms, 8 per cent; 240-acre farms, 8 per cent; 320-acre farms, 7 per cent.

[2]Both beef and dairy cows.

[3]Mainly beef cows.

TABLE 8. *Typical farming systems in the central part of Area 2 (Cass and Otoe counties); special tabulations, 1925 census*

Item	Typical 80-acre farms[1]		Typical 120-acre farms[1]	Typical 160-acre farms[1]		Typical 200-acre farms[1]		Typical 240-acre farms[1]		Typical 320-acre farms[1]
	Medium acreage in feed crops	Large acreage in feed crops	Most common	Medium acreage in feed crops	Large acreage in feed crops	Medium acreage in feed crops	Large acreage in feed crops	Medium acreage in feed crops	Large acreage in feed crops	Most common
Relative frequency of type	*Per cent* 44	*Per cent* 52	*Per cent* 95	*Per cent* 22	*Per cent* 75	*Per cent* 48	*Per cent* 48	*Per cent* 46	*Per cent* 43	*Per cent* 70
Cropping system	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Feed crops	50(37-55)	63(57-70)	80(60-90)	80(60-90)	105(92-135)	112(100-125)	150(130-165)	125(100-140)	160(140-185)	190(170-210)
Corn	35	45	50	50	60	70	90	75	100	110
Oats	10	10	17	20	25	24	30	25	35	40
Tame hay	5[2]	5[2]	8[2]	7[2]	14	15	20	20	18	30
Wild hay		3(0-12)	5(0-10)	3(0-8)	6(0-15)	3(0-8)	10	5(0-10)	7(0-15)	10
Wheat	10(0-24)		10	30	20	35	15	30	32	45
Pasture	15	10	25	45	30	45	30	75	40	70
Other land	5	4	5	5	5	8	5	10	8	15
Livestock system	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Horses	4	5	5	6	6	7	7	7	8	10
Cows	4	3(1-6)	5(2-8)	5(2-8)	6(3-9) 12(10-16)	7(5-10)	8(5-12)	5(3-8) 12(10-15)	6(3-9) 16(14-19)	15(10-20) 7(6-8)
Cows milked	3	2(0-5)	4(2-7)	4(1-6)	5(2-7)	6(4-10)	6(4-10)	4(2-8)	5(2-9)	6(4-10)
Other cattle	4(0-8)	4(1-10)	5(2-12)	7(4-10)	5(3-7) 12(10-15)	6(4-8) 15(12-20)	5(2-8) 15(12-18)	10-12 35(20-45)	6(3-9) 25(20-35)	35(25-50)
Sows	4(2-8)	2(0-6)	7(5-10) 0-2	8(6-10) 0	5(2-8) 12(10-15)	6(4-10) 0	7 15	12(10-15) 5(3-8)	15(10-20) 5(3-8)	15(10-20)
Other hogs	3-15	0-15	0-20	0-30	0-60	0-60	10-60	25-75	15-60	30-75
Poultry	100	80	120	140	140	120	100	140	140	175
Farms having tractors	*Per cent* 8	*Per cent* 20	*Per cent* 8	*Per cent* 33	*Per cent* 15	*Per cent* 33	*Per cent* 20	*Per cent* 30	*Per cent* 25	*Per cent* 50

[1]The farms of different sizes represent the following percentages of all farms: 80-acre farms, 11 per cent; 120-acre farms, 10 per cent; 160-acre farms, 32 per cent; 200-acre farms, 10 per cent; 240-acre farms, 15 per cent; 320-acre farms, 7 per cent.

[2]Mostly alfalfa.

