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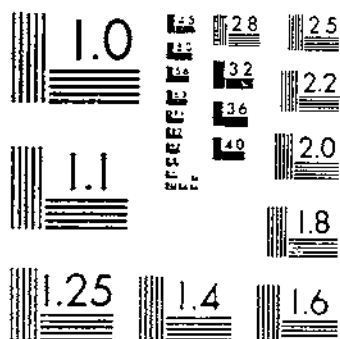
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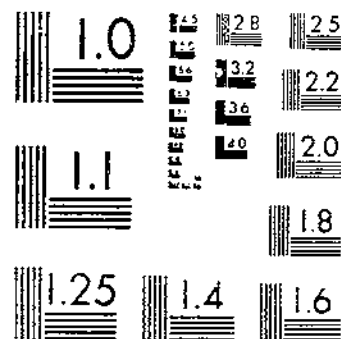
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A STUDY OF RANCH ORGANIZATION AND METHODS OF RANGE-CATTLE PRODUCTION
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UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

A STUDY OF RANCH ORGANIZATION
AND METHODS OF RANGE-CATTLE
PRODUCTION IN THE NORTHERN
GREAT PLAINS REGION

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THE UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION
WITH THE AGRICULTURAL EXPERIMENT STATIONS OF MONTANA,
NORTH DAKOTA, SOUTH DAKOTA, AND WYOMING

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INTRODUCTION

Beef-cattle production has long been the most important business enterprise in the northern Great Plains region, but for more than a decade the industry has been undergoing deep-seated changes. In 1917 it is still in a more or less disorganized condition. The northern Great Plains include the contiguous parts of North Dakota, South Dakota, Wyoming, and Montana.

There have been many causes for the changes which have taken place and for the unsettled condition of the present. Some of these causes are the results of such fundamental influences as the passing of the open ranges, which were formerly a part of the public domain, into small individually owned units through the various forms of homesteading, and the consequent development of dry-land farming. Outstanding among the temporarily disturbing causal factors may be mentioned a series of poor years for grass and feed production, the sudden postwar deflation in beef prices, and the continuous high

operating costs which have not followed the downward trend of the prices of beef cattle. As a result of these and other causes, heavy liquidation of cattle has taken place, and numbers of ranchers have completely gone out of business. Many of those that remain have greatly decreased their herds. The opinion prevails generally that new types of ranch organization must be developed and other methods of management must be employed, in order that cattle ranching may rest on a solid business foundation.

The typical dry-farming lands in this region in many cases have been cropped for a period of 20 years. The experience of farmers, together with the crop-production data of the experiment stations, gives a definite basis for evaluating the production of farming lands, but a large portion of the northern Great Plains is rough, untillable land that can be used only for grazing. The prosperity of these communities to no small degree will depend upon the intelligent use of this range resource. Because higher prices have been received for grain crops and other livestock than for beef cattle, it is but natural that during the last few years the general public in this region has been interested principally in the development of dry farming. The grazing resources and the ranching industry have not received the attention of the public in proportion to their importance in the region. As dry farming, a new type of agriculture, gradually encroached on stock raising, which had been generally successful for more than 30 years, there was a feeling on the part of the public that as the livestock business had taken care of itself in the past it could shift for itself in the future.

In order that ranchmen may successfully meet the changed conditions, the general public needs to know much more of the principle involved in the economic use of the untillable lands as well as to be informed about the economic use of the tillable dry-farming land. Attention must be given to the problems of the individual livestock producer as well as to those of the dry farmer by those agencies interested in the agriculture of the region.

It is evident that the old régime of ranch organization and practices in this region is rapidly passing and that there will evolve out of the present situation certain new types of ranch organization which will succeed in meeting the new conditions. This study is an attempt at a partial analysis of the present situation from the standpoint of beef-cattle production, with special reference to ranch organization and management. It aims to set forth problems for future study and, in the light of present information, to suggest types of ranch organization and production practices which have seemed successful in the study of the ranch business and the management records taken on more than 300 beef-cattle ranches operating within the region.

Changed economic conditions in the cattle industry as it came out of the depression period following the World War demand that many adjustments be made in ranch organization. These same economic forces, still at work, make necessary the careful selection of methods and practices in producing cattle to get the greatest income. There is probably no better way of determining what are successful business methods and management practices than the study of the results obtained on a large number of ranches. It was for the purpose of getting a record of the organization and operation of a large group of ranches that the United States Department of Agriculture in co-

operation with the agricultural colleges and experiment stations of Montana, Wyoming, North Dakota, and South Dakota made a study of 304 ranches in the northern Great Plains region.

In addition to the analysis of the business side of these ranches, the details of the system of management followed on each ranch were studied. A careful study was also made of the influences of weather, land settlement, taxation, credit, marketing problems, and the postwar deflation upon the cattle industry in this region. A record of the business of each ranch was made for the year April 1, 1924, to April 1, 1925. The information from individual ranches included a complete inventory at the beginning and at the end of the year, a record of total crop and livestock production, the details of ranch receipts and expenses, and an outline of the management policy and future plans, together with reasons for the methods and practices followed.

The figures on the business of the 304 ranches for 1924 were given by ranchmen, from their account books and from memory, to enumerators who visited their ranches during the spring and summer of 1925. These records, and all other information taken from each ranch, have been guarded as confidential, and the permanent files of this information carry the ranches marked by key numbers rather than by name. Additional information on the northern Great Plains region drawn from the Weather Bureau, the Bureau of the Census, the Forest Service, and various experiment stations has been analyzed and used in an attempt to learn the true conditions concerning ranching problems and operations.

THE NORTHERN GREAT PLAINS REGION

The northern Great Plains region, as considered in this bulletin, embraces that portion of Montana that is east of the Rocky Mountains, the northeastern quarter of Wyoming, and those portions of the Dakotas that lie west of the one-hundredth meridian, except for a small area in the north-central part of North Dakota. (Fig. 1.) The region comprises approximately 152,000,000 acres of land, of which 17,000,000 are devoted to crops, including wild and tame hay, cereal, and forage crops.

Drainage of the region is accomplished by the Missouri River, which projects its tributaries into the various areas to form a network of smaller streams. Very generally, even a small stream has an influence on ranching in the comparatively small area through which it passes because of the possibilities of a water supply, because of moist or irrigated land for wild hay or crop production, and because of the usual adjacent rough, broken ranges that furnish winter protection to livestock.

Aside from winter protection, topography seems to have an indirect influence on ranching in this region, except, possibly, in the Black Hills locality. The direct influence of topography is on the production of certain crops which in turn may influence ranching. But there is some relation between topography and soils, both as to types of soil and area of desirable type soil for crop production. In the "Bad Lands" district the proportion of level land to rough land is small. It is necessary to utilize every available acre of the level land for winter-feed production in order to be able to utilize the rough land for spring, summer, and fall grazing.

In the more level localities there is a considerable acreage of level or slightly rolling land that may be considered potentially tillable land. The attempt to cultivate all the tillable land that may be under individual ownership, especially on the larger ranches, presents difficulties in labor requirements, possible crop failures, and probable reduction of the grazing capacity of the unit of ownership.

The quality of the soil vitally affects ranching within relatively small and very definite localities. Crop production is directly dependent upon the quality of the soil, as are the native grasses, to a great extent. There is extremely wide variation in the types of soil in this region. Detailed information on that subject can be found elsewhere. The color of the soil, varying from the very dark to the lighter colors, which ordinarily indicates the relative amount of humus, is some indication of the comparative productivity. The darker soils are confined largely to the eastern part of the region.

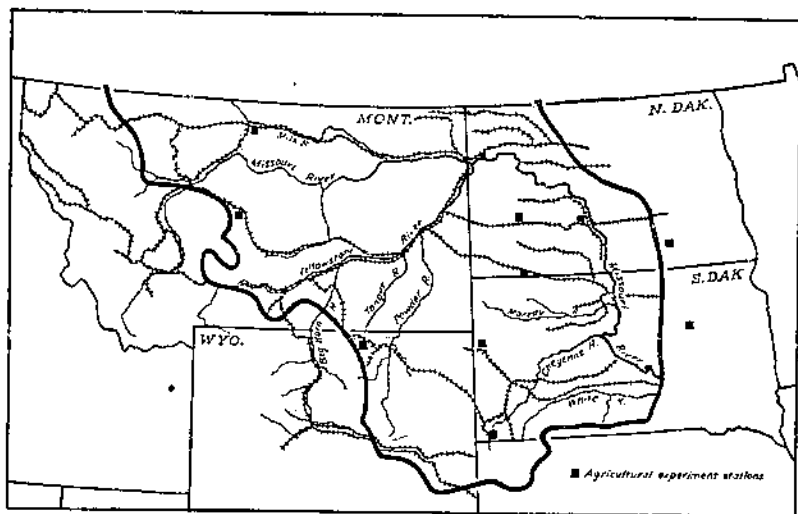


FIG. 1.—NORTHERN GREAT PLAINS REGION

Location of rivers, railroads, and agricultural experiment stations in the northern Great Plains region.

This is due in part to the heavier plant growth which is made possible by the greater amount of rainfall received. In general, smooth areas of land that lie along streams are very fertile and under suitable moisture conditions are capable of producing good yields of forage crops. The extremely light colored soils usually produce crops only under the most favorable climatic conditions. The brown soil, about 16 inches in depth, is generally considered to be about of the poorest quality that can be farmed with any degree of certainty, even under favorable seasonal conditions, but the poorer types of soil produce enough native grass to be of value for grazing purposes.

CLIMATE

The precipitation of the northern Great Plains region, which is shown in outline in Figure 1, varies from about 20 inches in the eastern to about 13 inches in the western portion of the region. The whole is a region of summer rainfall, as approximately 75 per cent

of the annual precipitation is received between April 1 and September 30. Wide variations often occur in the amount of rainfall from year to year and in its distribution within a single year. Extremely wet or extremely dry years may occur singly or consecutively. The normal amount of rainfall may be received during a certain year, but its distribution may be in the form of light showers of limited value to crops and summer grazing because of high surface evaporation. Torrential downpours over small localities or over relatively large districts are not uncommon. The precipitation received between October 1 and the last of March amounts to the approximate equivalent of about 4 inches of rainfall per annum. A considerable amount of this, however, is usually in the form of snow and may have an important influence on the use of range for winter grazing.

Among the important factors that influence the benefits derived from rainfall are temperature and wind velocity. The climatological data of the region indicate that it is one of extreme temperatures. During the winter a temperature of -30° to -40° F. may prevail for several consecutive days. During the comparatively short summers, temperatures as high as 100° F. may prevail for several days in succession. The mean winter and summer temperatures are considerably above and below the respective temperatures mentioned.

High wind velocity during the winter tends to blow the snow into drifts which leaves some areas open for a limited amount of grazing. High wind velocity during the summer tends to increase surface evaporation and in extreme cases is very detrimental to the growth of field crops and range grasses, particularly if accompanied by high temperature.

Table 1 gives a summary of the climatological data from 11 experiment stations which is fairly applicable to this region. All these stations are not located within the region, but are in such proximity as to make the data of value for comparative purposes. None of the tabulated data extends beyond 1922. Various phases of the data cover periods of 12, 20, and 40 years.

TABLE 1.—Summary of climatological data for 11 agricultural experiment stations in or near the northern Great Plains region¹

Station	Altitude	Precipitation					Seasonal evaporation	Ratio of seasonal precipitation to seasonal evaporation	Seasonal temperature		
		Average annual	Seasonal		Annual				Mean	Mean maximum	Mean minimum
			Average	Percentage of annual	Highest	Lowest					
	<i>Feet</i>	<i>Inches</i>	<i>Inches</i>	<i>Per cent</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>				
Redfield, S. Dak.	1,295	20.33	15.62	76.8	30.76	11.98		61			
Havre, Mont.	2,600	13.27	9.77	73.6	25.67	6.76	35.8	1 to 3.7	58	72.0	46
Moccasin, Mont.	4,300	16.52	11.99	72.6	23.76	9.90	33.4	1 to 2.5	55	68.0	41
Dickinson, N. Dak.	2,543	15.41	12.04	78.1	22.74	8.37	32.9	1 to 2.7	58	72.6	43
Mandan, N. Dak.	1,720	17.04	12.99	76.2	30.92	10.31	34.8	1 to 2.7	59	71.2	47
Williston, N. Dak.	1,875	14.76	11.12	75.3	23.25	7.37	33.0	1 to 3.0	58	71.0	45
Hettinger, N. Dak.	2,675	14.52	11.86	81.7	22.35	7.37	32.5	1 to 2.7	58	72.0	44
Edgeley, N. Dak.	1,468	17.57	14.51	82.6	27.45	10.41	29.2	1 to 2.0	58	71.0	45
Sheridan, Wyo.	3,790	14.43	9.36	64.9	22.54	7.98	36.2	1 to 3.9	57	72.0	43
Bella Fourche, S. Dak.	2,850	15.46	11.74	75.9	25.89	6.64	36.7	1 to 3.1	61	74.0	47
Ardmore, S. Dak.	3,567	16.69	13.25	79.4	30.41	12.78	37.7	1 to 2.8	61	75.0	47

¹ Table taken from the following: OAKLEY, R. A., and WESTOVER, H. L. FORAGE CROPS IN RELATION TO THE AGRICULTURE OF THE SEMIARID PORTION OF THE NORTHERN GREAT PLAINS. U. S. Dept. Agr. Dept. Bul. 1241. 1924.

TABLE 1.—Summary of climatological data for 11 agricultural experiment stations in or near the northern Great Plains region—Continued

Station	Absolute temperature for station		Killing frost				Growing season			Average seasonal wind velocity per hour
	Maximum	Minimum	Average date		Latest in spring	Earliest in fall	Average	Shortest	Longest	
			Last in spring	First in fall						
	° F.	° F.					Days	Days	Days	Miles
Redfield, S. Dak.	110	-44	May 14	Sept. 27	June 21	Sept. 9	136	33	172	5.4
Havre, Mont.	108	-37	May 17	Sept. 19	June 3	Aug. 25	125	83	152	6.5
Moccasin, Mont.	103	-37	May 18	Sept. 20	June 2	Aug. 24	125	83	150	6.7
Dickinson, N. Dak.	110	-47	May 26	Sept. 9	June 25	Aug. 9	106	47	155	6.0
Mandan, N. Dak.	110	-45	May 12	Sept. 19	June 7	Aug. 23	130	98	170	6.8
Williston, N. Dak.	109	-49	May 17	Sept. 18	June 16	Sept. 3	121	89	173	6.4
Hettinger, N. Dak.	105	-47	May 27	Sept. 17	June 17	Aug. 28	113	92	129	6.6
Edgeley, N. Dak.	110	-38	May 18	Sept. 20	June 9	Aug. 20	125	85	143	4.5
Sheridan, Wyo.	105	-45	May 20	Sept. 20	June 6	Aug. 25	123	100	156	6.0
Bella Fourche, S. Dak.	109	-37	May 12	Sept. 26	May 31	Sept. 14	137	119	171	5.3
Ardmore, S. Dak.	103	-34	May 8	Sept. 20	May 20	Sept. 8	135	121	140	

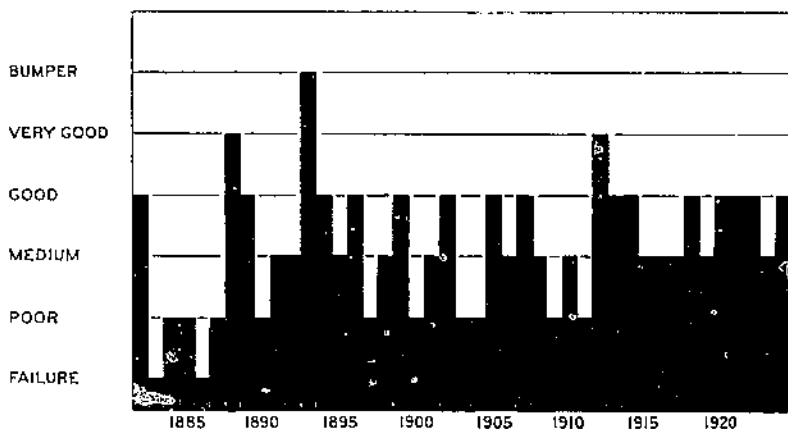


FIG. 2.—EARLY SPRING RANGE CONDITIONS, 1882-1924

There is considerable variation in spring range conditions from year to year. These conditions were indicated by a study of certain climatological factors such as rainfall, temperature, humidity, and wind velocity. (The data were compiled and the chart was made by P. Patton of the Montana Agricultural Experiment Station.)

Climate has a most important influence on the ranching industry in this and other western regions. Weather records showing the extreme variation and the average condition with regard to annual and seasonal precipitation, temperature, evaporation, wind velocity, and length of growing season should be of special interest to livestock producers in any locality or region. The variations, especially in subnormal rainfall and abnormal snowfall, that may prevail within a year, or a succession of years, are factors that must be considered seriously in formulating plans of ranch operation in any region of the Western States. Extremely dry grazing seasons followed by more or less severe winters usually result in situations difficult to overcome without financial loss or incurrence of high operating expense. This is particularly true under conditions of severe winters that necessi-

tate more or less winter feeding, as in the northern Great Plains region.

The following illustrations (figs. 2, 3, 4, and 5) are compiled from data collected and tabulated by the Montana Agricultural Ex-

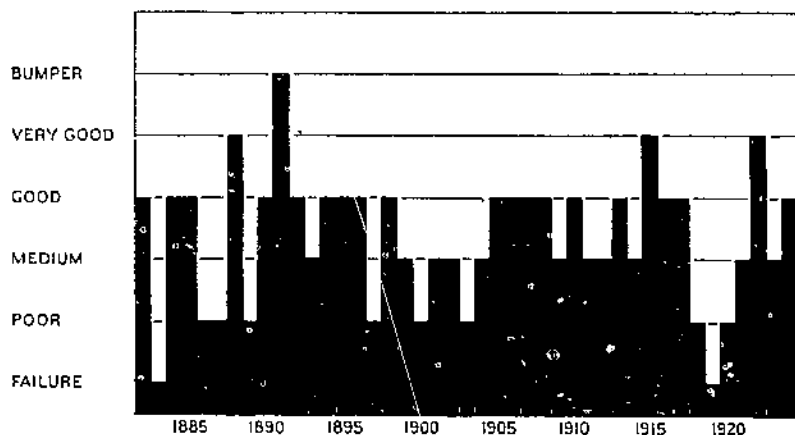


FIG. 3.—SUMMER RANGE CONDITIONS, 1882-1924

Summer range conditions affect gains made by steers and the condition of the breeding herd at the beginning of the winter season. (The data were compiled and the chart was made by P. Patton, Montana Agricultural Experiment Station.)

periment Station in studying the influence of weather on grazing and grass-hay yields as related to range-livestock production. Scientific publications, official reports, and newspaper files have been searched for verification of probable range conditions that might

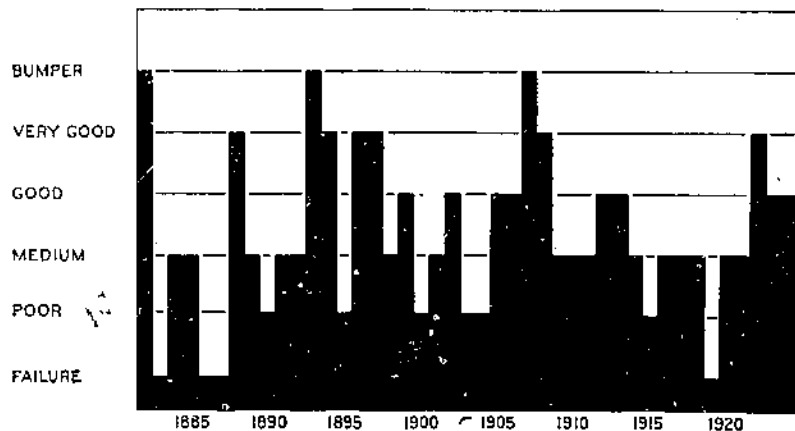


FIG. 4.—YIELD OF GRASS-HAY CROPS, 1882-1924

The uncertainty of a hay crop necessitates carrying over a reserve of winter feed from year to year. (The data were compiled and the chart was made by P. Patton, Montana Agricultural Experiment Station.)

have been expected to exist, as indicated by the climatological data of the period. The data are directly related to the State of Montana only, but they are typical of conditions that probably existed in other districts of the region.