TABLE 9. *Typical farming systems in the western part of Area 3 (Kearney county); special tabulations, 1925 census*

Item	Typical 80-acre farms[1]		Typical 120-acre farms[1]	Typical 160-acre farms[1]			Typical 200-acre farms[1]	Typical 240-acre farms[1]		Typical 280-acre farms[1]	Typical 320-acre farms[1]	
	No wheat	30 acres of wheat	45 acres of wheat	30 acres of wheat	50 acres of wheat	75 acres of wheat	90 acres of wheat	60 acres of wheat	100 acres of wheat	120 acres of wheat	105 acres of wheat	145 acres of wheat
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Relative frequency of type	60	40	70	20	40	24	65	30	62	57	50	40
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*
Cropping system												
Corn	40	32	40	60	55	50	65	80	70	80	105	95
Oats	7(0-15)		8	19	10	8	14	20	12	15	20	13
Barley				3(0-12)	3(0-10)			12	3(0-10)	10	9	5(0-30)
Tame hay[2]	6(0-11)	4(2-10)	1(0-5)	6(0-10)	4(0-12)	3(0-10)	6	9(0-15)	6(0-15)	6(0-12)	16(10-25)	10(6-5)
Wild hay	2(0-7)		2(0-5)	3(0-10)	2(0-10)	4(0-15)	5(0-15)	10(0-20)	10(0-20)	10(0-20)	8(0-30)	7(0-20)
Wheat	0	30	45	30	50	75	90	60	100	120	105	145
Other crops[3]	3(0-7)	1(0-5)	2(0-8)	3(0-10)	3(0-7)	3(0-10)	2(0-7)	5(0-10)	4(0-10)	3(0-10)	6(3-10)	4(0-10)
Pasture	17	9	18	30	25	13	13	35	30	25	40	35
Other land	5	4	4	5	8	4	5	7	5	11	10	6
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
Livestock system												
Horses	4	4	4	6	5	5	7	7	7	7	8	8
Cows	4(1-7)	4(0-7)	3(0-5)	7(5-11)	6(4-10)	5(3-7)	6(3-10)	8(5-11)	8(4-12)	8(6-12)	8(6-13)	8(4-10)
Cows milked	3(0-5)	3(0-6)	2(0-5)	5(4-8)	4(2-6)	4(3-6)	4(0-6)	5(3-7)	6(3-9)	5(4-10)	5(3-8)	5(3-8)
Other cattle	4(0-9)	3(1-8)	2(0-7)	9(6-11)	5(2-8)	5(2-9)	6(3-10)	7(3-12)	8(5-13)	10(6-20)	9(7-11)[4]	6(3-12)
Sows	3(0-9)	1(0-3)	1(0-3) 12(10-14)	2(0-8)[4]	4(2-10)	3(0-6)	2(4-8)	5(0-10)	5(0-12)	4(0-10)	9(6-15)	6(3-10)
Other hogs	0-30	0-15	0-40	10-50	15-60	10-50	0-35	10-45	10-50	0-50	15-50	15-60
Poultry	125	125	80	150	110	110	130	150	150	125	110	165
	Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
Fams having tractors	7	0	30	25	0	12	12	30	25	33	25	25

[1]The farms of different sizes represent the following percentages of all farms: 80-acre farms, 8 per cent; 120-acre farms, 8 per cent; 160-acre farms 21 per cent; 200-acre farms, 12 per cent; 240-acre farms, 15 per cent; 280-acre farms, 7 per cent; 320-acre farms, 10 per cent. The other sizes of farms are not of enough relative importance to group.

[2]Mostly alfalfa.

[3]Grain sorghum.

[4]A few have 15 or more.

followed an organization with 75 acres in feed crops, and 46 per cent followed one with 95 acres of feed crops. On the 240-acre farms 53 per cent of the farmers followed an organization with 130 acres of feed crops, and 42 per cent one with 180 acres of feed crops, and so on for the other sizes. Figures within the parentheses under crop acreages and livestock numbers present the range from low to high in acres or numbers. In some cases, it will be noted that two sets of figures are given for one or more of the kinds of livestock. These indicate that the variation in numbers of that class of livestock is wide and the separation into two groups indicates the varying emphasis given the enterprise.

WAYS IN WHICH THESE TYPICAL FARMING SYSTEMS MAY BE USED

The discussion of the uses of the material presented in the foregoing pages will be confined to three general headings: use of results in (1) determining profitable long-time systems of farming, (2) interpreting the annual agricultural outlook, and (3) other lines of research work.