Figure 2 presents the conditions prevailing on the ranges during the early part of the grazing seasons from 1882 to 1924, inclusive. It shows that in 12 out of the 43 years early grazing conditions were

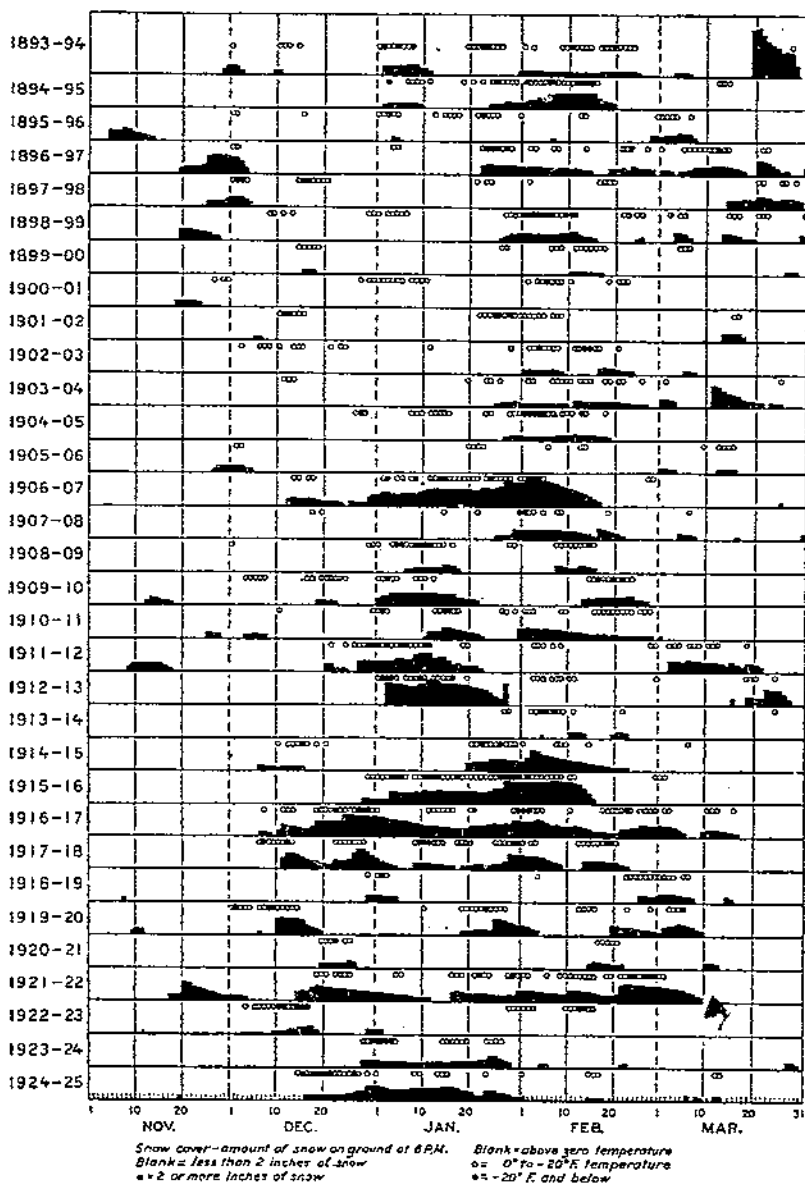


FIG. 5.—DAILY SNOW COVER AND SUBZERO TEMPERATURES, MILES CITY, MONT., 1893-1925

A large quantity of snow remaining on the ground for a long period affects adversely the extent of winter grazing and improves range conditions during the following season.

classified as "poor" or "failure." In three of those years early grazing conditions were classed as "very good" or "bumper," and they have been termed "medium" or "good" during the other 28

years. Consideration must be given the preceding season, however, and to the probable situation with respect to feed supply for meeting an unfavorable spring season. "Poor" range conditions may be expected to occur with greater frequency than "very good" or "bumper" years. Conservative operation will involve preparation for such emergencies.

Figure 3 deals with summer grazing. "Medium" to "good" range conditions prevailed in 29 out of the 43 years of record. In only 4 of the 43 years were the conditions above "medium" to "good," whereas for 10 of the 43 years a condition below "medium" to "good" was recorded. It may be noted in some instances that "poor" range conditions in the early season improved to "good" during the summer season. The early condition, therefore, is not a positive indication of what the summer condition will be. The condition of the range during the summer is of special importance in this region because of the influence on the condition of cattle marketed during the following fall. In addition, summer rains largely determine the quantity of native grass available for fall and winter grazing. A low yield of hay may be overcome in part by excellent range conditions during the fall, followed by a mild winter. But to depend upon such a favorable sequence of seasons is a risk too great to take without preparation for an emergency. The interdependence of seasonal conditions as affecting the ranching business very often puts ranchmen in difficult situations even though a conservative production policy is followed.

A poor condition of the range in the spring or summer may be materially improved within 10 to 20 days after a rain. In considering a certain condition as it prevails on an area of range, the fullest understanding can not be gained of what that condition actually means in terms of possible beef production, the finish that may be acquired, and the probable acreage per head necessary, without considering the native vegetation and its value for grazing. These qualities are referred to briefly under the related topics.

Figure 4 shows the yield of grass-hay crops possible under the conditions prevailing during the early spring and summer grazing seasons. Certain critical years are portrayed by following the data through several seasons. The seasons of 1886 and 1887 are recorded as having been among the most critical in the ranching history of the region. The range conditions during the early season of 1886 are recorded as "failure" in the chart. Summer range conditions were recorded as "poor." The hay crop was a failure. The early range condition during the following year, 1887, was little improved over those in the former year, and the condition of the summer range and yields from grass hay showed no improvement.

A later critical period, beginning in the spring of 1919 and ending with the winter of 1920, may be traced through the charts in a similar way. Range conditions were "medium" during the early grazing season of 1919. A comparison of rainfall data at various stations within Montana shows that the rainfall in April, May, and June of 1919 was approximately 2 inches as compared with a normal rainfall for those months of approximately 6 inches. As a result of the subnormal rainfall during the early season, summer grazing was a "failure." The unfavorable weather conditions in 1919, shown by the climatic records, were verified by many ranchmen who were

consulted during the survey, and their financial condition was attributed in part to the poor wintering conditions and the resulting necessity of heavy feed purchases in that year.

Figure 5 shows the snow cover and the subzero temperatures at Miles City, Mont., from the winter of 1893-94 to 1924-25, inclusive. In referring again to the seasons of 1919-20 it will be noted that a comparatively early snow of more than 2 inches fell around November 10 and that three other periods of heavier snowfall occurred previous to March 15 at this point. In addition the number of days of subzero temperatures seems to have been somewhat above the average, especially during the early part of the season. It is apparent, then, that such circumstances are very difficult to overcome. The fact is established by the experiences of many operators who contributed to the data contained in this bulletin.

Judging from the history of the years of 1886-87 and 1919-20 the occurrence of a very poor year or a succession of poor years usually means a crisis to many individual operators because of high operating expenses and great death losses among cattle. It is further evident that no cycle of very good years or poor years in any sequence is shown by the climatological history.

TYPES OF NATIVE RANGE GRASSES

The most important range grasses of the northern Great Plains region are grama, buffalo grass, and the wheat grasses. Many combinations of these with grasses of lesser importance occur to form range types. The various types are usually confined to certain types of soil, and the predominance of any particular grass is usually determined by the quality of the soil and the usual rainfall conditions. Certain range types are worthy of special mention because of their predominance in the region and their value for grazing.

The grama-grass type is composed almost entirely of pure stands of grama grass and is confined to districts of comparatively low rainfall in the western part of the region. This type is found almost entirely on the "tight" lands, which are not regarded as the best class of farming lands.

The grama-and-wheat grass type is composed of about equal proportions of the two grasses and is confined to the heavy clay loam soils. Considerable moisture is required for crop production on this type of soil. In addition to grazing, this type of range produces native-hay crops.

The grama-buffalo type is composed of approximately equal proportions of grama and buffalo grass and is among the most important types found in the tight-land districts of the southern part of the region.

The wheat-grass type, which is practically a pure stand of wheat grass, is confined to the heavy clay soil—of doubtful farming value because of the amount of moisture required. During favorable seasons this type of range furnishes excellent grazing. This grass is also locally known as bluestem.

Various minor types occur in which grama and buffalo grasses predominate. A very valuable characteristic of these grasses is that they cure well on the ranges and can be reserved for fall and winter grazing.

The native range grasses of the region are important in making it one of the best cattle-producing regions in the Western States. There is no area of comparable size in the 17 Western States that is as well suited to the production of a good-quality, grass-fat beef, because of the fattening qualities of the native grasses and the further possibility of producing a quality of beef that carries firm finish. The quality of the ranges is reflected in the weight and finish of the mature steers that are marketed from the region during years of normal seasons.

CROP PRODUCTION

The principal small-grain crops produced in the region are wheat, oats, and barley. The important hay crops are native grasses, bluestem (occupying a very favorable position in this group), alfalfa, and millet. Corn occupies an intermediate position, in that it is harvested as a grain crop under favorable climatic conditions and as a forage crop when not mature. Corn is a crop that fits in exceptionally well with the system of farming that includes summer fallowing. During years of unfavorable seasons small grain is usually harvested as grain hay to avoid entire loss of the crop. Certain other crops, like sweet clover, sunflowers, soy beans, Sudan grass, and crested wheat grass, have been tried at the various experiment stations within the region. Results indicate that a number of these crops under certain soil and climatic conditions will probably become more widely produced within the region than at present.

A vast amount of data is available concerning different varieties of the many crops produced experimentally under various seasonal conditions and cultural methods. That information may be obtained from the agricultural experiment stations of the respective States of the region and from the United States Department of Agriculture, and may be had by those especially interested in the crop-production phase of the agriculture of the region.

Table 2 gives the yields of crops that were thought to be of special interest to cattlemen of the region, judging from the records of crop production obtained in this survey.

TABLE 2.—Estimated average yield per acre of specified grain and forage crops at 11 agricultural experiment stations in the northern Great Plains region¹

Station	Grain crops			Forage crops			
	Spring wheat	Oats	Barley	Grimm alfalfa	Corn fodder	Dakota amber sorghum	Karak millet
	Bushels	Bushels	Bushels	Tons	Tons	Tons	Tons
Redfield, S. Dak.	16.5	30.5	34.2	1.6	3.4	3.5	2.8
Ardmore, S. Dak.	17.2	52.1	18.1	.98	1.5	2.8	2.0
Belle Fourche, S. Dak.	16.0	31.1	17.2	1.00	1.8	2.3	-----
Edgeley, N. Dak.	17.2	34.0	20.3	1.00	2.0	-----	-----
Mandan, N. Dak.	16.3	34.8	21.9	.93	1.9	1.8	2.0
Dickinson, N. Dak.	18.4	37.2	23.3	.85	1.5	1.6	1.2
Williston, N. Dak.	15.0	32.3	18.8	-----	2.4	2.2	-----
Hettinger, N. Dak.	14.5	32.8	24.9	-----	-----	1.7	1.6
Havre, Mont.	7.3	13.5	9.0	.2	1.0	.0	.2
Moorestown, Mont.	16.7	36.2	18.9	1.1	2.4	.7	1.1
Sheridan, Wyo.	15.2	31.8	25.1	1.2	1.3	1.6	1.4

¹ Table taken from the following: OARLEY, R. A., and WESTOVER, H. J.,

With the exception of the yields shown by the station at Redfield, S. Dak., which are the results of 3 years' tests, these yields represent the results of experiments that continued from 6 to 14 years. The original compilers of the data say that the yields shown are probably slightly above what the farmer could expect, because of the better seed-bed preparation and cultural methods usually employed in experimental work.

From the available data regarding the crop records it seems that three-fourths ton to 1¼ tons of wheat-grass hay per year is a fair yield from the native meadows that are classified as "subirrigated." Higher yields may be expected where actual flooding is possible. Under irrigation alfalfa has become an important hay crop and has replaced wheat grass in many localities. Dry-land alfalfa also has very promising prospects. Dry-land meadows of native grass that are cut every second year usually yield about 1 ton of hay per acre. A common method of handling these meadows is to keep half of the acreage ungrazed and cut the other half.

Climatic conditions exert a determining influence on the crop yields that may be expected each year. The average yields of wheat and flax, by States, as reported in the United States Department of Agriculture Yearbook are shown in Table 3. The wide range of average yields for an entire State like Montana indicates that there were much greater variations for any particular part of the State. Under irrigated conditions short crops are less frequent and complete failures rarely occur but a comparatively small percentage of the ranchmen have irrigation facilities. The wide variations shown in grass-hay yields in Figure 4 are not significant of variations that may be expected in yields of forage crops, because cultivation of crops has become more or less confined to areas where there are more favorable soil and climatic conditions and where there is a possibility of conserving moisture by cultural methods. The consensus of opinion is that forage crops used in connection with the native ranges will be more commonly found as a type of agriculture in this region than the production of cash grain crops.

TABLE 3.—Wheat and flaxseed: Average yield per acre, selected States, 1908-1925¹

Year	Wheat				Flaxseed			
	Montana	Wyoming	North Dakota	South Dakota	Montana	Wyoming	North Dakota	South Dakota
	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels	Bushels
1908	24.2	25.4	11.6	12.8	11.5	12.8	9.0	10.7
1909	30.8	28.7	13.7	14.1	12.0	-----	9.3	9.4
1910	22.0	25.0	5.0	12.8	7.0	-----	3.6	5.0
1911	28.7	26.8	8.0	4.0	7.7	-----	7.6	5.3
1912	24.1	28.7	18.0	14.2	12.0	-----	9.7	8.6
1913	23.8	25.0	10.5	9.0	9.0	-----	7.2	7.2
1914	20.2	22.9	11.2	9.1	8.0	-----	8.3	7.5
1915	26.5	26.5	18.2	17.1	10.5	13.0	9.8	11.0
1916	19.3	21.6	5.5	6.8	9.5	7.0	10.3	9.3
1917	10.4	21.2	8.0	14.0	3.0	6.5	3.9	7.0
1918	12.6	25.4	13.6	19.0	3.0	9.0	7.8	9.5
1919	2.7	14.4	6.9	8.2	1.3	4.0	4.6	7.0
1920	10.3	20.0	9.0	9.2	2.5	8.2	5.3	10.0
1921	12.3	17.2	8.5	9.1	5.0	5.7	6.5	6.5
1922	14.6	14.0	14.1	13.4	7.2	7.0	9.3	9.5
1923	14.0	15.0	7.1	9.6	8.2	10.0	7.7	8.5
1924	16.4	15.2	15.7	15.0	8.7	9.0	6.5	8.9
1925	10.7	17.0	11.7	11.8	4.5	-----	6.5	6.8

¹ U. S. Dept. Agr. Yearbook 1908: 612, 692; 1925: 746, 832.

THE AGRICULTURAL DEVELOPMENT OF THE REGION

Previous to 1870 agriculture as an established industry was negligible in this region, but the Territories of Montana and Wyoming, established, respectively, in 1864 and 1868 from Dakota Territory, soon became attractive to cattlemen, sheepmen, and farmers on account of the grazing resources and the available farming lands. Farming did not gain a very strong foothold until the building of railroads opened means of transportation for farm products. The agricultural development of the region since 1870 may be roughly divided into several periods, each marked by the fact that a certain type of agriculture came into prominence.

During the period from 1870 to 1880 the cattle business experienced wide expansion and little competition from farming. In 1871 the first trail herd of cattle came into Wyoming from Texas. In 1876 a band of sheep came into Montana from California. These movements are significant of the wide territory from which the region drew its livestock, especially during the years of greatest livestock expansion. During this period millions of acres of former Indian reservations were withdrawn as such and were added to the existing large area of public domain. Reliable statistical data are not available regarding numbers of livestock in the region during that time, but the records of Montana show 274,000 cattle and 250,000 sheep in 1880. As the record shows only 87,000 cattle in Montana in 1873, a rapid increase in numbers is indicated in spite of the existing conditions. The record further shows approximately 170,000 sheep in 1879, which indicates a very rapid increase, especially for one year. Concurrent with these conditions in Montana, the Black Hills locality was attracting attention because of the discovery of gold in 1874. This brought prospectors, many of whom turned farmers and cattlemen at later dates.

The numbers of livestock and acres of crops as given by the agricultural census for each period since 1880 are shown in Table 4. Instead of using the figures for the total area of the four States, which would include the highly developed farming land in the eastern part of the Dakotas, an attempt was made to consider the census enumerations for the region west of the Missouri River and east of the Rocky Mountains only. As a rule the county boundaries had changed at each census period, so the Missouri River and the State boundary lines were used as far as possible in order to get an area where outside boundaries had remained constant for the last 50 years.

Table 4 naturally shows a tremendous increase in the numbers of all classes of livestock kept and in the number of acres of crops grown since 1880. There has been a very marked decrease in the number of sheep in this region since 1910 due to the taking up of the open range by homesteaders, the prices brought by sheep as compared with prices brought by other livestock, and the severe climatic conditions from 1917 to 1919. The number of sheep decreased from over 4,000,000 in 1910 to 650,000 in 1925. There has been a decrease in the number of beef cattle since 1920 which may have been relatively greater than that shown in the table. The number of hogs enumerated in 1925 is almost double the number given in 1920. The increased importance of farming in the region is shown by the striking increases in the acreage of corn, wheat, oats, barley, and flax during the same period.

TABLE 4.—Number of livestock and acreage of crops in selected counties of Montana, Wyoming, North Dakota, and South Dakota, census years 1880-1925¹

Item	1925	1920	1910	1900	1890	1880
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Horses.....	714,760	805,866	457,351	271,845	100,645	5,486
Mules.....	13,574	9,742	8,753	2,103	1,032	611
Beef cattle.....	1,501,541	1,582,721	1,047,611	1,002,730	568,417	45,643
Dairy cattle.....	178,489	325,254	126,943	34,623	21,575	2,672
Sheep.....	651,271	1,054,449	4,161,210	4,385,802	1,564,001	86,201
Swine.....	991,400	372,835	159,254	38,741	23,405	2,082
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Corn.....	1,116,561	384,675	277,901	34,681	24,895	689
Oats.....	832,088	282,359	532,176	75,507	36,395	8,661
Wheat.....	2,048,694	2,192,000	732,694	144,494	38,866	4,023
Barley.....	275,980	123,782	55,033	6,736	874	698
Rye.....	154,509	314,574	3,455	2,375	102	19
Flax.....	553,120	93,970	191,605	4,558	824	-----
Hay and forage.....	2,069,443	3,474,350	1,793,161	659,448	258,744	15,605

¹ Compiled from reports of the Bureau of the Census of the United States Department of Commerce. The area to which the census data apply was of the same size each year and in 1925 comprised the following counties: *Montana*—Carbon, Carter, Custer, Dawson, Fallon, Fergus, Garfield, McCone, Menger, Musselshell, Park, Powder River, Prairie, Richland, Rosebud, Stillwater, Sweet Grass, Treasure, Wheatland, Wibaux, and Yellowstone. *Wyoming*—Campbell, Crook, and Weston. *North Dakota*—Adams, Billings, Bowman, Dunn, Golden Valley, Grant, Hettinger, McKenzie, Mercer, Morton, Oliver, Sioux, Slope, and Stark. *South Dakota*—Armstrong, Bennett, Butte, Corson, Custer, Dawey, Fall River, Gregory, Haakon, Harding, Jackson, Jones, Lawrence, Lyman, Meade, Sisseton, Pennington, Perkins, Shannon, Stanley, Todd, Tripp, Washabaugh, Washington, and Ziebach.

Soon after 1870 a condition existed in the southern range regions that influenced, more or less, the movement of cattle into Wyoming and the Dakotas. The principal outlet for Texas cattle was through the shipping points in western Kansas and Nebraska. Those points were the meeting places of eastern cattle buyers and range men. Because of the great numbers of cattle arriving at the shipping points the system of holding cattle on neighboring ranges for further grazing was developed. As conditions became crowded about the shipping points and as market prices fluctuated, the holding grounds were expanded, and uncrowded ranges were sought. Wyoming was one of the first States to receive the overflow.

In the early eighties a veritable flood of cattle went into the region, especially from the southern ranges. In 1880 the Utah Northern Railroad came into western Montana from Ogden, Utah. In 1882 and 1883 the Northern Pacific Railroad came into North Dakota and Montana, and in 1887 the Great Northern Railroad reached Montana. Improved transportation facilities gave an added impetus to the expansion of the livestock industry, until the ranges became heavily stocked, as compared with former years.

During this period there was considerable activity in the homesteading and purchase of the most valuable lands to be used in connection with the vast area of public domain. The principal demand was for the irrigable and other good hay land. As cattle become more numerous and the ranges were more heavily grazed, winter feeding became necessary.

Another factor that stimulated feed production and land acquirement should be considered. In the early movements of cattle from the southern ranges the herds consisted almost entirely of steers which were grazed two or more summers and were sold when 4 to 6 years of age. As the trade increased and the demand for steers became keener, great numbers of cows were moved into the region with the expectation of carrying breeding herds on the northern

ranges to produce steers. As cows could not raise calves and withstand the winters, it became necessary to raise feed for them. The steers could "winter" themselves, especially when well-protected range could be found with a fair amount of grazing during normal years.

Homestead entries of all classes increased during the period 1880-1890. Cattlemen increased their hay land by purchase of additional acreage. Ownership of hay land with a small acreage of range land was considered a safe basis for operation because of the immense acreage of public domain. Practically the only hindrances to use of the public domain were range rights of other cattlemen and the entrance of sheepmen. Under the ordinary system of use contentions often arose between the two classes of producers over the use of range.

The years 1886 and 1887 were the most trying that had confronted the cattlemen of the region. The ranges were heavily stocked, and grazing conditions were far below normal during the season of 1886. The hay crop was short, and the following winter was very severe. Cattle died by the thousands. Financial losses were heavy and many men were forced to leave the business. Others made vigorous attempts to find their money where they had lost it and many regained a footing in the cattle business.

Movements of cattle into the region continued into the nineties. After the latter eighties the trail movements all the way from the extreme southern ranges were more or less discontinued, and Orin Junction, Wyo., became a railroad unloading and distribution point. As it was situated near the center of the eastern half of Wyoming, the trails to Montana and to what is now North Dakota were merely prolongations of those leading to northern Wyoming and to the present South Dakota ranges from that point.

During the period 1890-1910 cattlemen did not depend entirely upon the open range, but each maintained a headquarters of owned land consisting principally of hay land, using the public domain as prescribed by water rights and other unwritten laws of the range. Certain localities because of the grass produced and winter protection afforded were reserved by consent of the users for wintering purposes. Usually the first cattle work in the spring was to work out the winter range and drift all cattle to the summer ranges to permit growth of grass for the next winter season. During the fall working, cattle were drifted toward the winter range. Large operators necessarily employed comparatively large numbers of men, a common ratio being one, regularly employed, to each 1,000 head of cattle. Saddle horses and round-up wagons were maintained in necessary numbers. Operations were systematized as applied to both the individual outfit and to areas of range. In working a range of a certain district or locality representatives of adjacent operators made up the round-up crew, each man looking after the interests of his employer. In return representatives were sent to other round-ups, and in each case the work was handled systematically.

Sheep production increased materially in the western portion of the region, especially after 1880. In 1892 sheep suffered a marked decline in prices. Many sheepmen sold out and did not return to the business even when it regained a better market condition. The low market price was a serious blow to the sheep business, and the

limited expansion that followed the more favorable market did not nearly make up for the reduction of numbers following the depression. Some districts experienced an almost entire passing of sheep, which were replaced by cattle. Contentions between sheepmen and cattlemen during this period resulted in the enactment of certain herd laws applying within the respective States. To this date some of those laws have not been revised to meet the changed conditions.