USE OF RESULTS IN DETERMINING PROFITABLE LONG-TIME SYSTEMS OF FARMING

During the past few years there has been a great deal of attention given to the working out of agricultural programs. The ultimate objective of these programs, whether on a county, state, or national basis, is to help farmers, both as individuals and as a group, to get into systems of farming which will give them maximum returns for the resources used. This is true whether the particular program be better crop rotations, improved varieties of crops, disease control, better feeding practices, adjustments to market outlooks, or what not. Before much progress can be made in this direction, however, it is first necessary to know what the situation is in each area of the county, state, or region. It is necessary to know not only such things as the yields, and production and feeding practices, but also what variations in farming systems are found so as to determine how the probable conditions of the next few years will apply to these situations in different areas.

With this information on organizations and production practices as a background, the real problem becomes one of determining, in the light of physical conditions in the area, the long-time outlook for yields, prices of farm products and the cost of items used in production, which of the many prevailing systems of farming being followed in the area is likely to be most profitable for the group in the long run, or to determine if some system of farming not followed at present gives promise of yielding even greater returns.

TABLE 10. *Details of the cropping and livestock systems of a typical 160-acre farm in Kearney county, Nebraska*

CROPPING SYSTEM

Crop	Acres	Yield	Production	Requirements		Salable surplus
				Feed	Seed	
Corn	55	23 bu.	1,265 bu.	735 bu.	8 bu.	522 bu.
Oats	10	24 bu.	240 bu.	222 bu.	18 bu.	...
Barley	3	21 bu.	63 bu.	59 bu.	4 bu.	...
Tame hay	4	2.0 tons	8 tons	8 tons	...	...
Wild hay	2	.9 tons	1.8 tons	1.8 tons	...	...
Wheat	50	11.5 bu.	575 bu.	10 bu.	50 bu.	515 bu.
Sorghum	3	3.0 ton	9 tons	9 tons	...	...
Pasture	25	...	...	.....	...	...
Other land	8	...	...	.....	...	...

LIVESTOCK SYSTEM

Class	No.	Production	Sales	Feed requirements						
				Corn	Oats	Barley	Hay	Straw	Sorghums	Supplements
				Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Lbs.*
Horses	5	.....	.....	125	207	..	1.8	5	6	...
Cows[1]	6	5 calves 400 lbs. B. F.	1 cow 400 lbs. B. F.	60	15	..	6	12	.	...
Other cattle	5	.....	3 veals 1700 lbs.	55	...	..	2	5	3	...
Sows	4	6000 lbs. hogs	6000 lbs.	430	...	59	..	..	.	900
Poultry	110	550 doz. eggs 220 lbs. meat	550 doz. 220 lbs.	65	...	10[2]	..	..	.	100

[1]Four cows are milked
[2]Wheat

The wide diversity in organization on farms of different sizes in the various areas and even on farms of the same size suggests the inadvisability of generalizing for the farms as a whole. Such blanket recommendations are not only questionable but are likely to be misleading. On the other hand, it probably is not feasible to attempt to give each farmer individual attention. When, however, the farming systems have been analyzed and grouped in a manner similar to that shown in the foregoing tables it is possible to make the interpretation in terms of groups of farms which are doing about the same thing. Farms taken as representative of these groups are as near the individual farm basis as it is possible to get without considering each farm individually.

Just how these typical farming systems may be used in arriving at a decision with respect to the relative returns which can be expected from different farming systems over a period of years will now be indicated. The organizations used in the illustration are taken from representative townships in Kearney county in Area 3. In this area the 160-acre farm is the dominant size. On these quarter-section farms, according to the special tabulation of the 1925 census, there were three organizations commonly followed. (See Table 9.)

To illustrate the method, a budget or estimate of receipts and expenses is shown in detail for the organization having 50 acres of wheat. More of the 160-acre farmers follow this organization than any other. The returns from two of the other organizations (those having 30 and 75 acres of wheat, respectively) are also calculated in the same way but only the final results are shown.

Since, in this illustration, we are interested in showing the probable returns which can be expected from these organizations from the long-time standpoint, both long-time yields and prices are used in calculating the budgets. The yields used are the average yields of the last ten years in Kearney county and the prices are the average prices received by farmers in Nebraska in the past five years. The prevailing production and feeding practices for the different classes of livestock and the machinery and cultural practices used in the area are assumed in figuring out-of-pocket expenses.

The indicated returns of $1,693 shown in Table 11 are not net by any means and should not be considered as such. Only out-of-pocket expenses have been deducted or only those expenses which will vary as the organization is changed. No charges have been included for taxes, insurance, interest, repairs, etc., all of which would have to be taken out to get a net income figure. Since in this illustration we are interested in showing the relative returns from one organization

TABLE 11. *Budget of receipts and expenses on a typical 160-acre farm in Kearney county, Nebraska*

Receipts		
Crops		
Corn, 522 bushels, at 65 cents	$339	
Wheat, 515 bushels, at $1.10	566	
Total sales of crops		$905
Livestock		
Butterfat, 400 pounds, at 35 cents	$140	
1 cow, at $45.00	45	
3 veals, at $12.00	36	
Beef, 1,700 pounds, at 8 cents	136	
Hogs, 6,000 pounds, at 8 cents	480	
Eggs, 550 dozen, at 20 cents	110	
Poultry, 220 pounds, at 17 cents	37	
Total sales of livestock		$984
Total sales crops and livestock		$1,889
Expenses		
Twine, 130 pounds, at 13 cents	$17	
Threshing	53	
Extra labor	30	
Miscellaneous livestock	30	
Shelling, 885 bushels, at 2 cents	18	
Supplementary feed	37	
Seed	8	
Seed treatment	3	
Total out-of-pocket expense		$196
Returns to organization above out-of-pocket expenses		$1,693

as compared with the relative returns from a different organization handled on the same size of farm in this area, it is necessary to consider only the expenses which will vary as we shift from one to the other. That is to say taxes, insurance, building repairs, and other such expense will be about the same regardless of which organization is followed. They may consequently be disregarded for this purpose, since the changes in the organization are not radical ones.

It should be further understood that these returns are figured on an average basis and do not represent necessarily what a particular individual might obtain. As was indicated above, about 40 per cent of the farmers on the 160-acre farms followed the organization shown in Table 10. Among this large group of farmers there are of course certain men who are more efficient than others. Hence they will make and would be expected to make more from this organization than the less efficient farmers. If the returns of all the farmers, both good and poor, were obtained and averaged, however,

the result would correspond very closely with the figure shown in the table.

Taking the other two organizations having 30 and 75 acres of wheat, respectively, and calculating the expected returns from them, using the same yields and prices, we get the following results which are compared with the returns from the organization having 50 acres of wheat:

Organization with 30 acres of wheat	$1,580
Organization with 50 acres of wheat	1,693
Organization with 75 acres of wheat	1,778

Thus, at average yields and prices which have been obtained in this area, these results indicate a slight advantage in returns for the organization having 75 acres of wheat. The nature of the other enterprises of these three organizations may be noted by referring again to Table 9.

While the organization with the high acreage of wheat has the highest returns, there are other factors which the farmer considers. With a larger wheat acreage than either of the other organizations, labor is distributed less evenly thru the year and more dependence must be placed on hired labor at harvest time. A larger outlay of cash is therefore required. Increases in wheat acreage beyond 75 acres would result in still less even seasonal distribution of labor requirements.

Following this same procedure it is possible to determine fairly accurately about what return on the average can be expected from any organization which might be handled on this size of farm. Such a method of attack will enable interested persons to determine which of any number of organizations will likely prove most profitable under the physical and economic conditions of production existing in the area.