On the whole, the period from 1890 to 1910 was one generally favorable to cattle production. There were some lean years, when range conditions and hay yields were very unfavorable; 1897, 1900, and 1903 may be mentioned especially. (See figs. 2, 3, 4, and 5.) The worst economic features were the panic of 1907 and market fluctuations. From the best information available it seems that operating expenses increased during this 20-year period. Operators could stand slight increases in operating expenses because most of the grazing could be had for the cost of labor to handle the cattle. Interest rates were comparatively high. The investment was principally in cattle that were increasing in numbers and weight and could be disposed of as the market price invited or as interest payments and range conditions demanded.

The period from 1910 to 1920 exceeded all previous 10-year periods several times over in the movement of homesteaders into the region, as indicated by various records. This movement was due to the passage of the 320-acre homestead law in 1909 and the 640-acre law in 1916. The amount of extremely good farming land was not sufficient to supply the demand, and inferior lands were also taken. The movement assumed vast proportions and dealt a telling blow to range men because the supply of open range really became limited and the position of the cattlemen became cramped, especially those who were depending to a very great extent upon the public domain for grazing. From 1910 to 1916 crop yields were fairly good. Some of the homesteaders on receiving patent sold their land, but the out movement was not general.

The declaration of war in Europe had a stimulating effect on cattle and grain production. It was expected that foreign trade would be developed. Market prices became stronger. Additional stimulation was given to homesteading in 1917 upon declaration of war by the United States. Young men going into the military service were by law permitted to file on homesteads and numbers of them took advantage of the opportunity. A considerable proportion of certain localities were filed on by men in the military service.

This influx of settlers interested the users of the range. Opinions varied as to whether the settlers would be able to stay, because of the hazards of farming. Favored with only a few lean years as compared with the number of years of good crop yields from 1890 to 1910 many of them stayed. Some failed or became dissatisfied, sold their land if patent had been granted, and left the country. Some range men took advantage of the opportunity to acquire land and bought it at low prices. Others preferred to use the abandoned land, which was limited in extent but which was free of charge. Some of the homesteaders made good crops and enlarged their holdings by buying out other farmers. By 1910 many cattlemen were in a more or less crowded condition, especially in those localities of level land which offered farming possibilities and a water supply.

The cattlemen in the rougher range areas were not as badly disturbed, except for possible homesteading of summer range, which was rather plentiful even at this time.

Concurrent with the above activities of cattlemen and sheepmen of the region there was an in movement of farmers, or home seekers. Practically everyone who came in went into some cattleman's or sheepman's range—his range according to the laws of the range but not according to the statute—and took a homestead. During the early years of homesteading there was an abundance of good land accessible to water. Those locations were the first chosen. With the closing of each watering place cattle and sheep had to be shifted to other ranges where water was available. From 1890 to 1910 the numbers of farms increased approximately 150 per cent. More irrigable land had been available in Montana than in other parts of the region, but by 1900 all of this had been taken up. From 1900 to 1910 the settlers went to the dry land.

From the spring of 1917 to the spring of 1919 conditions in the southwestern range area were not favorable. A severe drought prevailed. Comparatively large numbers of the southern cattle were moved to the ranges of the northern Great Plains region, and at the close of 1918 the latter were stocked heavily. The year 1919 was a very poor one, as indicated by Figures 2, 3, and 4. The early spring range was medium, and the summer range and hay crop were failures. The cattle were not fat in the fall, which limited the possibilities of sale at favorable prices. Feed was scarce and extremely high in price. Cattle were high.

Several plans were open to consideration: (1) Sell the cattle for what they would bring, (2) ship to other ranges, (3) attempt to winter them on the range, or (4) buy feed for wintering. Comparatively few cattlemen shipped to market. Some of the larger operators shipped to other ranges. The acute car shortage prevented shipment to market or other ranges by numbers of operators who considered the movement otherwise advisable. As a matter of choice in some instances and as a necessity in others, many held and wintered their cattle at heavy expense for feed and labor.

In addition to the feed and labor expense, death losses on the whole were heavy during the latter part of the winter of 1919-20. It was not difficult to borrow money to buy feed, because the opinion prevailed that market prices would remain high. From the best information available the average loan on cattle in the fall of 1919 was approximately \$20 per head. Local values at the time were around \$65 per head. The wintering charge for 1919-20 increased the indebtedness to approximately \$35 per head. The decline in prices early in 1920 decreased the value of cattle to approximately \$30 to \$35 per head. From a financial standpoint the situation was very critical.

Poor crop yields occurred in various districts of low rainfall from 1916 to 1922. In 1918, 1921, and 1922 seed loans were made by the Government in those districts that had suffered crop failures. In the early part of 1920 the financial condition of farmers was scarcely more favorable than that of cattlemen. The six-years' depression resulted in a heavy out movement of farmers, many of whom had come into the region in recent years.

The five years 1920 to 1924, inclusive, were very critical years for the cattlemen, regardless of the fact that range conditions were, on the whole, fairly good. Cattle prices were low compared with the prices of commodities which ranchmen had to purchase. The price of labor did not decline in proportion to the decline in the value of ranch products. Taxes voted during the war period remained high. The indebtedness was comparatively heavy in 1920 and interest was burdensome. The necessity for meeting the indebtedness compelled many cattlemen to go out of business entirely and others to decrease their herds materially.

The low prices of range cattle as compared with the general price level of all commodities is shown in Figure 6. The base period for this comparison is the five years 1909-1913. Considering the average price during this period as 100 it is seen that range-cattle prices in 1925 were 33 per cent above the average of this five-year period,

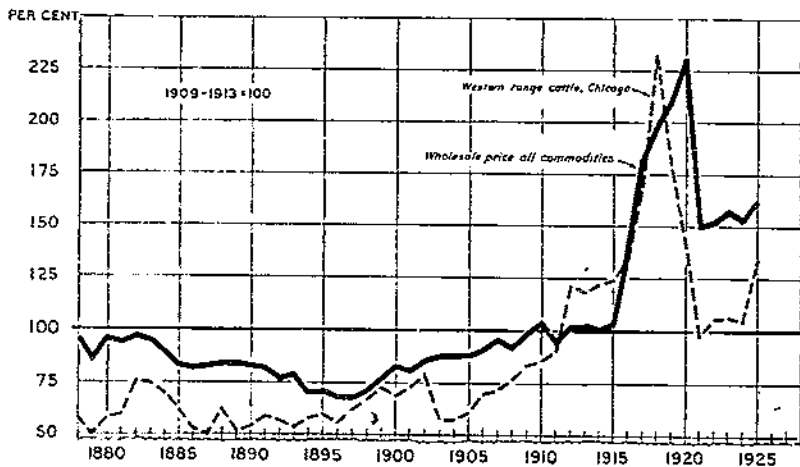


FIG. 6.—INDEX PRICES OF WESTERN RANGE CATTLE AND ALL COMMODITIES, 1878-1925

The price index of western range cattle was much lower than that of all commodities from 1919 to 1925.

whereas the general level of all prices in the United States was 62 per cent above the 1909-1913 level. This disparity in the price of range cattle and the general price level has continued since 1919.

There may be some question as to why the five-year period 1909-1913 was used as a base, inasmuch as the price of range cattle in relation to the price of other things was somewhat higher during this period than during the previous 30 years. It must be remembered that prior to 1900 range cattle had been produced primarily under free range conditions, and as this free range was being taken up by homesteaders for farming purposes the costs of raising range cattle were increasing because of competition with grain farming for the use of land, increased taxation, and the cutting up of the open range. With these things in mind it would seem that the 1909-1913 basis of relationship between the price of range cattle and all commodities is more nearly equitable for present conditions than the relationship which existed prior to this period.

Figure 7 also illustrates the unfavorable position of beef cattle prices since 1919. In this chart the actual prices of western range cattle at Chicago since 1878 were divided by the index of wholesale prices of all commodities, the five-year period 1909-1913 being used as a base. This shows that the price of western range cattle deflated in this manner was lower in 1925 than it had been from 1907 to 1920. On this basis the price of cattle in 1920 was lower than it had been in the 30 years previous.

Of the occurrences of the last 25 years that may have a lasting effect on future ranching in this region, the homesteading of the range stands out as the most important. It is evident that the progress of homesteading was too rapid and did not permit organization of the newly established units with reference to the natural adaptation of the region. Probably the most beneficial result has been that the title to land has passed to individuals who can lease or sell it. In its present condition of wide ownership this range land can not be

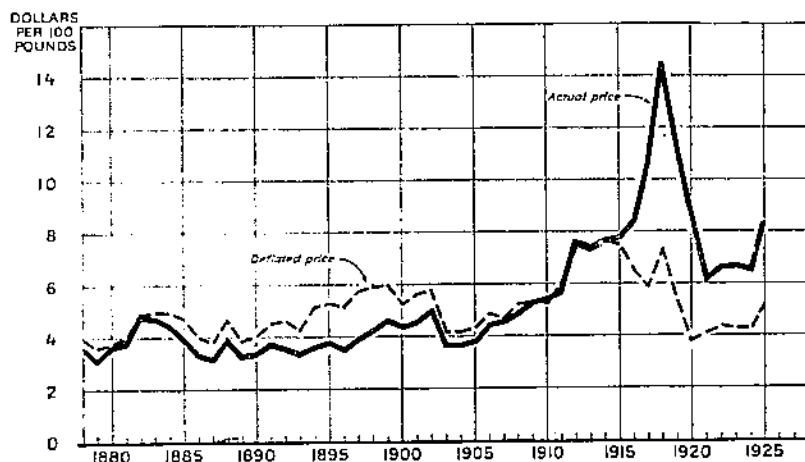


FIG. 7.—PRICES OF WESTERN RANGE CATTLE AT CHICAGO, 1878-1925

The price of western range cattle in terms of all commodities was lower in 1920 than it had been in 30 years.

expected to support a stable ranching industry. The cattle industry must assume some degree of stability if institutions are expected to finance it.

As a result of the economic situation briefly referred to, the cattlemen of the region at present are confronted with three major problems: (1) Acquisition of farm or range land by purchase or lease and its organization into stable productive units, (2) production and marketing of the class and quality of cattle demanded by consumers, and (3) care and improvement of the native range in order that the producing capacity of the unit may be increased.

RANCH MANAGEMENT

The 304 ranch records used in the compilation of the survey data were taken on 304 ranches of various sizes, distributed among the States as follows: Montana, 84; Wyoming, 57; North Dakota, 66; and South Dakota, 97. The particular districts of each State sur-

veyed and the approximate location of the ranches within the northern Great Plains region are shown in Figure 8. The number of ranches, their location, and the conditions represented are sufficient to give the tabulated data an application to a region much wider than the immediate vicinity of the ranches.

The records of the ranches have been grouped for this report with respect to the number of breeding cows on each ranch at the beginning of the year April 1, 1924. Since the breeding cow is the productive unit on cow ranches, the use of that unit reduces all the ranches to a comparative basis. In referring to breeding establishments the term "breeding cows" is more generally used in stating the size of the ranch in the range country than is any other term. The acres of land necessary to carry a cow, the percentage calf crops, the length of the grazing season, and all other factors that influence beef production may vary within wide extremes in the different

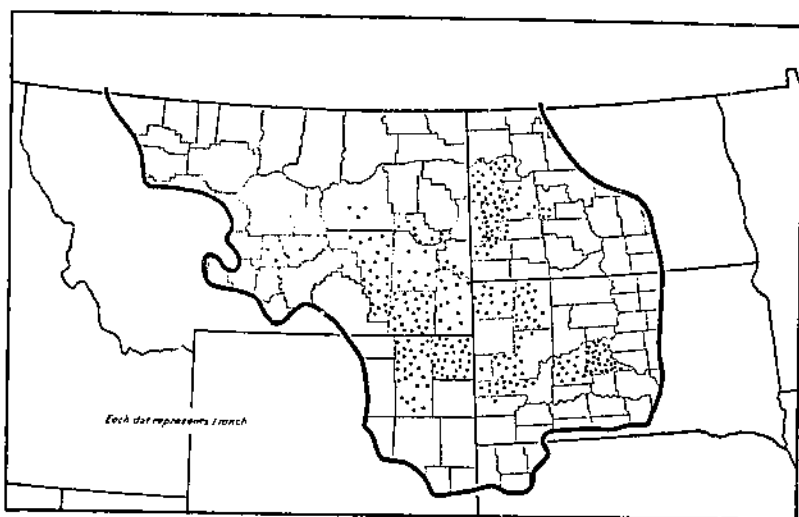


FIG. 8.—LOCATION OF RANCHES STUDIED

Of the 301 ranches studied, 84 were located in Montana, 57 in Wyoming, 66 in North Dakota, and 97 in South Dakota.

range regions of the Western States, but the productive unit as referred to remains the same. On ranches which carry a large proportion of steers or livestock other than cattle the number of breeding cows may not be a perfect measure of size of ranch, but in most cases it meets this purpose satisfactorily, especially in regions where public domain and national-forest range are used extensively.

Handling these data on this basis emphasizes the importance and need for concerted effort of research agencies in the various range regions of the Western States toward the determination of quantitative and qualitative requirements of range livestock under representative range conditions in order that comparisons of ranges may be made on their productive bases. Especially is this matter of urgent importance if land values, land leases, ranch loans, taxation of grazing lands, and other matters of much importance to the ranching business are to be considered with any regard to productive capacity. Furthermore, such information would facilitate true comparisons of the many

range regions, which can not be made at present because of the lack of basic research data on the subject of range livestock requirements.

The groupings made in the following discussions of the various subjects related to cattle ranching in the region permit consideration of those factors of production as an average in each group. Unfortunately, an average figure does not always show the true condition on a certain ranch. The condition existing with reference to any certain factor on any one ranch is ordinarily the point of greatest interest to the ranchmen. In this instance, however, the impracticability of showing every detail on every ranch is obvious because of the number of ranches involved. The less-than-50-cow group was made to permit special consideration of those smaller organizations which are more nearly in the class of livestock farms than in the class of ranches as the latter term is accepted among ranchmen. The 51-to-100-cow group permits consideration of a class of organizations similar to the above, though conducted on a more extensive scale. The 101-to-200, 201-to-450, and over-450 groups permit consideration of the various stages of expansion from the small to the large ranch, into which most cattlemen hope to expand their holdings.

THE USE AND CONTROL OF LAND

Land is the subject of one of the most perplexing problems of ranching in the northern Great Plains region. The problem is not confined to acquirement of land but involves the use of land as well.

The existing unsettled condition resulting from the passing of a high percentage of the open range into small tracts of scattered ownership and the following movement of homesteaders away from the land have made it difficult for many of the remaining ranchmen to acquire control of a large enough acreage of land and over a long enough period of time to establish a definite production policy that has any guaranty of permanence. Sufficient acreage, and a reasonable assurance that control of that acreage is possible for a number of successive years, are necessary if the enterprise is to be organized and conducted as a ranch.

Otherwise, small tracts of owned land must be organized as farms with limited possibilities for cattle grazing. On these farms the ranching enterprise could be expanded during times when grazing land is available and reduced in those years when grass is not available. Such a system does not have the stability or permanence which is essential in ranching. It is not possible to continue in the ranching business on a system of rapid expansion and contraction of the land area and of the livestock carried without introducing considerable speculation into the business. Immediate expansion of the grazing land acreage ordinarily necessitates, to a considerable degree, the immediate acquirement of cattle by purchase. Extensive and immediate reduction in the grazing-land acreage ordinarily necessitates disposal of cattle, the number retained being in proportion to the carrying capacity of the land retained.

The number of cattle that can be carried safely is an important consideration on any individual ranch. In this region ranching is a combination enterprise in which feed production, either in the form of cultivated crops or native hay, must be practiced in connection with the use of grazing land. In some cases, especially on the smaller ranches, grain production for additional income seems necessary.

In any event the combination brings up the important question of the proper ratio of farming to grazing land. The data obtained in this survey are not conclusive as to the proper ratio that should exist. Some indications of conditions as they exist and the influence upon the system of operation are given from the study.

The various classes of available land as regards ownership and the possible uses that may be made of each are phases that have a very definite bearing on the future possibilities of ranching within the region. The comparatively small amount of public domain that remains is available for grazing. The quality of this land scarcely permits its acquirement with the expectation of farming it. Homesteading is the only present means of acquirement, and the greatest value of the land probably lies in its possible use in connecting adjacent tracts into suitably organized units.

The national-forest range, which makes up a comparatively small proportion of the region, is available for grazing during the summer



FIG. 9.—Layout of ranch headquarters adjoining a national forest in southeastern Montana

season. This class of range has an important influence in the adjacent communities and ordinarily permits carrying larger numbers of cattle than would be possible if operations were confined to individually owned land. Figure 9 shows the layout of a ranch headquarters adjoining a national forest. There is some probability of further withdrawal of small tracts from national-forest control and of opening it to homesteading. Rather large acreages of Indian-reservation lands in Montana and the Dakotas are available for grazing by leasing. Lease contracts on the Fort Berthold Indian Reservation prescribe a certain acreage at a definite price per acre. The rate of stocking is fixed at 20 acres per head. Some special provisions exist whereby areas are available for farming under a lease similar to grazing leases though at higher prices.

State-owned lands may be purchased or leased. Practically all State lands are classified as to grazing or farming land and the prices fixed accordingly. The laws of the States prevail as to prices and means of disposition.

Privately owned lands comprise the largest acreage of any class. At present there are comparatively large areas of owned land that have been abandoned during recent years and are now available for use as free range. Herd laws restrict the use of abandoned lands in some instances. Such lands are usually available for lease or purchase, but the widely scattered ownership is a discouraging feature in attempting to organize these tracts into suitable units. The major portion of this land is grazing land, and time will be required to overcome the damage done by breaking the sod. The situation of ownership may be clarified materially during the next few years because of the probable reversion of some of this homesteaded land to the States for payment of back taxes. In certain instances relatively large areas of farming or grazing land are available by lease or purchase.

Considerable acreages of railroad lands, consisting of farming and grazing lands, are available for lease and purchase. For the most part railroad lands are in small bodies, one section or less, which is a result of the Government policy of granting alternate sections of land to certain railroads at time of construction. The lease or purchase prices that may be applied to all will depend on the quality of the land, the market prices of ranch products, and the level of operating costs that may prevail.

Severe handicaps may be expected in the event of purchases of land which involve heavy indebtedness to be paid from ranch receipts, unless long-time terms at low rates of interest are obtained. Difficulties may be expected from extensive operation on short-time leased land because of the unstable factors of such a system of organization.

Table 5 shows the average-sized ranch of each group as determined by the number of breeding cows on hand at the beginning of 1924, together with the acreage and tenure of farming and grazing land in each case. The acreage of land accounted for is that part actually owned or leased. No estimates were obtained as to the area of public domain, abandoned homesteads, or national forests used except where special leases were in force. Information was obtained in practically all cases as to the dates on and off "free" range and the number of cattle and horses involved. In this bulletin "farming land" is a general term including crop land and hay land, without regard to the particular crop or kind of hay unless specified.

TABLE 5.—Acreage of farming and grazing land, by tenure and number of cows per ranch, 304 ranches, northern Great Plains region, 1924

Number of cows per ranch	Ranches	Average size of ranch		Farming land			Percentage of total	
				Total	Owned	Leased	Owned	Leased
	Number	Acres	Sections	Acres	Acres	Acres	Per cent	Per cent
50 and less	68	1,884	2.9	261	191	103	65	35
51 to 100	104	2,833	4.4	311	298	76	78	22
101 to 200	77	5,692	8.9	378	344	34	91	9
201 to 350	46	8,816	13.8	516	478	38	93	7
Over 350	9	19,376	30.3	930	930		100	

TABLE 5.—Acreage of farming and grazing land, by tenure and number of cows per ranch, 304 ranches, northern Great Plains region, 1924.—Continued

Number of cows per ranch	Grazing land					
	Total	Owned	Leased	Owned	Leased	Average acreage per head ¹
	Acres	Acres	Acres	Per cent	Per cent	Acres
50 and less	1,590	822	768	52	48	19
51 to 100	2,488	1,205	1,284	48	52	16
101 to 200	5,314	2,746	2,568	52	48	18
201 to 450	8,300	3,870	4,431	47	53	15
Over 450	18,446	7,527	10,919	41	59	11

¹ Does not include acreage of national-forest land, public domain, nor abandoned homesteads used.

The area of farming and grazing land per ranch shown in Table 5 naturally increased with the number of cattle kept. There was considerable variation, however, in the proportion of farming land as compared with grazing land on the different sized ranches. The percentage of farming land of the total ranch area decreased from 16 per cent, in the group with 50 cows and less, to 5 per cent in the group with more than 450 cows per ranch. The small ranches contained 1 acre of farm land to 5 acres of grazing land, whereas on the largest ranches this ratio was 1 acre to 20 acres.

The large ranches owned a much greater percentage of their farm land than did the smaller ones, although the small ranches owned a larger proportion of their grazing land. Many of the ranchmen leased more than one-half of their grazing land. There was considerable variation in the number of acres of controlled grazing land per head on the ranches of different sizes. The figure for controlled grazing land per head was obtained by dividing the number of acres of controlled grazing land by the number of cattle on hand at the beginning of the year. The acreages per head are merely indications and must not be interpreted as actual requirements because in some cases cattle were bought and sold at such seasons of the year that the average number of cattle carried throughout the year would be materially different from the opening inventory. In addition, many of the ranches were much understocked.

The group with 50 cows and less had 19 acres of controlled grazing land for each head of cattle on hand at the beginning of the year. The largest ranches had only 11 acres of grazing land per head of cattle. This might lead one to think that the large ranches used more public domain inasmuch as it could not be supposed that their grazing land had any higher carrying capacity than had the smaller ranches. The fact that a larger proportion of large ranches used national-forest range in connection with their owned and leased land serves to correct this impression.

The average carrying capacity of grazing land in this region seemed to be about 20 acres per animal, judging from the ranches that were reported as being "normally stocked" and operated on fenced range. About 1 acre of farm land per head was required to provide hay or other winter feed. The average amount of roughage fed to 41,154 head of mixed cattle was 0.8 ton per head or the approximate yield of 1 acre of hay.

Table 6 shows that 42 per cent of the ranches studied used to some extent "free range" composed of public domain and abandoned homesteads. There was a larger percentage of the small ranchmen who owned and leased all the land they used than of the larger ranchmen. This condition may seem to indicate greater stability of organization among the smaller than the larger ranches. When the permanency of national-forest permits is compared with the short-time commercial leases the indication is not sustained. The column in Table 6 showing the numbers operating on the Indian reservation may be considered as "owned and leased" situations since definite acreages are prescribed which are tabulated as any other leased lands.

TABLE 6.—Number and percentage of ranches using grazing land, by number of cows per ranch and class of land used, 304 ranches, northern Great Plains region, 1924

Cows per ranch	Ranches		Owned and leased only		National forest ¹		Public domain and abandoned lands ^{1, 2}		Indian reservation		National forest, Indian reservation, and free range	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
50 and less.....	68	28	41	7	10	32	47	2	2	1	2	
51 to 100.....	104	30	35	23	21	43	41	3	4	1	1	
101 to 200.....	77	24	31	21	27	26	34	4	4	3	4	
201 to 450.....	46	15	33	10	15	33	33	4	0	2	4	
Over 450.....	9	2	22	2	22	4	45	—	—	1	11	
Total and average.....	304	105	35	62	20	120	39	9	3	8	3	

¹ In addition to owned and leased land.

² Constitutes the "free range."

The distribution of the different-sized ranches according to the number of sections of owned and leased land under control is shown in Table 7. On an average the ranches with the fewest cattle naturally controlled the least land. There were several instances of ranches of 10 or more sections of owned and leased land that had less than 200 head of cattle. Those conditions, of course, are reflected in the figures. Almost two-thirds of the ranches had less than 6 sections of land under control. There was a rather wide variation in the number of sections under control in the case of the large ranches. Forty-three ranches with more than 100 breeding cows had less than 6 sections of owned and leased land. No doubt these were ranches that depended largely on the national forest and free range.

A salient point brought out in Table 7 is the varying numbers of cattle that may be carried on a ranch of definite size as defined by the acreage of owned and leased land with other classes of range available. This point enters very forcibly into the capital requirement of ranch operation since owned land necessitates investment of capital. Another feature affected is the stability of the enterprise. Next to owned land, the use of national-forest range under the proposed adoption of 10-year permits and privileges of improvements construction seems to offer a more stable situation than the use of leased privately owned land under the usual conditions of short-time leases,

The free range offers little in the matter of stability. Those using free range to advantage at present may become crowded by other producers who are anxious to participate in the advantage. Leasing the abandoned homesteads may offer the advantage of control at the disadvantage of a high price, especially if relatively large areas are to be combined into an operative unit.

TABLE 7. Number and distribution of ranches, by number of cows and number of sections per ranch, 304 ranches, northern Great Plains region, 1924¹

	50 cows and less		51 to 100 cows		101 to 200 cows		201 to 450 cows		451 cows and over		Total ranches
	Number of sections per ranch		Number of sections per ranch		Number of sections per ranch		Number of sections per ranch		Number of sections per ranch		
	Ranches	Owned and leased grazing land per head	Ranches	Owned and leased grazing land per head	Ranches	Owned and leased grazing land per head	Ranches	Owned and leased grazing land per head	Ranches	Owned and leased grazing land per head	
	Number	Acres	Number	Acres	Number	Acres	Number	Acres	Number	Acres	Number
Less than 3	47	10	37	8	8	4	5	2			97
3 to 5.9	19	22	49	15	25	11	5	6			98
6 to 8.9			9	25	18	17	5	0	1	3	37
9 to 11.9			5	26	5	17	5	13	1	5	19
12 to 14.9			4	45	7	21	14	14	1		16
15 to 19.9	1	1234			6	25	5	17	1	12	16
20 and over	1	114			5	56	9	25	6	13	21
Total	68		104		77		46		9		304
Average number of sections	2.9		4.4		8.9		13.3		30.3		

¹ The area grazed in national forests and free range was not included.

² These ranches were much understocked.

The average value given for farming land, including hay land, was \$18.11 per acre. Some choice irrigated land seeded to alfalfa was valued at \$100 an acre. Second-grade alfalfa land, usually located in moist valleys, ranged in valuation from \$35 to \$50 per acre. Good-quality bluestem meadows were valued at \$30 to \$40 an acre. Dry-land meadows were valued at \$10 to \$15 an acre. Good quality dry-farming land was generally valued at \$20 to \$25 an acre.

The average value placed on improved grazing land was \$8.11 per acre. Much of the grazing land ranged in value from \$4 to \$7 an acre, including improvements. In some instances grazing land was valued as high as \$10 per acre because it was considered as potential crop land. The values given owned land in some cases may have been influenced somewhat by its location near public domain, where a certain amount of free grazing was obtained through ownership of important watering places.

The average area of leased land shown in Table 5 and the high percentage of ranches using leased land give some indication of the widespread practice of leasing. Many leases on abandoned homesteads were obtained for the payment of taxes. In other cases 10, 12, and 15 cents per acre were common lease rates. Many ranchmen said that it was much cheaper to lease than to own land. High land values and tax rates and low prices for cattle would seem to substantiate this statement for the present. The ownership of ranch lands for long-time operation has the advantage of permanence, however, and is to be preferred to a system of short-time leasing.

The fact that the public domain is rapidly passing makes it necessary for the ranchman of the future to control his entire grazing area either by ownership at fair valuations or by dependable long-time leases. As much as any other one thing this will eliminate uncertainty and give some measure of stability to the ranch organization.

The ebb and flow of homesteaders into and from the northern Great Plains region, with the consequent expansion and contraction of the acreage available to ranchmen, necessitates the immediate acquirement and disposal of cattle in large numbers and thus introduces the speculative element into the business. To have stability, the ranchman must control all of his farming land and most of his range. Under a condition of unrestricted use of the public domain, frequently only farming land is owned and the open range is expected to supply grazing.

There is a need for control of the public domain by some public agency so that: It may be organized into stable operation units in connection with owned land; permanent improvements may be established; and in general a long-time policy of production may be planned which will result in a more secure ranch business.

In the case of the individual ranchman, it would seem desirable for him to gain control of the necessary acreage for his operation by the purchase at a reasonable figure of abandoned homesteads that can be consolidated with the land already owned. In many cases this policy is not feasible because of interlying areas of public domain which can not be controlled by the ranchman under present conditions.

The lack of stability in the range-cattle business in the northern Great Plains region is probably the outstanding handicap to operation. With a stable situation for operation, which involves permanent range control, a ranchman can attract capital at reasonable rates of interest to improve his ranch and herd and counteract the effect of the lean business years.

FEED CROPS AND GRAIN PRODUCTION

Practically every locality in the northern Great Plains region has its problems of feed production, upon which cattle production is largely dependent. There are very few instances in which those engaged primarily in the cattle business are producing an overabundance of feed. The reverse situation is rather usual, and often operators do not seem to have a safe margin between feed production and normal requirements for wintering. This situation was especially true in 1919, which was an extremely lean year, and the experience is distinctly remembered by cattlemen who faced it.

Hay is of greater relative importance to cattle production than grain, since sufficient roughage is essential for the best results in wintering cattle. Table 8 shows the amounts of the most important kinds of hay and grain produced on the ranches in 1924. The percentage variation of the different kinds of hay among the four States is some indication of the reliance placed by cattle producers upon the principal hay crops. In the case of North Dakota it is especially interesting to note the lowest percentage of alfalfa and the highest percentage of millet and grain hay. The percentage of grain hay might have been abnormally high in 1924 because of the failure of grain crops to mature.

TABLE 8.—Hay and grain: Percentage of specified kinds produced, 304 ranches, northern Great Plains region, 1924

State	Ranches reporting	Hay				Grain						
		Total produced	Alfalfa	Wild	Grain	Millet	Total produced	Corn	Oats	Wheat	Barley	Miscellaneous
	<i>Number</i>	<i>Tons</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Bushels</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
Montana.....	84	21,137	49	45	5	1	98,784	25	32	42	—	1
Wyoming.....	37	12,415	59	37	4	—	35,643	10	52	29	5	4
North Dakota..	66	15,629	27	42	21	10	217,129	1	51	35	6	7
South Dakota..	97	19,724	40	52	7	1	59,037	31	49	13	6	1
Total or average..	304	68,804	43	45	9	3	410,384	12	40	33	5	4

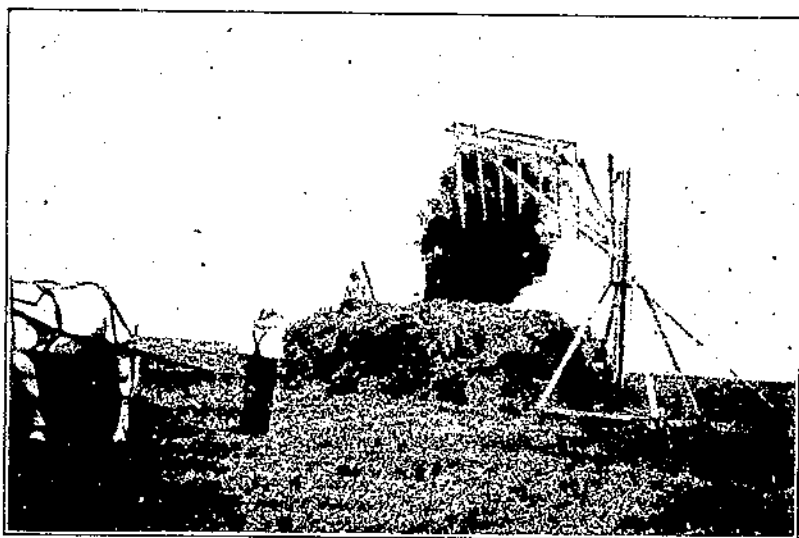


FIG. 10.—Method of stacking alfalfa hay in the northern Great Plains region

It is of interest to note the relative percentages of alfalfa and wild hay produced over the region as a whole. It is not likely that this relation will prevail for many years because of the improvement in alfalfa culture here and the possibilities of seed production, both of which have contributed to the general tendency toward increasing the acreage. Figure 10 illustrates the method of stacking alfalfa in this region. The percentage of the 304 ranches that produced certain hay and grain crops was as follows: Alfalfa, 85 per cent; wild hay, 78 per cent; grain hay, 28 per cent; millet hay, 17 per cent; corn, 40 per cent; oats, 56 per cent; wheat, 39 per cent; barley, 14 per cent; rye, 6 per cent; and ommer, 6 per cent. These figures indicate the widespread production of alfalfa and wild hay and the wider production of oats than of wheat.

Grain, especially corn, will probably have a great influence on the livestock industry in the future, as feeding for market is being considered in some localities. In this instance, wheat is not regarded

as a feed crop and is included in Table 8 for comparative purposes and as a cash crop only. Oats is a primary feed crop and a secondary cash crop in many localities. In those communities where corn has become an important crop, the impetus has already been given to finishing cattle and hogs for market. Further expansion of the crop will probably further increase this industry.

Many of the ranchmen expressed an interest in improving their meadows to increase the per acre hay yield. Some of them have sown tame grasses on meadows that have poor stands of wild grasses. Others have seeded alfalfa and sweet clover. In practically all cases the results obtained have been proportional to the moisture available. An outstanding example of meadow improvement and increased acreage yields was observed on a ranch in Wyoming. The hay land was confined to a valley, as is usual over the entire region. A comparatively large ditch had been constructed along the side of an adja-



FIG. 11.—Grain produced under seasonal irrigation by run-off water from hills

cent hill so that the run-off water was diverted to the meadows and crop land instead of being allowed to run off the premises unused. An attractive feature of the practice is that a rain light enough to be of limited benefit to a growing crop can be converted into a much heavier irrigation because of the larger acreage drained on to the cultivated land. (Fig. 11.) In this instance approximately 150 acres of land was being subjected to seasonal irrigations. The cost of constructing the ditches had been apparently rather insignificant as compared with the benefits derived. There are other ranches in the region that could probably be benefited by similar improvements.

A safe system of operation in this region necessarily includes a feed reserve. In this survey ranchmen were found who normally carry one year's supply of feed as a reserve. This system is to be recommended on all ranches regardless of size.

The ranchmen who expect to feed out livestock can afford to consider the feed value of the various crops that can be produced in their localities. In some instances it will probably be advantageous to change the cropping system to produce those feeds that are

especially valuable for fattening livestock. In Table 8 it will be noted that wheat and oats are the crops that produce most of the grain. It is probable that a very high percentage of the wheat in certain areas could be replaced with crops that could be used as feed. Numbers of ranchmen expressed interest in barley as a possible feed for finishing cattle.

The size of the ranch will influence the extent and diversity of the farming enterprise. The records show comparatively few large ranches that are selling grain. The labor requirement is largely responsible for the variations in crop production between the larger and smaller ranches. More definite information as to the financial returns from the various sources may be gained from study of Table 22.

MANAGEMENT OF RANGE CATTLE

Aside from land, the investment in cattle represents the largest item of capital on most ranches. On ranches using a high percentage of leased land, the investment in cattle may be even greater than that in land.

CATTLE INVENTORIES

Tables 9 and 10 show the average number and value of cattle on the different-sized ranches for the year beginning April 1, 1924, and ending April 1, 1925. The differences between the two inventories represents the net change in cattle tallies during the year. The factors responsible for these changes in inventories are sales, purchases, death losses, ranch use, and calf crops.

TABLE 9.—Opening cattle inventory, by class of cattle and number of cows per ranch, 304 ranches, northern Great Plains region, April 1, 1924

Number cows per ranch	Heifers			Steers				Bulls	Spayed heifers; 2- and 3-year-olds	Milk cows ¹	Total head
	Cows	2-year-olds	1-year-olds	1-year-olds	2-year-olds	3-year-olds	4-year-olds				
50 and less.....	34	6	12	12	11	6	1	1	2	2	85
51 to 100.....	72	7	21	24	18	10	1	2	1	3	159
101 to 200.....	141	6	38	41	33	22	6	5	5	1	298
201 to 450.....	285	14	71	77	57	31	15	9	0	2	570
Over 450.....	733	6	172	281	304	132	35	25	26	—	1,734
Average value per head, dollars.....	39.55	33.27	27.40	31.03	42.72	53.04	50.83	108.30	40.57	51.49	30.71

¹ Other than cows from the range herd that were milked.

TABLE 10.—Closing cattle inventory, by class of cattle and number of cows per ranch, 304 ranches, northern Great Plains region, April 1, 1925

Number cows per ranch	Heifers			Steers				Bulls	Spayed heifers; 2- and 3-year-olds	Milk cows ¹	Total head
	Cows	2-year-olds	1-year-olds	1-year-olds	2-year-olds	3-year-olds	4-year-olds				
50 and less.....	43	6	12	12	12	0	2	2	—	3	98
51 to 100.....	75	5	24	25	21	11	1	2	1	4	172
101 to 200.....	144	12	43	44	36	23	4	5	5	2	318
201 to 450.....	284	23	83	81	62	33	5	9	1	2	582
Over 450.....	678	54	210	196	214	224	26	28	17	1	1,684
Average value per head, dollars.....	41.40	36.03	28.45	31.92	44.02	56.90	64.31	112.32	42.66	51.37	41.55

¹ Other than cows from the range herd that were milked.

The steer and heifer yearlings shown in the opening inventory are of the 1923 calf crop held on the ranches. The same classes of cattle in the closing inventory are of the 1924 calf crop remaining on the ranches. Considering the fact that most of the calves are dropped in the spring and early summer, any definite date for advancing the age of classes of cattle will result in two groups of each class—"full ages" and "short ages." That is unavoidably true in these inventories because of the impracticability of attempting to keep separate inventories on the full and short ages of each class of cattle. The changes in the ages and values of the various classes of cattle are made April 1, 1925. Therefore, cattle shown as yearlings in the opening inventory appear as 2-year olds in the closing inventory, and the changes in numbers are accounted for through sales, purchases, etc. The increases in values shown are justified by actual increases in weights and in corresponding spread in prices that occurred.

The values stated in the various classes of cattle are the averages of all values given by ranchmen from whom records were obtained. The per-head valuations are conservative and in accord with weights and current prices of cattle at the time of the survey.

The numbers of bulls shown in either inventory can not be considered as the usual proportion to the number of breeding cows because some of the ranches had culled their bulls the previous fall but had not replaced them with breeding bulls at the early dates of the inventories. An addition of minor importance to the opening inventory may be made of an average of eight bulls held for sale in the over-450-cow group of ranches. This item appeared as an average only once in either inventory.

It is probable that heavy marketing of the younger cattle (calves, 1-year-olds and 2-year-olds), because of financial pressure in many cases, resulted in higher ratios of breeding cattle shown in the inventories than would prevail under a normal economic condition.

It is recognized that the general trend in range beef-cattle production during the last few years has been toward the sale of younger cattle. This region has not escaped the influence and the effect that it has had toward increasing the ratio of cows to the total number of cattle carried is not known because of lack of comparable average tallies during more normal times. If the special adaptation of this region for beef-cattle production receives the fullest recognition, however, the penalty on heavy steers will have to be more severe than at present to influence greatly the present ratios of the various classes of cattle comprising the cattle population of the region, as indicated by the survey data.

As the financial condition of the individual ranchman improves, he will be placed in a more independent position as to choice of markets. Whether he will accede to the apparent popular practice of selling young cattle, or will harvest the production of the various range areas in which limited numbers of cows can be carried because of lack of an abundance of winter feed, by carrying the steers to older ages, is a question on which opinions vary. The subject is of such importance to individuals of the region that it merits individual study involving many economic phases of the beef-cattle industry not within the scope of this survey.

In the preceding tables the increases or decreases in various classes of cattle may be determined by comparing the opening and closing inventories. Comparing those differences with the numbers of the various classes shown in Table 11 gives a general idea as to whether the changes occurring during the year of this study were from purchases or sales of other cattle or from holding cattle raised on the ranches.

CATTLE SOLD AND PURCHASED

In Figure 1 are shown the railroads that serve the region. The greatest movements of cattle from the region are eastward to the river markets, with only limited numbers to the northern Pacific coast markets, and to Denver, Colo., and Ogden, Utah. The distance from shipping points of some of the ranches in remote localities is a problem of marketing. During the survey several ranchmen referred to the fact that settlement of land between the remote ranges and shipping points had added difficulty to the marketing problem because of lack of driveways and suitable holding grounds necessary in the trailing of cattle. Distances from shipping points that necessitate more than one day's trailing add further difficulties to marketing calves and small numbers of cattle. There is little doubt that the long distance from shipping points has a tendency to fix marketing at a certain season of the year and to include all cattle to be sold from the ranch in one movement. Small ranches are at a greater disadvantage in the movement of cattle over long distances to shipping points than are the larger ranches, because of lack of volume. This fact has encouraged sales to local buyers, who concentrate purchases and ship to distant markets.

Some instances of selling to Corn-Belt feeders on the range came to notice during the survey. Weighing facilities and the cultivation of acquaintance with men from the feeding districts may encourage this form of marketing, to the mutual benefit of feeders and producers. Cooperative-selling associations among producers present difficulties so far as actual consummation of extensive sales are concerned but may be used effectively as a means to sales principally through advertising numbers and quality of cattle available in certain localities and promoting personal contact between feeder-cattle producers and buyers.

Table 11 shows the numbers of cattle and the average prices received for cattle sold from the ranches included in this survey. On the whole, 2 and 3 year old steers made up the bulk of the sales. Yearling and 2-year-old steers generally go into the feeder trade, and 3-year-olds and 4-year-olds generally go to the killers. The practice of selling all cows that fail to calve and are fat in the fall increases the turnover in numbers of cows. Some objection may be taken to the system from the standpoint of selection and herd improvement.

Most of the cattle from the region are sold during the fall. The early movements occur in August and include approximately 10 per cent of the numbers. During September, October, and November about 20, 30, and 25 per cent, respectively, of the annual movement occurs. Shipments in December decline to around 5 per cent, and in January they decline further to about 3 per cent of the annual movement. In February, March, and April the shipments scarcely reach 1 per cent during each month.

TABLE 11.—Cattle sold: Average number per ranch, by class of cattle and average value and weight per head, 304 ranches, northern Great Plains region, April 1, 1924-March 31, 1925

Number of cows per ranch	Cows	Heifers		Steers				Bulls	Spayed heifers 2- and 3-year-olds	Calves	Total head
		Two-year-olds	One-year-olds	One-year-olds	Two-year-olds	Three-year-olds	Four-year-olds				
50 and less.....	6	1	1	2	5	5	1	-----	1	22	
51 to 100.....	12	2	1	4	8	9	1	1	2	40	
101 to 200.....	21	1	4	7	10	15	7	1	5	76	
201 to 450.....	43	6	5	18	22	23	13	1	4	152	
Over 450.....	105	23	34	65	34	180	45	2	69	557	
Average value per head.....dollars.....	36.33	40.85	32.43	37.11	50.92	62.52	67.79	74.25	41.91	21.66	46.38
Average weight when sold.....pounds.....	989	517	607	646	909	1,058	1,148	1,265	910	366	884

The calves purchased (Table 12) were, with few known exceptions, unweaned and were included with the purchase of cows. The comparatively large numbers of 3-year-old steers purchased were bought by operators who handle steers in connection with breeding herds as suggested briefly under the consideration given use of grazing land and ratio of hay land to numbers of cattle. The numbers of bulls purchased do not seem sufficient to meet the normal needs for replacement, considering the numbers of ranches involved. The purchases indicated only about 10 per cent of the number of bulls accounted for in the opening inventory. Ordinarily there should be at least 25 per cent replacement of bulls annually unless special provisions are made to prevent inbreeding. The above condition may be interpreted to indicate that ranchmen were using bulls longer than advisable, probably because of stringent financial conditions.