USE OF RESULTS IN INTERPRETING THE ANNUAL AGRICULTURAL OUTLOOK

In a similar way these typical farming systems may be used in interpreting the meaning and effect of changing price relationships upon the relative profitableness of different farm organizations. A farmer cannot stop with the selection of a general system of farming to be followed over a period of years. Some short-time adjustments in the general plan are usually necessary. This may be desirable due to failure of a particular crop or to prospects for either more or less favorable prices for the products in a particular year. In the following table the relative effect which changing prices have upon the returns from different organizations is illustrated. For this purpose the same organization used in illustrating the calculation of the budget (Table 10) will be used. In this organization as now handled it will be noted that both corn and hogs are sold. While 6,000 pounds of hogs

TABLE 12. *Effect of changing corn and hog prices on the returns to organizations selling varying quantities of corn and hogs (prices of other products kept constant)* [1]

Item	Unit	Returns to organization above out-of-pocket expenses when prices are as follows:		
		5-year average prices	High corn and low hog prices	High hog and low corn prices
		Dollars	*Dollars*	*Dollars*
Corn	Bushel	.65	.80	.50
Hogs	Pound	.08	.06	.11
Organization No. 1, selling 522 bu. corn and 6,000 lbs. hogs		1,693	1,651	1,795
Organization No. 2, same as No. 1 except all corn fed and 12,500 lbs. hogs sold		1,806	1,556	2,181
Organization No. 3, same as No. 1 except 750 bu. corn and 3,000 lbs. hogs sold		1,634	1,687	1,611

[1]Organization No. 1 is the same as used in Table 10 to illustrate calculating the budget. Organizations No. 2 and No. 3 are the same as No. 1 except the relative quantities of corn and hogs sold are varied.

are sold, there are nevertheless not enough hogs on the farm to consume all the corn.

To determine whether or not greater returns could be expected if more or less corn and hogs were sold than are sold at present, the organization as followed at present is first shown (designated No. 1) and then the hogs are increased to take care of the corn as in No. 2, and decreased so that more corn would need be sold as in No. 3 (see Table 12). The returns from each of the three are then calculated at varying prices of corn and hogs. The prices of the other products sold are held constant thruout, that is, equal to the five-year average price. Thus we get a direct comparison of the effect which changing hog and corn prices have upon the returns from organizations selling varying quantities of these products.

The prices in the first column of the table are the average prices received for these products by Nebraska farmers the past five years. In the second column of the table high corn prices and low hog prices are used. The prices for the other products are kept constant. This increase in corn prices, it will be noted, has resulted in a difference in returns from the three organizations. Whereas at average prices Organization No. 2, which feeds all the corn and sells 12,500 pounds of hogs, is most profitable, when corn prices are high and hog prices low as in the second column, Organization No. 3, which has the most corn and fewest hogs to sell, makes more money. On the other hand, when the reverse situation obtains and

hog prices are high and corn prices low, both Organizations No. 1 and No. 2 show a higher return than does No. 3, which has only a few hogs.

In other words, this table simply illustrates that as prices change the returns to be expected from different organizations likewise change. Hence, if a farmer is to follow his economic advantage, he must take changing price relationships into account when deciding what is the best thing for him to do any particular year. When the annual outlook report comes out these typical farming systems thus afford an excellent basis for interpreting its probable effect to the farmers in the different areas of the state.

USE OF RESULTS IN OTHER LINES OF RESEARCH WORK

These type-of-farming studies are also useful in other ways. By differentiating the agriculture of a state into type-of-farming areas a much more detailed and accurate picture of the situation in each part of the state is obtained. It further gives a better idea of the limits within which specific results from experiments or special studies may apply and also affords a more accurate basis for determining the degree of generalization that is permissible.

Studies made with the view of determining standards of performance, yields, production practices, etc., will be more reliable and trustworthy if confined to type areas in which there is a fairly high degree of uniformity in these factors. Likewise income studies would be more realistic and suggestive if the results were analyzed from the standpoint of type-of-farming areas and further restricted to show returns from farms of the same size and type. In these and many other ways the results of these studies should be of help in adding greater precision to other lines of research work.

[August, 1930—5M]