TABLE 12.—Cattle purchased: Average number per ranch, by size of ranch and class of cattle and average value per head, 304 ranches, northern Great Plains region, April 1, 1924-March 31, 1925

Number of cows per ranch	Cows	Heifers		Steers			Bulls	Calves	Total head
		Two-year-olds	One-year-olds	One-year-olds	Two-year-olds	Three-year-olds			
50 and less.....	5	1	1	1	1	1	-----	2	12
51 to 100.....	3	1	1	2	1	1	-----	3	11
101 to 200.....	4	-----	2	3	-----	-----	1	4	15
201 to 450.....	3	-----	2	3	-----	-----	1	3	16
Over 450.....	-----	-----	-----	-----	-----	12	5	58	103
Average value per head.....dollars.....	36.49	33.26	27.13	20.56	38.21	43.60	48.16	20.90	33.70

DEATH LOSS

The heaviest death loss is generally suffered among cows and 2-year-old heifers, as shown by Table 13. More cows are lost during the winter and early spring than at any other time. Thin, weak cows once hooked or otherwise knocked down, and chilled, can rarely be saved. For this reason it is advisable to separate thin cattle from

fleshy cattle. No data are available on the subject, but there is some probability that shipping all the fat cows in the fall and retaining those not fat enough to make good beef, as practiced on some of the ranches, increases the winter death loss of cows on those ranches.

TABLE 13.—*Death loss, by classes of cattle, 304 ranches, northern Great Plains region, year beginning April 1, 1924*

	Per cent
Cows.....	2.5
Heifers:	
2-year-olds.....	5.9
1-year-olds.....	1.7
Calves.....	3.0
Steers:	
1-year-olds.....	1.5
2-year-olds.....	1.3
3-year-olds.....	.9
4-year-olds.....	.5

It is highly improbable that anything will be gained by shipping good thrifty cows, especially if they have good teeth and are known producers of good calves, and thus using additional amounts of feed to winter less thrifty cows. A better plan of management is to cull out unthrifty cows in the fall, utilize comparatively less feed per head for wintering thrifty cows, feed young growing cattle more liberally with the surplus feed, and decrease the risk of heavy death losses in the cow herd.

A heavier death loss is incurred with heifers that calve at 2 years of age than with those that drop their first calf when 3 years old. Small ranches with 200 cows or less, that are so situated as to give close attention to a limited number at time of calving, may consider breeding heifers to calve at 2 years of age, provided the calves are to be weaned early, or additional feed is to be supplied to eliminate the probability of their developing into small cows, as well as avoiding death loss from poor condition during the winter.

It is almost impossible to avoid losing some calves. The most practicable means of decreasing this loss is to get cows in good condition at time of calving and to vaccinate the calves against black-leg, which is the most prevalent and fatal disease affecting calves in this region. Table 13, showing death losses, is based on averages of all cattle of each class on all the ranches.

Death losses of steers are usually not as great as in other classes of cattle mentioned in Table 13. In any event, death losses must be considered as detracting directly from profit. Good management includes practical means of minimizing that loss.

WINTERING CATTLE

The problems of wintering are the most important phases of herd management on practically every ranch in the northern Great Plains region. The difficulties are to avoid death losses and to get cattle on the winter or spring range, according to the season, in the best possible condition with the means available and in keeping with economy. Heavy death losses and high feed expense are not conducive to profitable operation. The problem is made more difficult by the fact that these two adverse factors prevail simultaneously, and the only resource is feed which is more or less expensive to produce and very expensive when purchased.

TABLE 14.—Kind and quantity of feed fed to various classes of cattle, northern Great Plains region, April, 1924, to April, 1925—Continued

Class of cattle fed	Number of cows per ranch	Other roughage				Grain			
		Ranches reporting	Cattle fed	Quantity fed		Ranches reporting	Cattle fed	Quantity fed	
				Total	Per head			Total	Per head
		Number	Number	Tons	Tons	Number	Number	Bushels	Bushels
Cows	50 and less	15	563	307	0.70	9	333	1,905	6.50
	51 to 100	33	2,620	1,619	.77	15	900	3,065	3.40
	101 to 200	21	2,721	1,012	.37	11	1,321	3,420	2.57
	201 to 450	13	3,164	1,248	.39	8	1,944	2,385	1.20
	Over 450	1	600	12	.02	1	600	500	.83
	Average				.47				2.22
Bulls	50 and less	8	10	18	1.80	3	4	70	17.50
	51 to 100	17	36	95	2.64	11	27	535	10.81
	101 to 200	8	32	82	2.56	14	46	469	9.77
	201 to 450	6	15	30	1.67	10	82	760	9.34
	Over 450	1	55	3	.05				
	Average				1.51				11.43
Calves	50 and less	13	320	208	.63	10	256	1,760	6.88
	51 to 100	25	1,235	614	.50	23	1,104	5,830	5.28
	101 to 200	15	1,330	674	.51	10	1,301	7,034	3.70
	201 to 450	8	1,961	944	.48	15	2,772	8,612	3.11
	Over 450	1	307	10	.03	1	781	1,550	1.98
	Average				.50				3.64
Long yearlings:	50 and less	9	201	100	.50	1	30	175	5.83
	51 to 100	17	764	328	.43	10	477	2,325	4.67
	101 to 200	11	738	515	.70	2	630	4,058	6.38
	201 to 450	7	794	400	.62	3	235	364	1.55
	Over 450	1	210	5	.02				
	Average				.53				5.02
Long 2-year-olds:	50 and less	2	11	3	.27				
	51 to 100	3	152	43	.28	1	18	20	1.11
	101 to 200	1	65	32	.49				
	201 to 450	3	555	220	.40				
	Over 450								
	Average				.38				1.11

In Table 14 the heading "Other roughage" includes millet hay, grain hay, straw, corn fodder, and corn stover. Under the heading "Grain" are included corn, oats, barley, rye, and emmer, which are the grains most commonly used for feeding purposes. In considering Table 14 it must be kept in mind that all ranchers did not feed all the different kinds of feed but that practically all of them fed two or more of the different kinds of roughage available in the region. For example, of the 24 ranchers in the small-sized ranch group that fed roughage, 8 fed alfalfa, 16 fed wild hay, and 15 fed other roughage in amounts shown in each case. Practically every ranchman in the region has some general plan of taking care of cattle during the winter other than merely supplying them with feed. In general the best results have been obtained from separation of the various classes of cattle so far as practical. It is not always practical to segregate every class according to age, but separation of cows, calves, and other young growing cattle into different lots is generally desirable. On large ranches including 200 cows or more it is not uncommon to use

two or more winter headquarters, and various classes of cattle are wintered at each. On several large ranches observed, the breeding herd and calves were wintered at one headquarters, and the steers and heifers were divided between two others.

The usual method of handling cows during the winter is to wean the calves in October or November depending largely upon the age of the calf, allow the cows to run on the range thereafter, and begin feeding in December. Thin cows are put on feed earlier, and cows in good flesh are sometimes not fed till January 1 to 15, the severity of the winter and condition of the cow being considered. Extremely thin cows, as well as other classes of cattle, are usually kept in one bunch and fed separately as the winter progresses. The amount of all roughage fed to cows during the winter of 1924-25 varied from 0.67 ton to 1.37 tons on the various-sized ranches, and the average for all cows fed was 1.02 tons per head. The data indicate that the larger ranchmen feed less per cow carried and probably depend more upon winter grazing than do the smaller operators. Estimates given by many of the ranchmen were that a safe system of operation necessitates an allowance of $1\frac{1}{2}$ to 2 tons of hay per cow for wintering.

The use made of grain in wintering cows is brought out very forcibly in Table 14. It will be noted that the group of small ranches used 6.5 bushels of grain per head and that the larger ranches used grain in much smaller quantities. The usual practice on ranches that carry 100 or more cows is to use hay as much as possible for wintering and supply grain to the extremely thin cows only. This is practical and in line with economy. It is not necessary to winter breeding cows in extremely high condition. Ranchmen should not allow cows to become so weak as to incur the risk of losing either the calf or the cow. Good thrifty condition is all that is necessary. It must be kept in mind that cows that are to calve early in the spring should be in strong condition at the time and that they are not so likely to acquire good condition on the range as are the cows that will not calve until late, because of a possible shortage of early range. There is likelihood of losing extremely thin cows at time of calving and additional likelihood of losing the calf because of insufficient milk. A mixture of one-third or one-fourth alfalfa and the remainder native hay will give better results in wintering cows than will alfalfa hay alone, according to the opinions expressed by several ranchmen who have had occasion to try both rations.

Bulls are not as difficult to winter as cows. They can endure more adverse circumstances, but for the best results from their service they should be wintered in good condition, and special attention should be given them in the spring to condition them for the breeding season. It will be noted in Table 14 that hay and grain were fed to bulls in rather liberal quantities. A number of ranchmen reported no special care of bulls other than wintering on hay and keeping them on good grass in the spring before the breeding season. As it is common knowledge among practical cattlemen that bulls must be in good thrifty condition before they will be of much service in the cow herd, the most progressive cattlemen make a special effort to have their bulls in excellent condition by the beginning of the breeding season. Good results have been obtained by wintering bulls on hay and supplying from 8 to 12 pounds of grain per head

per day on good grass for 75 days before the breeding season begins, which is ordinarily about July 1.

The fact that cattle will continue to eat alfalfa hay after grass has appeared in the spring may be applied in conditioning bulls where grain is limited and hay is available. Specific examples of higher percentage calf crops resulting primarily from conditioning bulls were not available for the one year's data, but the years of observation and experience of the majority of the cattlemen who have consistently obtained rather satisfactory calf crops is sufficient to warrant consideration if not immediate employment of the practice, probable expense to be considered.

Calves demand closer attention during the winter than any other class of cattle. Little difficulty is experienced in getting calves on feed after weaning if they are handled properly. In some cases the short-aged calves, less than 6 months old, are allowed to remain with the cows for a month or two during the first part of the winter and are later put on feed with the older calves. This practice is to



FIG. 12.—A permanent type of corral in protected location

be recommended. On most of the ranches some grain is used for wintering calves. Table 14 shows the average quantities of hay and grain fed calves on ranches of the various groups. The quantity of grain fed is of special interest. Calves are generally placed on feed around November 1 to 15 and fed until April 15 to May 1, depending upon the season. The quantities of feed shown in Table 14 are for approximately 150 days.

In general, good care is taken of calves during the winter. Many of the ranchmen provide good shelter in the form of inclosed sheds or open sheds in a well-protected location. (Fig. 12.) It is not advisable to crowd calves too closely during the winter, and the various bunches should not be so large that each calf will not have access to feed. Placing the thin and weak calves in a separate lot is advisable.

Grain fed to well-bred calves is an investment that will ordinarily yield returns. Unfortunately, many of the ranchmen do not produce enough grain to permit its liberal use. Good results can be

obtained from hay alone if used in liberal quantities, if of good quality, and if properly proportioned as to feed value. Unfavorable results have been obtained in some cases from wintering calves on alfalfa hay alone, but excellent results have been obtained from the use of a mixture composed of one-third alfalfa and two-thirds native hay, fed at the average rate of 8 to 10 pounds daily for 150 days. Certain ranchmen who are producing exceptionally good steers make a practice of feeding 3 to 4 pounds of grain daily for 150 days to all calves, in addition to as much hay as they will eat.

When it is considered that calves are to be the market cattle within a comparatively short time, the necessity of giving them the best possible start is obvious. Much depends upon the first wintering that an animal gets, in making a breeding cow, a feeder, or a grass-fat animal. Feed, shelter, and general care sufficient to keep calves putting on weight daily through the winter constitute important influences toward meeting the demand for good breeding, feeder, or fat cattle.

Of the remaining classes of cattle, yearlings require more feed than do 2 and 3 year olds, because yearlings are losing their teeth during their second winter and can not utilize the grass as older cattle can. Two-year-old replacement heifers should be handled as cows. On the small ranches where it is practical to breed heifers to calve at 2 years of age they, too, should be given every attention necessary to mature breeding cows. Long yearlings, steers, and spayed or open heifers, can usually be wintered on three-fourths ton of hay per head and some winter grazing. The amount of winter grazing will be governed largely by the condition of the cattle and the severity of the winter. In general, great reliance is placed upon winter grazing for 2-year-old and older steers, and for open and spayed heifers of the same ages. These classes are usually thrifty and in good condition at the beginning of winter. Well-protected and reserved winter range is an economic means of handling them, but it is customary to make provision for feeding them during heavy storms or other emergencies.

Ranchmen who expect to sell feeder cattle can probably afford to consider the possibilities of wintering the market classes in such condition as to promote gains and acquire desirable early finish on the range during the following grazing season. It is probable that limited quantities of surplus grain could be used to an advantage in wintering long yearlings and long 2-year-old steers. In some instances, especially where cheap feed is available, well-bred steers are produced, and an early seasonal demand exists for a high-quality product.

Experiences and observations gained from numbers of years in the cattle business in the region were related by many of the successful cattlemen. Their agreement on the following practices and advice is interesting: Always keep a reserve consisting of one year's supply of feed on hand for an emergency; produce plenty of grain and feed it to young cattle liberally; mix alfalfa with other kinds of hay; use the best quality of hay for wintering calves; and always be prepared for a worse winter than ever experienced.

FEEDING FOR MARKET

There is greater interest among cattlemen of this region at present in feeding for market than formerly existed, especially since the production of corn has become general. The prevailing opinion is that

the short feeding period, 75 to 100 days, will be more advantageous to feeders because of the usual limited supply of grain. Since calves demand a longer feeding period for high finish than do older cattle, the opinion is that long yearlings and long 2-year-old steers will be the most desirable classes of cattle to feed. Heifers make rapid gains in the feed lot, and it may be advantageous to consider feeding out this class of cattle either as calves or as yearlings.

Several lots of calves and yearlings were fed in various localities during the winter of 1924-25. The methods employed and rations fed on a certain ranch in North Dakota were as follows: Early in November the calves with cows were turned into a cornfield that, owing to crop failure, was not considered worth cutting. The field was cleaned up by December 1, and at this time the calves weighed approximately 400 pounds per head. On December 1 the calves were taken off the cows, placed in a shedded pen, and started on a ration of approximately 2 pounds of oats per head per day and all the wild hay they would eat. The grain ration was gradually increased throughout the month. Beginning January 1 the oats were ground, and a sixth part of ground barley was added to the oats. The grain ration was gradually increased as the feeding progressed, and on March 1 the calves were consuming approximately 12 pounds of the grain mixture per head per day and all the native hay they would eat. During the last 30 days of the feeding period the calves had the run of an open lot and access to an open shed instead of the close-shedded pen in which they had been fed to that date. The change to the lot was apparently beneficial.

When finished, the calves were bought for \$55 per head, by a local buyer who shipped them to market. On April 30 the calves weighed 650 pounds on the market and sold for \$9.50 per hundredweight. Considering the prevailing price of such calves at the time they were put on feed, which was around \$20 per head in that locality, the quantity of feed consumed, and the net returns from the calves, the financial side of the operation was satisfactory to the feeder. The grain was marketed at a somewhat higher price than it would have brought if sold for cash.

A lot of long yearlings put on feed December 1 and marketed the following April 1 weighed 975 pounds on the market and sold for \$9.50 per hundredweight. The ration was approximately 15 pounds of oats per head per day and a mixture of alfalfa and native hay at the rate of 1 to 3. The feeder considered that the financial returns were fair when oats were considered to be worth 30 cents per bushel and hay \$5 per ton, the prevailing local prices at the time. By utilizing the feed on the ranch a 20-mile haul to market was eliminated. This ranchman expects to plant half of his cultivated land in corn and considers that the production of a crop will be practically clear profit since safe farming of small grain necessitates summer fallowing and corn production is more or less a system of summer fallowing.

In each of these examples of feeding, ground barley, or corn would have probably given better results than oats.

There is some likelihood that a very high percentage of the corn fed to cattle and hogs in this area will be gathered by the particular class of livestock fed, because the stalks of the corn are too short for binders of the present type to handle satisfactorily. Various

experiences show that the hogs or cattle to be fattened should be given the first run of the field for best results and that the other livestock may be used to clean up the field.

Several feeders are considering the fattening of cattle on grass. In various localities there are pastures of variable sizes that produce excellent grass and have a very high carrying capacity during the spring and summer. The plan is to feed a heavy grain ration to steers on this grass in much the same manner that cattle are finished in certain sections of the Corn Belt. With favorable range conditions and plenty of water there is a likelihood that the system will be satisfactory where the cattle are handled properly.

In a certain area in Texas a similar practice prevails. Calves or steers are bought in the fall and are wintered well. When the grass is good in the spring the yearlings are fed 1 pound of cottonseed cake per head per day and allowed the run of pastures. The ration of cake is gradually increased until $2\frac{1}{2}$ to 3 pounds are being consumed daily about June 1. The yearlings are marketed June 15 to July 15. Very desirable finish and gains have been acquired under the system. Older steers are fed a heavier ration of cottonseed cake, often as high as 5 pounds per head per day, at the time of marketing. It is probable that grain could be used as a concentrate instead of the cake under the conditions that prevail in the more northern area, owing to the general high price of the cake, and it is probable that cottonseed or linseed cake in limited quantities could be used satisfactorily as a part of the concentrated ration on grass.

Ranchmen who produce a surplus of grain over that required for wintering the livestock on hand can afford to consider the possibilities of finishing their cattle or other livestock on the ranch. It is questionable, however, whether the profits would justify heavy investment in farming equipment in instituting the practice, but there are situations at present where grain and feeder cattle are being sold from the same ranch, and where feeding would necessitate but little extra expense above the operator's labor.

Feeding livestock for market during years of heavy grain crops and low market prices for grain should be given special consideration. Since feeding comes at a time of the year when there is comparatively little work other than winter feeding, the additional cash expense need not be excessive. Those well situated for finishing their cattle may consider the feeding value of locally grown feeds, both hay and grain, and make the necessary changes in their cropping system to supply those feeds of high value for feeding purposes. It is probable that ranchmen who are carrying about 125 cows or less are in better position to consider finishing their cattle than are those in the 200-cow class because of the greater amount of grain usually produced and the time that can be put into the operation. But there are exceptions to both classes. Equipment like corrals, bunks, sheds, and water will necessarily have to be considered in the arrangement for feeding.

SEASONAL GAINS ON GRASS

Estimates were obtained during the survey from approximately 60 per cent of the ranchmen on normal weights of various classes of cattle on April 1 and November 1. The difference in weight of various classes of cattle on the dates indicates the approximate gain made during a growing season; however, spring grazing is not

usually begun until April 15 or May 1. Cattle in high condition lose weight on the range in this region after the first days of October, depending on the prevailing season.

Table 15 shows the estimated spring weights and gains made during the summer by the various classes of cattle. The gains on cows, bulls, and 4-year-old steers were omitted. In some areas cows that raise calves lose weight, but in other areas small gains may be made during the summer grazing season. An average of those differences was of no significance. Bulls that are conditioned for breeding lose weight during the summer season. The number of estimates on 4-year-old steers were too few to be representative. The estimated weights of the various classes of cattle on November 1 were compared with actual sales weights of cattle of the same classes near that date. The comparisons showed the estimated weights to be very close to the actual weights. It is probable that some estimates were based on knowledge of actual sales weights at central markets and were lower than would apply for ranch weights.

TABLE 15.—Estimated normal weights and seasonal gains on different classes of cattle, northern Great Plains region, 304 ranches

Class of cattle	Weight on Apr. 1	Seasonal gain until Nov. 1	Class of cattle	Weight on Apr. 1	Seasonal gain until Nov. 1
	Pounds	Pounds		Pounds	Pounds
Cows.....	914		Calves.....		1 346
Bulls.....	1, 332		Yearling steers.....	485	178
2-year-old heifers.....	719	138	2-year-old steers.....	718	185
Yearling heifers.....	473	173	3-year-old steers.....	917	162

¹ Total weight.

The estimated gain of 185 pounds on 2-year-old steers has been compared to gains made by the same class of cattle under experimental conditions and on range that is of much higher grazing value than is common on representative ranches. The cattle experimented upon actually gained approximately 100 pounds per head more than the estimated gains. The estimates made by the ranchmen are therefore conservative.

The gain in weight that interests ranchmen most is that made and carried to market, especially on those classes of cattle that are usually sold in the fall. With breeding cows the seasonal gain is not so important except in preparation for wintering, and some ranchmen prefer to wean early calves in October or early November to allow cows to put on weight before winter actually begins. The two important points in connection with gains made by market classes of cattle are the amount of gain made and the degree of finish attained. The heavier gains can be expected, under normal conditions, during the early part of the grazing season. From all information available, June is probably the month of greatest gains. High finish is not acquired, however, until later in the season, probably August or September, depending largely on the season, and the maturity and quality of the range grasses utilized.

It is to every ranchman's personal interest to consider the seasonal gains and degree of finish that market cattle are making during the summer seasons and possible means of improving both. Separation

of steers from the breeding herd, liberal acreage of summer range per head for market cattle, and utilization of the best fat-producing types of range for the special classes of cattle, are means most commonly employed by ranchmen who are attempting to market their cattle in the best possible condition. There is little doubt but that the condition of the cattle at the beginning of the summer grazing season influences the seasonal gains, the degree of finish, and, to some extent, the approximate time required for acquiring suitable finish. There is probability that, under certain conditions, market classes of cattle may be wintered in better condition to hasten gains and finish for an earlier market which usually offers a higher price for well-finished grass-fat cattle than do the later markets, especially during the season of heavy runs.

IMPROVEMENT OF THE BREEDING HERDS

Among the cattlemen who are specializing in the production of choice fat or feeder cattle in this region few suggestions can be made in regard to improvement of the quality that would be in keeping with practical breeding possibilities in range-cattle production. Ranchmen of this class can point to examples of the results of systematic breeding in the production of uniform cattle, and, generally speaking, to additional examples of efficient herd management, sufficient feed production, and proper utilization of feed. Usually such ranchmen are receiving prices that are among the highest prices being paid for cattle.

In some localities the opinion prevails that there has been a marked decline in quality of cattle being produced at present as compared with those produced 10 or 15 years ago. This seems especially true in communities of small ranchmen who are more or less dependent upon farm crops and the sale of cream for a comparatively high percentage of their income. In some of those communities, dairy breeds have been introduced, and indiscriminate cross breeding has occurred to such an extent that there remains little breed identity. But among the ranchmen who carry from 50 to 100 cows, there are those who have used good beef-type bulls consistently and are producing good beef cattle.

It is unfortunate that the small producers are rarely encouraged in the production of high-quality cattle by receiving as good prices for them as do the specialized ranchmen who produce cattle in comparatively large numbers though of no higher quality. The reason is that small operators usually are forced to sell to local buyers because of lack of numbers for a car-lot shipment to attract the larger buyers. Local traders usually combine purchases into car-lot or larger shipments. The handicap of small numbers usually means a difference of \$5 to \$10 per head, country prices, on yearlings in the fall or spring as compared with prices received by larger producers. Considering this fact, in addition to the possible means of utilizing farm crops, it may be well for small ranchmen who produce sufficient feed to consider finishing their cattle at home, as suggested in the discussion of feeding for market.

The use of good bulls is a practical means of herd improvement, and results are usually obtained in the first calf crop from them. There is no doubt that the financial depression of several years' duration has had a great influence toward the use of more inferior

bulls than would have been used under favorable financial conditions. With better cattle prices considerable improvement may possibly be expected. A wider spread in price between good-quality cattle and the common kind would be the most effective means of encouraging beef-cattle improvement in this, as well as other range regions. In general, cattlemen are well informed regarding the desirability of producing a product of good quality and the means of accomplishing it, but there are influencing factors of various kinds that render it impossible to approach nearer the ideal, and the most influential factor is, generally speaking, the financial condition of the property. A herd of breeding cows of good quality is shown in Figure 13.

Some of the ranchmen in this region have attempted to adhere to a particular line of breeding in selecting their range bulls. The practice is conducive to fixing uniformity if followed up in culling the cow herd and selection of replacement heifers with regard to type and other desirable characteristics. In addition to blood lines, many of the

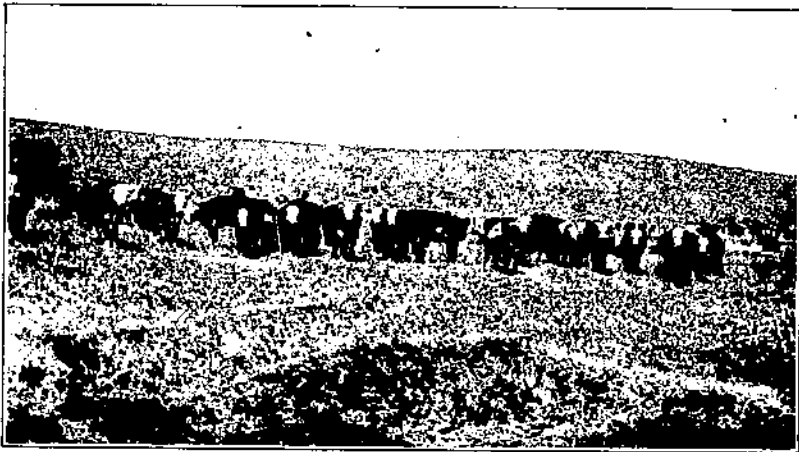


FIG. 13.—Breeding cows of good quality

ranchmen realize the importance of type in bulls, and the preference is given those carrying scale, depth, and weight over the lighter type, commonly termed the "Corn Belt" type.

The lack of facilities, especially fences and water development, does not permit separation of the various classes of cattle on the summer range on all of the ranches. Some ranchmen have made the necessary improvements and are pleased with the results derived from keeping heifers out of the breeding herd until they are 2 years of age. A number of the larger ranchmen are spaying yearling heifers not needed for replacement and finishing them out on grass with steers. Comparatively few of the smaller ranchmen practice spaying. The greatest advantage received from spaying probably has been in the solution of a problem of management rather than the greater financial returns received. It is not necessary to separate spayed heifers from the steer herd, and the danger of breeding too young is eliminated. Spaying is generally done in the spring or early summer because of more favorable weather at that time.

The wide spread in price between good-quality spayed heifers and steers has not been satisfactory to producers. There is great need for

experimental work on the subject of finishing spayed heifers to determine the length of feeding period required for finish, the amounts of feed required, the yield per animal, the percentage of the various cuts, and the waste. Comparisons should be made with steers of the same age and quality. Since spaying can be done with as few fatalities as castrating, it seems advisable for cattlemen to begin the practice very generally in the region, especially if heifers are to be held beyond the yearling age. Among ranchmen who carry 100 cows or less, and who expect to sell young cattle, the practicability of spaying will depend on the local situation and plan of operation. In addition to a means of herd improvement, spaying may further be considered as a means of utilizing heifers. A plan of encouraging Corn Belt feeders to utilize spayed heifers for feeding purposes could probably be worked out by a system of branding for permanent identification and further guaranty of the spaying. The best results from spaying as a means of herd improvement can be expected from the elimination of undesirable heifers as possible breeding cows and the fact that separation of the few replacement heifers until of proper breeding age is facilitated. They should be bred to calve at 3 years of age, on the larger ranches, and possibly a year younger on the small ranches.

In this region cows that fail to calve during the year are usually fat in the fall. The prevailing practice of shipping all fat cows in the fall is not conducive to the best results in improving a herd of breeding cows. Some of the best cows on any ranch, regardless of the attention given, will fail to calve some year before they begin to fail as producers of good calves. Young cows that do not produce good calves in the beginning should be culled out at early ages, and their offspring should not be kept for replacement purposes. Cows that fail to calve two years in succession should not be retained in the breeding herd. Cows that are especially known as producers of good calves of the right type can usually be held over one winter after failing to calve, on the probability of producing desirable calves the following year, provided, of course, the cows are thrifty and have good teeth.

Indiscriminate shipment of cows before they begin to fail adds to the difficulty of maintaining uniformity, which is an especially desired characteristic in a herd of good breeding cows, because every heifer that goes into the breeding herd does not make a good breeding cow and is therefore an experiment. Selection of cows on their individual performance will be a much more effective means of establishing a good herd than throwing all heifers, without regard to quality and type, into the breeding herd and culling out fat cows that fail to calve.

CALF CROP

Improvement in a breeding herd should not be confined to quality alone, but should include the productivity of the herd as well. The two phases of improvement are inseparable, and neither is complete without the other. There is no advantage in building up a breeding herd of high-quality individuals and then eliminating the possibility of profit by retaining a high percentage of nonproducers or by haphazard management that results in low percentage calf crops. Variations in percentage calf crops occur from year to year and seem to be influenced by range conditions, wintering, number and distribution of bulls, and possibly other factors, such as abortion, which

was given as a common cause of low calf crops on some of the ranches.

Table 16 shows the average percentage calf crops of the five groups of ranches. There was a tendency for the smaller ranches to have the highest percentage calf crops, especially those carrying less than 50 cows. Reference has been made to comparative numbers of ranchmen operating entirely on controlled land, or in part on open and national-forest range. The use of controlled land indicates operation under fenced conditions. Examination of those ranches that operate under fenced conditions fails to establish any indications of higher calf crops on fenced range as compared with calf crops on the open and national-forest range during the year under study. The many factors that may influence the calf crop eliminate the possibility of conclusively establishing from data of this kind, that a certain factor or system of operation is wholly responsible for the high or low calf crop. The best information in such cases comes from consideration of various situations, climatic conditions, individual methods of operation, and other problems that confront ranchmen in their management over a period of years.

TABLE 16.—Average percentage calf crops, 304 ranches, northern Great Plains region, 1924

Size of ranches, by number of cows:	Calf crops, per cent
50 and less.....	70
51 to 100.....	67
101 to 200.....	59
201 to 450.....	61
Over 450.....	51

Although the one year's data do not prove the success of these practices, the methods most commonly employed in efforts to increase the calf crop by progressive ranchmen are pasture breeding, separation of the breeding herd from other classes of cattle, and feeding bulls to good, thrifty condition. A number of individual examples in various localities of the region tend to bear out the practices that have been discussed and indorsed as means of increasing the calf crop. Cattle-men are familiar with the necessity of providing pastures, and in all probability the lack of range control has been the greatest handicap to furtherance of certain approved practices. It is noticeable in the various localities that many ranchmen who are operating entirely on owned land have instituted these practices in an effort to obtain higher calf crops and the benefits derived from steers remaining undisturbed by the presence of cows that come into heat. Further division of certain ranges, such as Indian-reservation, and national-forest range, which are not already divided into pastures, may be worthy of consideration and in all probability will take definite form under a more suitable financial condition of the cattle business. The greater ease of handling the various classes of cattle is an additional feature in favor of further division of some ranges.

Some of the ranchmen are doing an excellent job of conditioning bulls for the breeding season. Direct comparisons with those who do not condition for breeding were not available from the one year's records received. The experiences, however, of those men who consistently obtain good calf crops seem to warrant the practice.

A further effect of the general practice of selling a large part of the cows that fail to calve and are fat in the fall is probably reflected in

the calf crop. It is very likely that some ranchmen, judging from their lack of special effort to obtain a high percentage calf crop, consider the returns from dry cows with as much or more favor than the possible returns from a higher percentage calf crop.

It must be kept in mind that cow beef does not usually bring as high a price as steer beef or beef from a good quality of feeder cattle. If the usual number of calves are branded from a smaller number of cows there is an elimination of the expense of carrying the nonproducing cows, and there is the possibility of utilizing the feed normally required for them in feeding young growing cattle, fat or feeder steers, or spayed heifers—classes which ordinarily bring a higher price than cows. In addition, increasing the percentage calf crop from any given number of cows rarely increases the cost of production materially and is considered one of the most economical means of increasing the returns from the cattle investment.

CONTROL OF BREEDING

Controlled breeding is very important. Through it are governed the season of calving, the age at which the heifers are bred to calve, and the breeding age of bulls. The general practice is to turn the bulls into the cow herd about July 1, which permits calves to be dropped as early as the following April. Most of the calves are dropped in May and June, and considering the danger from severe storms that sometimes occur in April, this season is early enough under the prevalent conditions on the large ranches that depend upon natural shelter for protection. Small ranchmen who have sufficient sheds can consider breeding for earlier calves, especially if the plan is to feed out or sell feeder calves. In addition, large operators with 200 or more cows, who expect to sell feeder calves in the fall can consider means of sheltering earlier calves and can breed for them accordingly.

Since the average weight of calves in this region is around 350 pounds at weaning time and the most desirable weight for commercial feeder calves is from 400 to 450 pounds, the desirability of heavier calves than the average for use in the feeder trade is obvious. With plenty of feed available and facilities for extremely good care, some ranchmen may be in a position to consider having calves dropped late in the winter or very early in the spring before the cows are off winter feed. The system will require unusual facilities both as to feed and shelter and very careful attention to the cow herd and the young calves.

The most desirable time for a heifer to drop her first calf is at 3 years of age. If bred to calve at 2 years every practical effort should be made to prevent death loss and to avoid by extra feeding the development into a small cow. Probably the best means of handling calves from 2-year-old heifers is to ship them in the summer or early in the fall as weaners and allow the heifers the run of good range during the remainder of the grazing season. Calves from 2-year-old heifers are not generally as growthy as are those from mature cows, and usually the producers of high-quality feeder calves in certain other range regions do not offer them to the feeder trade in lots of calves from the mature cows.

Bulls may be put to full service at 2 years of age. Good results may ordinarily be expected if the animal is well developed at that age and has been acclimated to the locality. Range cattlemen can

usually profit by buying bulls as calves or yearlings and maturing them to meet their local conditions. To wait until there is an immediate need is to run the risk of having to pay a high price for an undesirable class of bulls.

Spaying is to be recommended as a means of preventing breeding in addition to its other desirable features.

RANGE USE AND IMPROVEMENT

A classification of ranges in the region on the basis of ownership gives some indication of the use usually made of the various classes. Where a sufficient acreage is owned, privately owned range is used for summer and winter grazing. Leased range is operated in most cases as if owned. The limited amount of national-forest range in the region is used for summer grazing. The public domain and the abandoned and unfenced homesteads, both of which constitute the "free range," is used to a greater extent for summer than for winter grazing, but in some favorable areas, the open range furnishes considerable winter grazing, notably in the Bad Lands area of North Dakota. That it is not uncommon to find ranchmen who are operating on several of these classes of range, especially among the smaller-sized groups, is indicated in Table 6.

The operation of an individual ranch is usually planned to meet the local situation with reference to any of these classes of range that may be available. Changes will have to be made from time to time from the present systems of operation to meet the changes in land ownership in the various communities. Difficulties that have a disheartening effect on cattlemen are not uncommon. Sometimes unusual arrangements are necessary if a man is to remain in the business.

A local resident, for example, whose cattle operations are too small to occupy all of his time (he has 52 cows and a limited acreage of farming land) has leased all desirable uninhabited homesteads within a community adjacent to a rather large area of open range. Cattlemen living within handling distance, 10 to 40 miles, of this leased land place their cattle on the range under contract with the lessor, who furnishes all labor and receives 50 cents per head per month, all cattle, excluding calves, being counted. The operation is known locally as "summer herding," and the responsibility of the lessor is to keep the cattle within the general boundaries of the grazing area, maintain watering places, and prevent depredation. The cattle are not held in herds as indicated by the terms, but are allowed to graze at will, over the land. The herding season lasts from about May 15 to October 15, at which time the owners remove their cattle from the summer herd to the home ranches for wintering.

Two similar systems were observed in other localities, and the total number of cattle so handled approximated 2,000 head. The greatest disadvantages of this system are (1) the driving to and from the summer range, (2) comparatively high cost, and (3) lack of permanence of such a system. The principal advantages it offers are (1) means by which certain operators, especially those well situated with reference to winter-feed production and who have a limited area of summer range, can run more cattle, (2) ease of working the summer herd as compared to the common system of turning cattle loose on large range areas, and (3) minimizing losses from straying and theft.

EFFECT OF OWNERSHIP

The fact is well established by the prevailing system of operation that ownership or lack of ownership of the range is the factor determining the system of range use employed. The present land situations where taxes are higher than lease prices can not be expected to continue for many years. The problem of land ownership or control by lease is the influencing factor in stable organization.

The two seasonal uses made of ranges are for summer and winter grazing. It is doubtful if the majority of the cattlemen have given special consideration to the types of range according to the species of native grasses that can be utilized to the best advantage during the summer and winter seasons. On the other hand, location is an important consideration given to seasonal range. It must be remembered that every cattleman does not have an unlimited choice as to type of range, seasonal use of the various types, and other matters pertinent to good range utilization and management. The condition is often a situation in which the operator attempts to do his best with the means at hand.

As the ranchman views it, a good summer range should have an abundance of good grass and a water supply that does not fail. Ordinarily the deserved emphasis is placed on the water supply. Summer range can be handled with greater inconvenience with regard to location than can winter range. The general rule is to reserve winter range for the breeding herd and for the young cattle about the headquarters. The system has merit, regardless of lack of consideration of type of range, when it is understood that feeding is necessary during periods of snow. Others prefer ranges from which the snow blows during snowstorms for winter grazing of mature cattle. Some operators prefer the rough broken areas characterized by the Missouri River "breaks" for winter range because of the greater amount of protection afforded. (Fig. 14.) It is true that winter grazing is practiced more or less in connection with winter feeding on many of the ranches. The winter range is of special importance because of the saving of feed on those ranches that are running comparatively large numbers of steers. Grama and buffalo grasses, which cure well in the late summer and fall and retain their feed value, are especially suitable for winter ranges.

There are many factors affecting the individual in the selection of seasonal ranges, and all of them must be considered in the general plan of operations. There are few ideal situations, but on practically every ranch one or more opportunities exist that may mean the difference between success and failure in the accomplishment of some single result that relates to the financial returns.

Important among the considerations to be made in addition to type of range for certain seasonal use is the class of cattle to use it. It is not necessary to use an extremely good-quality fattening range for carrying cows during the breeding season. Ranges of this type can ordinarily be used to better advantage by steers that are to be marketed during the grazing season or at the close of it. But a cow range should be good enough to permit attainment of excellent condition by cows with calves at foot (fig. 15). Young steers that are to be held for several seasons may be grazed on ranges that

afford growth but not necessarily a high finish. Good fattening ranges, however, are not objectionable for growing young steers.

In attempting to make the best use of the available types of range during certain seasons it is necessary to consider the special value of the predominating species of grass, especially their growth, feed value, maturity, and curing qualities. Such information must be confined to the individual ranch because of the wide variation in relatively small areas. It is not necessary for the individual ranchman to go into extremely detailed scientific research, for his practical application of desirable information will require only identification of the good grasses, dates of seed maturity, and the comparative amount of grazing each variety will stand. Certain known facts are being employed in numbers of instances to excellent advantage.



FIG. 14.—Broken areas furnish good winter protection

That bunch grasses can be grazed more heavily than can the single-stem plants during the growing season and that bluestem, during favorable seasons, is a very desirable grass for fattening purposes are among the facts that should be known and used.

An outstanding example of results that may be expected from the proper seasonal utilization of various types of range by special classes of cattle is afforded by a certain ranch in Meade County, S. Dak. The plan of the operator is to sell 2-year-old steers. In addition to producing well-bred and good-type cattle the ranchman considers that additional returns can be secured from making his steers as heavy as possible and firm fleshed. This minimizes the amount of shrink in shipment and promotes good appearance at the market.

After the steers have made the approximate maximum gain on the spring and summer range, which is separate from the pastures grazed by the other classes of cattle, they are put into a specially reserved

bluestem pasture about July 15. During the two and one-half to three months on this range the steers gain some in weight but the greatest benefit is in their hardening or becoming firm-fleshed. The steers are held on the dry range until shipment, dry hay is fed for 24 hours before loading, and the result is a minimum amount of shrink and a good appearance at the market.

A comparison of results obtained from this system of hardening steers was made during the fall of 1924. A neighboring ranchman marketed steers of the same breeding, comparative age, weight, and appearance at the time of shipment. The lots of cattle went to market on the same train and had identical treatment en route. The steers of this second man had been grazed during the latter part of the season on moist valley range and were not "dried out" before shipment, but this ranchman had the same opportunity of hardening his steers as



FIG. 15.—Cow range of good quality

the first man. On arrival at market, the hardened steers induced competition between killer buyers and buyers of heavy feeder cattle, but the "soft" cattle attracted no killer buyers. The hardened steers weighed 987 pounds and netted \$64 per head. The soft steers were sold to feeders and netted \$20 per head less, which may be attributed in part, if not entirely, to lack of firm flesh with consequent heavier shrink.

The utilization of desirable range for hardening 3 and 4 year old grass-fat steers is even more important than in the case of younger steers. Older steers are not as widely demanded by feeders, and the firmness of flesh has much to do with the killing qualities, which is an important factor in determining killers' bids. Steer range of good quality is shown in figure 16.

RATE OF STOCKING

Range livestock production is not a business to be entered into with the expectation of high net returns within a period of a few years.

Systematic or conservative operation necessitates taking care of the native grasses. On practically every range there is constant competition between the various plants for predominance. Continuous close grazing of the most desirable grasses will result in the less desirable becoming predominant. Therefore, overstocking is false economy in a plan of ranch operation that is expected to be continued over a period of years. Excessive overgrazing for two years in succession may result in greater damage to the range than can be overcome during the following four years under approved methods of range improvement.

Among the influences that prompt ranchmen to overstock are extremely low market prices which encourage an attempt to avoid sacrifice sales; and financial obligations, not necessarily pressing in



FIG. 16.—Steer range of good quality produces fat and finish

nature, but sufficient in amount to encourage carrying a larger number of cattle for collateral. It seems that some of the ranchmen from whom records were obtained, are acting in accord with the latter reasoning. The reaction of some ranchmen toward a favorable market has been to carry more livestock than the range would normally carry for greater production to sell on an expected higher market. From the many examples of adversity resulting in part, or entirely, from overstocking in the western range regions, it is very evident that the chance is not worth taking.

On the other hand, practically every ranching community affords an example of conservative utilization and care of the native range that has resulted in avoiding heavy feed purchases, heavy death losses, and sacrifice of cattle by forced sales because of unfavorable range conditions. Wide observation is the basis for the statement that the ability of a ranchman is generally reflected in the care given

the continuously operated range. Of course, subnormal range conditions occur in practically all areas with more or less regularity. No one has yet been able to forecast their frequency. The safest system of operations will include the minimum number of risks and proper consideration of the possible or probable seriousness that may result from any adverse circumstance.

The representative ranches included in Table 14 indicate the use of more winter feed on the smaller than on the larger ranches. This would indicate that the large ranches are greater users of the native range than are the smaller ranches. It is not always the fortune of a ranchman to have a choice between heavy stocking and feed production or light stocking and wintering out. Lack of available range in the one instance and lack of labor in the other may determine the plan of operation.

The rate of stocking any particular tract of range must be arrived at through consideration of the type, condition resulting from previous use, and normal seasonal rainfall. On the Fort Berthold Indian Reservation in North Dakota, which is generally considered good range, the lease contract stipulates the rate of stocking at 20 acres per head. It must be kept in mind that lessors usually leave their steers on the reservation pasture during the winter. In some cases other classes of cattle in addition to steers are left on the reservation for wintering.

This rate of stocking seems to be a fairly good index figure for the ranchmen in the region who plan to practice winter grazing when the weather permits and supply winter feed to weak cattle and all others if necessary. On some of the better ranges 10 acres per head during the growing season will be sufficient, with additional winter range or winter feed for the entire herd. Fifteen acres per head with winter feed or additional winter range for part of the herd will be satisfactory in some situations. In others, 25 to 40 acres per head with winter feeding during seasons of heavy snow or severe storms, will be a safe rate of stocking for year-round use.

Experiments conducted at the northern Great Plains field station at Mandan, N. Dak. from 1916 to 1921, inclusive,¹ indicate that one 2-year-old steer to 7 acres is approximately the required acreage to produce maximum gains under a system of continuous grazing. The range has not deteriorated from that rate of use. In the same test, 10 acres of land per steer was more than necessary, and 5 acres per steer was insufficient to allow maximum gains and resulted in an overgrazed condition of the range. The periods of grazing in the above experiment each year have been from May 15 or June 1 to October 1 or November 1, as winter grazing is not considered dependable in that locality.

The land used for the pastures in this experiment was considered "potentially tillable land of good quality." Because of that fact, cattlemen, in considering an application of the above results on rates of stocking to their situation, will necessarily be guided by the comparative length of the grazing season and quality of the range. Range that is of such quality that a 2-year-old steer on 7 acres, without additional feed, will gain from 250 to 300 pounds during the summer without injury to the range is the most valuable basic

¹ SARVIE, J. T. EFFECTS OF DIFFERENT SYSTEMS AND INTENSITIES OF GRAZING UPON THE NATIVE VEGETATION AT THE NORTHERN GREAT PLAINS FIELD STATION. U. S. Depl. Agr. Bul. 1170, 40 p., illus. 1923.

requirement in employing a system of finishing on grass with or without supplemental feeds. Marked changes in conditions within relatively small areas render it impossible to state other than general figures on rates of stocking, and each ranch is a specific problem within itself.

The systems of grazing that may be considered in this region are continuous, deferred, and rotated. At present, continuous grazing, which means use of the same range throughout the summer season, or year, is practically the only system employed. Deferred grazing is employed in part by some operators who withhold grazing of certain pastures until the grass has matured. The use of bluestem range late in the summer for hardening steers is an example of this system. Deferred and rotated grazing, which necessitate division of the range into areas each of which is deferred in turn, are not generally practiced.

Results obtained at the Mandan station which made comparisons of systems of grazing in addition to the comparisons of different rates of stocking should be of interest to cattlemen in this region.² In the spring of 1918 a 70-acre pasture stocked at the rate of one 2-year-old steer to 4.4 acres was devoted to the deferred and rotated system of grazing. A comparison was made with the effects on the range plants and gains of cattle to a 70-acre pasture stocked at the rate of one 2-year-old steer to 7 acres that was continuously grazed. Preliminary to the actual beginning of grazing the pasture was divided into three divisions, A, B, and C. The divisions were grazed in the following order:

First year-----A, spring; B, summer; C, fall.
 Second year----A, summer; B, spring; C, full.
 Third year-----A, spring; B, fall; C, summer.

In the last three years of the experiment the pastures were grazed in the same order as in the first three years shown above.

The statement of results indicates that there has not been an increase in any of the species of grasses in the rotated pasture by reseedling, which was probably influenced by the unfavorable seasons, but that good results may be expected from this system of grazing in the region because of the physiological effect on the plants. The cattle made the best gains in the 70-acre pasture that was grazed continuously, and the gains of the cattle in the 70-acre rotated pasture were about 10 per cent less than those above. The native vegetation was not as completely utilized in the continuously grazed as in the rotated pasture. The vegetation in the rotated pasture has not been injured by the greater utilization because each division was allowed to mature at various periods before being grazed again. Further, in order to avoid injury to the vegetation under a system of continuous grazing, from 15 to 25 per cent of the foliage cover must remain on the pasture at the close of the grazing season.

The latter statement, referring to the results obtained, should be of special interest to range-livestock producers because of the very general use of the system of continuous grazing. It is improbable that an attempt to utilize the grass completely is a safe

² STEPHENS, J. M., WILSON, R., BAIRD, W. P., SARVIS, J. T., THYSSELL, J. C., KILLAND, T. K., and BRINSMARKE, J. C., JR. REPORT OF THE NORTHERN GREAT PLAINS FIELD STATION FOR THE 10-YEAR PERIOD, 1913-1922, INCLUSIVE. U. S. Dept. Agr. Bul. 1301, 80 p., illus. 1925.

method of operation for ranchmen, regardless of the system of grazing employed. It is especially dangerous for ranchmen whose facilities for providing roughage are limited. Subnormal seasons result in subnormal growth of range grasses, and in that event an overstocked condition would probably result.

The practicability of operation and the cost of inauguration are factors that must be considered in the adoption or continuance of either of the above systems of grazing. The system of continuous grazing is the simplest to employ. It is practical in connection with such practices as separate ranges for the various classes of cattle. Deferred grazing could be instituted on many additional ranches within the region with little difficulty. There are situations in which deferred and rotated grazing may be considered. On many of the ranches, however, this system of grazing in connection with the advocated separate ranges for various classes of cattle would probably result in a system of operation too complicated to be of much practical value. It is evident that good results may be obtained from either system if it is properly applied. A range-livestock producer can not afford to overlook all means of range maintenance or improvement. The basic fact is this: A margin of safety must prevail in the rate of stocking, regardless of the type of range and method of use employed, before successful results can be achieved with any system of range improvement.

FINANCIAL SUMMARY OF RANCHES

DISTRIBUTION OF INVESTMENT

The total investment varied from \$20,767, the average of the smallest ranches, to \$186,056 in the case of the largest ranches. Table 17 shows the average investment in the various items on average ranches of the five groups.

TABLE 17.—Distribution of ranch investment, 304 ranches, northern Great Plains region, 1924

Number cows per ranch	Investment								Percentage distribution							
	Ranches	Total	Land	Improvements	Range cattle	Work stock	Other livestock	Equipment	Feed and supplies	Land	Improvements	Cattle	Work stock	Other livestock	Equipment	Feed and supplies
50 and less.....	65	\$20,767	\$11,271	\$3,038	\$3,715	\$609	\$602	\$1,129	\$401	54.3	14.6	17.9	2.9	2.9	5.4	2.0
51 to 100.....	104	29,608	15,561	4,481	6,539	669	531	1,305	322	52.5	15.1	22.1	2.9	1.8	4.4	1.6
101 to 200.....	77	52,818	29,955	6,221	12,228	899	908	1,774	836	56.7	11.8	23.2	1.7	1.7	3.3	1.6
201 to 450.....	46	72,748	32,576	9,777	23,126	1,422	1,710	2,578	1,559	44.8	13.4	31.8	2.0	2.4	2.5	2.1
Over 450.....	9	186,056	92,603	13,896	70,704	2,472	1,858	3,712	1,371	49.8	7.4	38.0	1.3	.7	2.0	.8

It will be noted that the investment in land in the three groups of smaller ranches is above 50 per cent of the total investment. In the two groups of larger ranches the land investment is below 50 per cent. Referring to Table 5, some general relation between the percentage of leased grazing land and the percentage investment in land as shown in this instance may be observed. Normally the percentage investment in improvements decreases from smaller to larger ranches. Such a decrease is not constant in this instance because of the influence

of leased land and because of the improvements thereon, except where such improvements represented capital of the lessee. A large ranch made up of smaller units of highly improved land may show a relatively high percentage of the investment in improvements, but such situations are not representative examples of ranch organization.

The gradual increase in the percentage investment in cattle from the small to the large ranches is favorable to the large ranches, unless the land should increase in value rapidly. The desire of the majority of ranchmen is to keep the investment in land as low as possible and the investment in cattle as high as possible. In some cases this desire carries ranchmen to extremes in the form of overstocking and operating extensively on short-time leased land. Ranches in western Texas, an area of stable ranch organizations, have approximately one-third of the investment in cattle and the remainder in equipment and good grazing land, which does not seem to be a serious situation where a rather high percentage of the land may have a potentially tillable value. There is no doubt that the narrowing of the margin between the necessary investments in land and cattle during the last 20 years has been one of the greatest influences toward diversification in ranching. As land prices increase the necessity for diversification will become more pronounced.

RANCH INDEBTEDNESS

The operator's equities can be determined by comparing the land and cattle indebtedness as shown in Table 18 with the respective investments as shown in Table 17. Comparing the total investment per average ranch of the five groups to the total average indebtedness per ranch of each group, the percentage of indebtedness in the two groups of smaller ranches is 18 per cent in each case. The indebtedness is 15 per cent in the 101-to-200-cow group of ranches. In the two latter groups the indebtedness is 23 per cent in each instance.

TABLE 18.—Ranch indebtedness, 304 ranches, northern Great Plains region, 1924

Number of cows per ranch	Total indebtedness	Total annual interest paid	Land indebtedness			Cattle indebtedness			Other debts			Ratio of paid interest to receipts less expenses
			Average per ranch	Per acre	Rate of interest	Average per ranch	Per head	Rate of interest	Miscellaneous	Unpaid taxes	Unpaid interest	
					Per cent			Per cent				Per cent
50 and less	\$3,826	\$277	\$2,368	\$2.38	6.3	\$1,133	\$13.33	9.1	\$275	\$42	\$8	21.5
51 to 100	5,309	399	2,862	2.01	6.8	1,945	12.23	8.8	315	12	12	22.2
101 to 200	8,023	625	3,775	1.23	7.3	3,910	13.12	8.3	322	4	12	29.8
201 to 450	17,035	1,274	6,270	1.44	6.6	9,942	17.44	8.0	608	54	161	27.6
Over 450	43,611	2,911	9,889	1.17	6.6	33,278	19.10	7.4	444			18.4

It will be recalled that the two groups of large ranches were carrying comparatively large numbers of steers, and it is very likely that the higher percentage of indebtedness as compared with total investment was caused by the financing of the steers. Table 18 which shows the average indebtedness per head of cattle gives the same indication. The above percentages of indebtedness on the whole show a very sound condition of the business upon the ranches included in the survey, as applied to equities owned by the cattlemen.

A high percentage of the present indebtedness had its origin during the years of 1919 and 1920. Conditions since that time have not been very favorable to paying off this indebtedness. Many cattlemen have been pressed for interest and principal payments. In numbers of instances the financial condition of operators was so hopeless after the decline in prices that quick liquidation was resorted to. It is probable that a number of such instances would not have occurred had a wider margin of equity been required at the time of the loan. Many original loans were made on safe margins but in some instances the unfavorable conditions necessitated further extension of credit as a means of making good the first loan.

There are two distinct phases of financing the ranching business, one having to do with land and the other with livestock loans. A third may be said to deal with operation expenses or working capital. The working capital is included in the item of "miscellaneous debts" in the table.

Of the land indebtedness shown in Table 18 the following percentages were being carried by the various agencies mentioned: Federal farm loan banks, 26 per cent; private individuals, 18 per cent; State loan agencies, 15 per cent; cattle-loan companies, 11 per cent; and other agencies, 30 per cent. It is unusual for cattle-loan companies to advance money on lands, and the probability is that these cases arose from the necessity for additional security on cattle loans. It is likely that a high percentage of the indebtedness to private individuals represented balances due on purchased land rather than outright borrowings of capital. The great amount of capital ordinarily required to purchase extensive acreages of ranch lands necessitates long-time loans and low rates of interest. This type of credit was never more available than it is at present. Cattlemen and farmers have realized the benefits to be derived from long-time loans on the amortization plan, either from cooperative, State, or private sources, and the trend seems to have been toward this type of land loan during recent years within the region. The average rate of interest of 224 land loans averaged 6.8 per cent and varied from 5.5 to 8 per cent. The time varied from 1 to 30 years according to the source of the loan.

The total cattle indebtedness was being carried by the respective agencies in the following proportions: Local banks, 57 per cent; War Finance Corporation, 13 per cent; cattle-loan companies, 12 per cent; intermediate-credit banks, 6 per cent; and other agencies, 10 per cent. The average rate of interest on 197 cattle loans was 8 per cent and varied from 7 to 9 per cent. The time varied from six months on bank loans to nine months paper subject to four renewals under the intermediate credit plan.

Until the establishment of the intermediate credit system cattle loans were generally on a short-time basis. The present prospect is that if cattlemen are to receive the benefits of intermediate credit it will be necessary for them to organize their associations, similar in nature to the Federal farm loan associations, and deal directly with the intermediate credit banks.

The rate of interest on cattle loans has, from time to time, been a subject of some contention throughout the cattle-producing areas of the Western States. It is to the ranchman's advantage, of course, to obtain loans at the lowest rate of interest. Time or length of the

loan is a more important factor to the ranchman than the rate of interest, within certain limits. Cattlemen who operate under representative conditions and apply the average cattleman's managerial ability can ordinarily overcome heavy indebtedness if given time and if not crowded or intimidated in their plans of production. A relatively high percentage of cattlemen will invariably express a preference for borrowing money on cattle from local sources, and paying a somewhat higher rate of interest with the prospect of several renewals rather than obtaining cheaper money with little assurance of the renewal feature. Unfortunately local financiers are not always in position to make the expected renewals, and financial pressure results.

During the survey references were made by cattlemen on several occasions to local financiers having made loans to inexperienced men who were really not financially able to engage in the cattle business. Instances were cited in various localities of men having gone into the cattle business during the period of high prices on leased land entirely and with little or no equity in the cattle purchased. Bona fide cattlemen stated that such practices tend to raise the rates of interest, induce competition for lease land, and increase local prices of cattle above actual market values to such an extent that the condition can not be met in a conservative system of operation.

Recent history of range-livestock finance indicates that justice to the industry as a safe field for finance, to the cattlemen as qualified business men and to financiers as conservative investors demands (1) margin of equity by borrowers be more than sufficient to overcome probable market declines, (2) stable situations of operators with reference to range land and feed production, and (3) the possibility of extension of time by financiers to permit cattlemen to "grow out" the indebtedness carried on breeding herds, especially.

DISTRIBUTION OF EXPENSES

The distribution of ranch expenses is shown in Table 19. According to statements from many ranchmen and the figures given, the expense for purchased feed for the year 1924 was not excessive. In fact, the winter of 1924-25 was unusually mild, and the amount of home-raised feed was generally sufficient to meet all needs. It will be noted that decreases in the inventories and depreciation on improvements and equipment are items contributing to the total expense.

TABLE 19. --Distribution of annual ranch expenses, 304 ranches, northern Great Plains region, 1924

Number of cows per ranch	Ranches	Total expense	Current expenses						Total current expense	Depreciation	Ratio of current expense to total expense
			Taxes	Labor	Leases	Feed	Repairs	Other			
	Number									Per cent	
Less than 50.....	88	\$1,335	\$214	\$209	\$124	\$42	\$151	\$317	\$1,057	\$278	79.2
51-100.....	103	1,841	270	368	107	81	208	371	1,474	367	80.1
101-200.....	77	2,950	578	792	256	84	303	437	2,450	500	83.1
201-450.....	46	5,025	810	1,601	429	265	530	684	4,252	773	84.0
Over 450.....	9	10,877	2,275	3,425	1,092	658	282	1,974	9,706	1,171	89.2

TAXATION OF RANGE LANDS

The payment of taxes is among the largest single items of expense on the ranches in this region. The problem of equitably taxing grazing lands is one that confronts a large number of State authorities, ranchmen, and other landowners in the northern Great Plains region. This problem should be given serious consideration, as it has a very important bearing on the progress of the livestock industry in this region. Thousands of acres of range lands were assessed at rather high values as compared with current prices of grazing lands.

TABLE 20. —*Expenditure of taxes collected in representative counties, northern Great Plains region, 1924*

State	Counties	Proportion of total taxes used to support—				
		State	County	Schools	Township	City
		Per cent	Per cent	Per cent	Per cent	Per cent
Wyoming.....	2	16	33	52		
Montana.....	4	15	41	44		
North Dakota.....	1	11	26	50	11	2
South Dakota.....	6	8	38	46	4	4

Table 20 shows that schools are making the greatest demand of any of the allocations to which the taxes are directed. It is indicated throughout that the heaviest taxes are those voted locally. Tax reduction then becomes largely a county or a community problem. Rural schools and public-roads problems will probably require larger levies. Counties are probably in better position to handle taxation matters as applied to the special adaptations of their area than are any other units of tax administration.

Landowners in general comment rather unfavorably upon the assessment values placed on grazing lands as compared with those placed on farming lands. An outstanding example of eliminating such comment and placing the assessment values on an equitable basis is afforded by Mercer County, N. Dak. Experts were employed by that county, and bonds were required of them. Each 40 acres in the county was classified as tillable or nontillable land, and the classification was made a part of the county records. Since this was done, it is generally considered that each landowner is being taxed on an equitable basis and in proportion to the actual value of his holdings in the county.

The low prices of ranch products and the abandonment of homesteads have increased the volume of tax delinquencies. For example, in Montana alone, for the State as a whole, the delinquencies averaged 9.8 per cent in 1921, 11.1 per cent in 1922, and 17 per cent in 1923. In 1925 there were over \$11,000,000 of delinquent taxes, which represents the percentage of the actual amounts levied not collected. In order to secure full revenue, the counties must either sell tax certificates or increase the levy of taxes on all property for county purposes in the succeeding year. The percentage of all taxes paid by agriculture in Montana amounted to 38 per cent in 1924.

It seems that the cost of local government has increased materially during recent years, which together with community improvements

has made the subject of taxes foremost in discussions. The high taxes as compared with the rate of returns has been noticeable in this region. The payment of taxes took 8.7 per cent of the income from the ranches studied in this survey. Of the total operating expense 13.5 per cent was taxes during the year 1924.

LABOR

Labor is a very important part of the ranch expense, as indicated in Table 21. In this study the total amount of labor employed on the ranch was obtained, together with the classification as paid, unpaid, and operator's labor. Paid labor, as indicated, is that for which a wage was paid. Unpaid labor is that represented by labor performed by members of the family, ordinarily. Operator's labor is that performed by the owner. As may be expected, the labor requirements increase from the smaller to the larger ranches, and as the requirements increase the amount of paid labor also increases. The cost of labor as shown in Table 21 includes board.

TABLE 21.—*Labor: Amount and kind, per ranch, and value, 304 ranches, northern Great Plains region, 1924*

Number of cows per ranch	Ranches	Amount of labor per year, by kinds				Value of labor, per month, by kinds				Distribution of amount of labor, by kinds			
		All labor	Paid	Unpaid	Operator	All labor	Paid	Unpaid	Operator	All labor	Paid	Unpaid	Operator
		Number	Mos.	Mos.	Mos.	Mos.					Pct.	Pct.	Pct.	Pct.
50 and less.....	68	22.7	3.9	7.2	11.6	\$46.83	\$53.85	\$40.00	\$48.71	100	17.2	31.7	51.1
51 to 100.....	101	25.0	6.7	6.7	11.6	48.24	51.64	38.80	51.72	100	26.8	26.8	46.4
101 to 200.....	77	30.6	14.4	4.9	11.3	52.00	53.82	46.73	51.95	100	47.1	16.0	36.9
201 to 450.....	46	45.4	26.4	7.6	11.4	53.04	57.27	43.82	52.08	100	58.2	14.7	25.1
Over 450.....	9	59.0	70.0	7.0	12.0	52.25	53.00	48.57	50.00	100	78.6	7.9	13.5

¹ The value of "unpaid" and "operator" labor was found upon each ranch by comparing the manual labor done by these two classes of laborers with that performed by hired labor, and a figure was established in this manner.

A comment frequently made by ranchmen during the survey was to the effect that labor was high and out of proportion to its real worth because of inefficiency. Keen seasonal demand for labor during haying and harvesting seasons makes it very difficult for ranchmen to obtain the necessary labor to put up hay for winter feed. In very few localities was there said to be an abundance of reliable seasonal labor.

Ranches of various sizes require employment of labor in accordance with the number of cattle or amount of farming work to be done. In instances where considerable cropping is done, the necessity for labor during the cropping season is somewhat greater than on the larger ranches where hay is the principal feed crop. In general, on the larger ranches the spring work consists principally of getting the cattle onto the spring and summer range.

The first working of the cattle occurs in July. At this time calves are branded, castrated, and in some cases vaccinated. During the summer months cattle require comparatively little attention, and the work is limited to riding the range and looking after the fences and the water supply. The second working is usually timed to correspond conveniently with the shipping season, which is generally in Septem-

ber or October, depending somewhat upon seasons and market conditions. At the second working the younger calves are branded, castrated, vaccinated, and in some instances dehorned. After the beef shipment the calves are usually weaned; in most cases this occurs in November or early in December. Some ranchmen prefer to let the calves stay on the cows until the latter part of December or until January 1, but most of them prefer the earlier dates for weaning. Whether feeding is begun in December or January depends upon the necessity. Feeding continues until about April 15.

It is essential that cattle work and farm work be arranged to permit the attention due to each operation. On established ranches a well-organized system usually prevails. For instance, in some cases the first working of cattle occurs in either June or August to permit haying in July. Ranchmen who are considering expanding their operations to include a larger number of cattle or extensive crop production must take into consideration the requirement of time in connection with their other operations. If there is considerable work with no plan for its distribution, extra labor will be needed. This is usually found to be more costly than that regularly employed. The availability of seasonal labor is a matter of concern and is generally a problem, especially during the haying season. Any well-organized ranching system will facilitate an orderly employment of labor and get the most done for the money expended. Since labor payments in most cases are items of cash expense, added emphasis is given to the fact that efficient utilization should be made of labor.

DISTRIBUTION OF RECEIPTS

The various sources of receipts as shown by Table 22 indicate the rather wide diversity of operations on the five groups of ranches. Less than half of the receipts on the small ranches come from range cattle, 47 per cent being derived from cattle, 25 per cent from crops, 15 per cent from other livestock, and 8 per cent from livestock products. Medium-sized ranches had about 75 per cent of their receipts from cattle, and the large ranches depended upon cattle for 94 per cent of their total receipts, less than 4 per cent being obtained from crops and other livestock. Receipts as shown in the following table are made up of cash sales and increases in the inventory values of the various commodities. In no instance was there a decrease in the cattle account. On some ranches, which began the year with comparatively large feed reserves that were utilized, the feed inventory shows a decrease in value as well as in quantity.

TABLE 22.—Ranch receipts, 804 ranches, northern Great Plains region, 1924-25

Number of cows per ranch	Ranches	Total receipts	Distribution of ranch receipts—						Percentage distribution					
			Range cattle	Crops	Other livestock	Livestock products	Increase in feed	Other sources	Range cattle	Crops	Other livestock	Livestock products	Increase in feed	Other sources
50 and less	68	\$2,502	\$1,209	\$654	\$392	\$205	\$80	\$52	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
51 to 100	101	3,636	2,183	760	354	162	143	34	46.7	25.2	15.1	7.9	3.1	2.0
101 to 200	77	5,073	3,860	458	473	91	175	10	60.0	20.9	11.7	4.2	3.9	1.0
201 to 450	46	9,670	7,877	700	553	34	504	2	76.2	9.0	9.3	1.2	3.5	.2
Over 450	12	26,064	24,950	519	433		679	83	81.5	7.2	5.7	.4	2.2	.3
		9,26,064	24,950	519	433		679	83	93.6	1.9	1.6			

The "other livestock" consist of horses and hogs, principally. "Livestock products" consist of sales of cream, hides, etc.,

Diversification from the standpoint of percentage returns from the various sources is much more pronounced on the smaller than on the larger ranches. This might be expected when the situations of the larger and smaller operators are considered with reference to acquirement and utilization of labor. A man with a limited acreage of available land will necessarily be limited in the number of cattle that can be produced. Insufficient income from that source to meet the needs necessitates expansion of operations, and farming is practically the only alternative. In reality many of the ranches at present in the region began as farms, and cattle operations have been increased to their present status through the acquirement of more grazing land and the shifting of the farming operations from the sale of cash crops to feed production.

Diversification of crops or livestock necessitates an arrangement of the entire organization that will permit the necessary attention to be devoted to each enterprise. A number of the small ranches studied, especially those well situated for grain production, are raising hogs. Comparatively few of them, however, are attempting to finish the hogs for market as is done in the Corn Belt but are selling feeder pigs that weigh from 100 to 175 pounds. The grain crops that encourage hog production are corn and barley. Alfalfa is used very generally for hog pasturage. Favorable results are being obtained from this practice in connection with farming and other livestock operations.

Horse production was not being considered favorably on the ranches during the time of the survey because of the low market and the surplus of off-type horses; but there was a limited demand for well-broken horses weighing at least 1,500 pounds. A few ranchmen were meeting this demand and receiving fair prices. In several instances mules were being produced. A certain ranchman in South Dakota who does considerable farming is using brood mares for draft purposes, and mules are being produced with very little interference with farm work. The demand for mules in the cotton-producing States, and in those industries such as lumbering, road building, and oil-field work, should bring opportunities in mule production as a form of diversification on some of the larger as well as on the smaller ranches.

In some parts of the region former cattlemen described plans for going into sheep production and several cattlemen planned to close out their cattle and buy sheep. In such cases a number of matters should be considered very seriously before final decision is reached. The most important are whether the range is suitable for the class of livestock preferred, the situation for wintering, and the price relation of the different classes of livestock. There are few examples of remarkable success in the region of ranchmen who have practiced sudden and repeated changes from one class of range livestock to another over several years' operation. On the other hand, there are examples of many failures. Abrupt change from one class of livestock to another is a matter for serious consideration. It is usually more desirable to consider a well-balanced plan of operation over a period of years, using the kind or kinds of livestock best adapted to the situation of the individual ranchman.

Wheat is given wider consideration as a cash crop than is any other grain. In some communities flax has been produced to a considerable extent on the sod land. The production and sale of certified alfalfa seed has been an important source of receipts during the last few years and a number of ranchmen planned to produce it on a larger scale by increasing their alfalfa acreage. The crop offers advantages both for feed and for seed production.

A number of the smaller ranches are in a position to diversify further their present operations. Special situations will demand special arrangements. Ordinarily ranchmen who have ability above the average in handling range livestock can best apply that ability in that class of operation. To accomplish the best results from livestock production in connection with crop production it is essential that a ranchman possess ability that is well-balanced between the two operations. It is doubtful if many of the big ranches in the region can maintain a heavy overhead in extensive crop production. The most desirable form of diversification open to the larger establishments seems to be in the production of horses, mules, or sheep, with enough farming to provide sufficient feed for liberal winter feeding. Numbers of small ranches could probably handle small flocks of sheep to advantage.

INCOME STATEMENT

The ranch income shown in Table 23 is determined by deducting the total expense from the total receipts. The income shown does not take into consideration the ranch indebtedness and interest payments (Table 18) that have to be paid out of the receipts. In considering the return on the investment it must be recalled that the use of open range without charge has contributed to the returns, but the data do not permit estimates on the percentage so contributed. The return on investment varied from 2 per cent on the ranches with less than 50 cows to 8 per cent on the largest ranches with more than 450 breeding cows.

TABLE 23.—Financial summary: 804 ranches in the northern Great Plains region, 1924

Number of cows per ranch	Ranches	Total receipts	Total expenses	Ranch income	Unpaid labor ¹	Return to capital	Total capital	Return on investment
	<i>Number</i>							<i>Per cent</i>
50 and less	68	\$2,592	\$1,335	\$1,257	\$563	\$401	\$20,753	1.95
51 to 100	104	3,636	1,841	1,795	800	035	29,608	3.10
101 to 200	77	5,073	2,950	2,123	817	1,309	52,313	2.50
201 to 450	46	0,870	5,025	4,615	930	3,715	70,358	5.20
Over 450	9	20,004	10,877	15,787	937	14,850	186,057	7.98

¹Including operator's labor.

Assuming that ranchmen's receipts could be favorably influenced to the extent of 25 per cent above those shown, the indication yet remains that the two groups of small ranches may be considered as rather small, especially if interest payments and loans have to be met. Indications are that the 101-to-200-cow ranches are near the minimum size, if the returns are to be almost entirely from cattle. From the opening and closing inventories of cattle it may be determined that the number of cattle carried by the average ranch of this group was 308 head, of which 142 head were cows. Considering

20 acres of grazing land per head as a conservative rate of stocking, a total amount of grazing land required for a minimum-sized ranch would be about 6,160 acres stocked as at present.

On ranches of smaller size the indications are that a rather high percentage of the receipts will have to come from sources other than cattle. In that part of this bulletin which deals with standard organizations the 101-to-200-cow group of ranches has been used as the basis of expansion into the 200-cow ranch that is set up as a desirable size for this region where a very high percentage of the returns is to come from cattle and mature grass-fat steers are to be marketed. Sale of cattle at younger ages will permit operation on correspondingly smaller acreages.

CASH AVAILABLE TO MEET LIVING EXPENSES, DEPRECIATION, AND RETURNS TO EQUITY IN BUSINESS

Table 24 was prepared to express the financial summary for the different-sized groups in a form readily understood by the ranchman. It distinguishes between actual cash received and paid out, and the income that is due to an increase in livestock and feed on hand at the end of the year. It shows the actual cash available for living expenses. The items of family labor, operator's labor, depreciation, and interest on equity do not have to be paid in any given year. Replacement to cover depreciation may be postponed but must be made at one time or another. Family and operator's labor and interest in equity should also be met in the long run unless the ranchman is willing to work for less than ordinary wages and to receive less than current rates on his investment. In the first three groups the actual cash on hand after paying all cash expenses was hardly more than enough to pay ordinary wages to the operator and any of the family who worked on the ranch. This amount, however, may be enough to meet the living expenses of the family and allow the operator to stay in business without going further into debt or selling more cattle.

TABLE 24.—Cash available to meet unpaid labor, depreciation, and returns to equity on different sized ranches, 304 ranches, northern Great Plains region, 1924

Item	Ranches grouped by number of cows per ranch				
	50 and less	51 to 100	101 to 200	201 to 450	Over 450
Cattle sales.....	\$1,080	\$1,746	\$3,612	\$7,010	\$20,744
Other livestock and livestock products.....	605	550	720	516	170
Crop sales.....	654	760	458	700	619
Miscellaneous receipts.....	52	34	10	2	83
(a) Cash receipts.....	2,391	3,090	4,800	8,237	27,525
Net increase in feed and supplies.....	80	143	175	504	870
Net increase in livestock.....	555	802	542	2,190	2,719
(b) Total receipts.....	3,056	4,035	5,817	10,931	30,923
Current expenses.....	1,057	1,474	2,450	4,252	9,706
Interest paid.....	280	369	625	1,274	2,911
Livestock purchases.....	464	389	541	1,263	4,259
(c) Total cash expenses.....	1,801	2,272	3,616	6,789	16,876
Actual cash in hand to pay family and operator's labor, depreciation, and return to equity (a-c).....	590	818	1,181	1,450	10,049
Cash easily available to cover above items (b-c).....	1,255	1,763	2,198	4,144	14,047
Items to be met by above income:					
Value of family and operator's labor (\$40 to \$65 per month).....	553	860	917	630	937
Depreciation in improvements and equipment.....	278	367	500	773	1,171
Interest on operator's equity in capital at 7 per cent.....	1,185	1,702	3,100	3,733	9,971
Total.....	2,316	2,929	4,417	5,136	12,079

SOME PROBLEMS OF RANCH OPERATION IN THE REGION

TYPES OF BEEF-CATTLE PRODUCTION

Certain problems of a general nature and deserving special consideration confront established and prospective ranchmen of the northern Great Plains region at this particular time. These problems are not confined to any one type of production but to the three most common types representing the evolution of the types of operation that prevailed in the earlier days of the cattle business. At present the types are characterized as follows: Maintenance of a breeding herd and sale of feeder cattle, maintenance of a breeding herd and sale of mature grass-fat cattle, and operation confined to the handling of steers entirely or as a major enterprise.

Contemplated changes in methods of operation, especially with reference to classes of cattle to be sold, will bring ranchmen face to face with new operation and marketing problems. For that reason consideration should be given by the ranchmen to market trends, including the local situation for producing a certain class of cattle; marketing seasons, facilities, and competition; operating expense, especially feed and labor; range use and improvement. These phases of production can not be considered other than as contributing factors to the general system of operation. Some indications of operation requirements are given from the survey data used in this bulletin, together with the methods employed by various ranchmen in meeting problems common to production in the region.

A number of influences have been responsible for the departure from the former system of selling mature cattle to the present general system of sale of younger cattle that go into the feeder trade. Important among those influences are disappearance of former available free range, forced liquidation, and the greater demand for younger cattle in the Corn-Belt regions for feeding, which has been and is being influenced by market demands for lighter-weight carcasses.

Operators who expect to change to a plan of selling feeder cattle may expect competition from the more southern producing areas. To meet this competition successfully in the feeder-calf market will mean producing early calves in order to obtain desirable weight, obtaining high percentage calf crops, and cheap maintenance of breeding herds. With recovery from droughts that have prevailed on the southwestern ranges for several years and a return to more nearly normal conditions, producers may expect somewhat larger numbers of young cattle to be available for the feeder trade than have been supplied from southwestern ranges since 1920. The probability of these cattle going into the feeder trade is increased by the fact that the Southwest is a breeding region that has very limited facilities for producing mature grass-fat cattle.

Unrestrained extension with the expectation of having the supply absorbed by the Corn-Belt feeder trade would probably result in such low prices for feeder cattle as to decrease the present narrow margin of profit in producing them unless production costs are lowered. The data obtained in the survey indicate that the possibilities of extensive reduction in operation costs in this region are limited, except through an increase in the percentage calf crop.

Probably the greatest encouragement that has been given to the continued production of mature grass-fat steers has come from the special adaptation of a very high percentage of the range in this region to supplying high-quality grass beef. The Flint Hills section of Kansas is the principal competing region that contributes to the central markets in supplying high-quality beef without supplemental feeding. The necessary cash expense of approximately \$8 to \$10 per head for three to four months' pasturage, plus \$4 to \$6 per head freight and marketing costs that have to be borne by the southern producers who utilize Kansas grass, seem to place the northern producer in a somewhat more favorable position for producing mature grass-fat steers. They can operate at home and have a decidedly small cash carrying charge.

Safety in the plan of operation has justified continued production of mature steers in several instances. Certain situations and possibilities may be explained as follows: Ranchmen who are fully stocked with cows are sometimes forced to sacrifice part of their herds at low prices because of shortage of summer range or winter feed. Others who maintain comparatively small breeding herds and who mature their steers are in a position each year to take advantage of a favorable market on yearlings and on 2 and 3 year old steers. During unfavorable seasons all steers may be disposed of, since there is practically a constant demand for steers, and the breeding herd may be held intact, thereby retaining the productive power of the ranch and avoiding sacrifice of breeding cattle which it has required years of improvement to obtain.

There is little indication at present of reestablishment of the former volume of trade between the producers of stocker cattle in the southern areas of production and the men who produce steers in the northern Great Plains region, especially considering the prevailing transportation charges. Probably the two most encouraging influences to continued steer operations are the availability of desirable range and the more generous supply of young steers available for purchase from local breeders. The safest system in this type of operation will be the purchase of calves in the fall, if the ranchman has wintering facilities, or yearlings in the spring, with the expectation of "growing them out." Few examples of adversity have come from that system of operation. The purchase of mature steers for finishing on grass is a more or less speculative system of operation. The wide fluctuation in market prices of this class of cattle and the fact that when finished they are forced on the market make dealing in heavy steers hazardous from a financial standpoint. To buy steers at young ages and "grow them out" is a much safer plan of operation.

Range-cattle producers of this region can well afford to consider their situation with reference to other production regions. Special adaptations of the region for producing certain market classes of cattle, possible competitive areas and supplies from those areas, seasonal movements, and market demands are matters that producers should consider individually and collectively. Those who expect to supply mature grass-fat steers should give special consideration to the fact that the quality and finish of that class of cattle must be attractive.

TYPES OF RANCH ORGANIZATION

In a study of ranches in an area where crops like corn, oats, wheat, and flax are commonly grown it is necessary to consider the combinations between ranching and farming that may exist in order to determine what are desirable organizations. To illustrate the principal types of organizations existing, the ranches of each size group were divided into those producing: (1) No grain feed crops; (2) grain feed crops to supplement hay; (3) grain feed crops, hogs, and no cash grain; (4) grain feed crops, hogs, and less than 100 acres of cash grain; and (5) grain feed crops, hogs, and more than 100 acres of cash grain.

The results are given in Tables 25 and 26.

On a large number of the ranches in each size group practically no farming was done; some ranches did not even grow any feed crops. This was especially true in the case of the large ranches. The ranches with considerable farming have a larger investment because of the larger proportion of the higher-priced farm land. In Table 26 the total receipts increase as supplemental enterprises are added, while the receipts from the cattle enterprise remain about the same. The distribution of receipts shown in Table 26 gives a good idea of the essential differences among the different types of organization.

Expenses also increase with the addition of enterprises supplemental to range cattle. Taxes, labor, depreciation, and repairs are items of expense that were considerably larger on ranches on which more farming was done.

The income from the ranch before allowance is made for unpaid labor and interest and after all current expenses and depreciation are paid is shown in the column designated as receipts less expenses. This item increases rather regularly as the other enterprises are added in each size group, except the 201 to 450 cow group. The discrepancy in the 201 to 450 cow group seems to be due to the small number of ranches and to the poor calf crop (35 per cent). There is some reason to believe that crop and other livestock enterprises added to a large cattle business may not increase the income in the same proportion that it does on smaller ranches because of the difficulty of giving the required attention to both the cattle and the other enterprises.

These tables seem to indicate that ranches with 50 cows or less, had too small a business to make an appreciable return on investment after paying ordinary wages to the operator unless they had more than 100 acres of wheat and flax. The 12 ranches (type 5) with less than 50 cows and having 145 acres of wheat and flax had an income of \$2,673 to pay for the labor of the operator and his family and a 7.1 per cent return to a capital investment of about \$22,000. In 1924 the yield of wheat in this region was fully as high as the average yield over a period of years, and the price received was considerably higher than in any year since 1920. There is a great variation in wheat yields in this region from year to year, and in a year of poor yields or low prices, or both, the ranch with this organization (type 5) would probably return little if any more than the ranches that depend upon cattle alone (types 1 and 2). It should be kept in mind that cattle prices were considered low in 1924 as compared with prices of commodities purchased.

The groups of ranches with 51 to 100 and 101 to 200 cows, without any supplementary enterprises such as hogs and wheat (types 1 and 2), produced a greater income than did those ranches that had less than 50 cows, but as the capital invested was very much larger the return on investment was only a little more than 2 per cent. In both of these groups the ranches with over 100 acres of wheat and flax made the largest percentage return to capital although their investment was larger than that on the ranches without these crops.

In the groups of ranches having 201 to 450 cows, those having no hogs, cash grain, or other enterprises (type 1) made a satisfactory return. In this group those ranches which had a substantial hog enterprise and some alfalfa seed (type 3) also made a good return. But those ranches which had cash grain crops (types 4 and 5) in addition to 201 to 450 cows did not produce a satisfactory income. There were only three ranches representing this last type, and these had a very low calf crop. It is possible that with as many cattle as this in this region the addition of grain farming or hog raising detracts from the attention that can be given to the cattle business. On those ranches which had over 450 cows, practically no farming was done, more than 93 per cent of their receipts being from cattle (Table 22).

It is impossible from records of one year's ranch operations to determine the smallest number of cattle with which one can expect a satisfactory living and return on investment without depending upon sale of grain, hogs, or dairy products. It would seem, however, that without other enterprises it would be necessary to carry at least 150 breeding cows to provide sufficient income to pay expenses, to pay a reasonable wage to the operator, and to make a return on his investment. This would mean that in this region the minimum size of ranch where very few cash crops are grown should have from 5 to 7 sections of land if all of it is to be under control.

TABLE 25.—Investment, receipts, expenses, and income on ranches with different types of organization, 295¹ ranches, northern Great Plains region, 1924

Number of cows per ranch	Type of ranch organization	Ranches	Capital			Indebtedness		Ranch receipts				
			Total	Land and improvements	Range cattle	Land	Chattel	Total receipts	Livestock ²			
									Cattle	Hogs	Horses	
50 and less	Cattle and hay with—	<i>Number</i>										
	(1) No grain feed crops	17	\$14,724	\$8,309	\$4,451	\$1,324	\$1,143	\$1,869	\$1,443	\$76		
	(2) Grain feed crops to supplement hay	28	17,461	12,206	3,034	1,238	823	1,847	853	353		\$56
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	9	28,645	20,399	4,070	2,790	1,452	3,113	1,309	629		12
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	12	22,192	15,147	3,124	3,266	905	4,766	1,141	215		92
51 to 100	(1) No grain feed crops	14	24,956	16,758	6,310	2,411	2,528	2,678	2,248	26		54
	(2) Grain feed crops to supplement hay	31	22,338	13,830	6,380	1,691	1,854	2,544	2,178	85		42
	(3) Grain feed crops, hogs, no cash grain	28	24,969	15,610	6,535	3,097	1,907	3,220	2,058	482		25
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	15	32,449	20,910	6,894	3,289	2,690	4,603	2,536	518		96
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	14	32,267	20,992	6,730	4,056	1,612	6,186	2,037	407		14
101 to 200	(1) No grain feed crops	17	40,148	23,970	12,623	3,261	4,312	4,304	3,906	21		19
	(2) Grain feed crops to supplement hay	28	35,756	22,072	10,470	4,236	3,884	9,790	3,373	110		28
	(3) Grain feed crops, hogs, no cash grain	13	53,560	37,047	12,135	3,524	3,718	5,045	3,812	418		116
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	8	52,829	31,982	14,334	5,803	3,438	6,137	4,399	813		232
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	7	78,778	55,508	16,592	6,953	5,000	9,594	5,680	457		76
201 to 450	(1) No grain feed crops	22	63,744	35,800	22,902	8,232	11,999	9,231	8,356	205		69
	(3) Grain feed crops, hogs, no cash grain	10	85,707	49,576	25,700	4,090	9,450	11,934	9,259	1,137		1
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	10	82,880	53,237	21,091	4,051	6,086	9,984	7,183	622		13
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	3	56,673	26,674	20,181	463	16,111	7,037	3,714	48		56
	(2) Grain feed crops to supplement hay	9	189,890	110,273	70,706	9,889	23,278	25,664	24,950	244		108

¹ In this table 9 ranches of the original 304 ranches were omitted because certain ranching operations made them incomparable to the others.

² Livestock receipts are arrived at by finding the difference between the sums of (1) value of livestock at close of year and receipts from sales; (2), value of stock at beginning of year and cost of purchases. No adjustments have been made in these data for changes in market value of cattle during the year. See Tables 9 and 10 for values at beginning and end of year.

TABLE 25.—Investment, receipts, expenses, and income on ranches with different types of organization, 295 ranches, northern Great Plains region, 1924—Continued

Number of cows per ranch	Type of ranch organization	Ranch receipts—Continued										
		Livestock—Continued			Livestock products		Crop sales					
		Poultry	Other stock	Total	Dairy	Total	Alfalfa sec. ²	Flax	Hay	Wheat	Other	Total
50 and less	Cattle and hay with—											
	(1) No grain feed crops	\$23		\$1,542	\$62	\$115	\$102		\$32			\$134
	(2) Grain feed crops to supplement hay	68	\$6	1,366	188	274	57	\$18	7	\$18	\$39	139
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	20	3	1,073	145	163	107	140	39	540	34	860
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	5		1,453	122	230	50	252		2,054	129	2,485
51 to 100	(1) No grain feed crops	22	0	2,350	49	92	84		74			158
	(2) Grain feed crops to supplement hay	5		2,310	27	46	8			8	3	19
	(3) Grain feed crops, hogs, no cash grain	29		2,594	204	241	122		6	50	39	217
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	30		3,180	139	184	13	82		793	96	984
	(5) Grain feed crops, hogs, and more than 100 acres cash grain	16		2,474	236	334	54	477	7	2,640	3	3,181
101 to 200	(1) No grain feed crops	2		4,040	29	30	194			3		197
	(2) Grain feed crops to supplement hay	10		3,521	26	43	63	3	30	12	29	137
	(3) Grain feed crops, hogs, no cash grain	24		4,370	154	233	17		15	67	17	116
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	25		5,469	38	46				519		519
	(5) Grain feed crops, hogs, and more than 100 acres cash grain		154	6,367	71	71		240		1,944	210	2,394
201 to 450	(1) No grain feed crops	7	41	8,678	23	27	156		65	6		227
	(3) Grain feed crops, hogs, no cash grain			10,397	11	25	742				100	842
	(4) Grain feed crops, hogs, and less than 100 acres cash grain	27		7,845	37	52	165			983	1	1,149
	(5) Grain feed crops, hogs, and more than 100 acres cash grain			3,812	33	69		53		2,640		2,693
	(2) Grain feed crops to supplement hay	28	53	25,383			89		410	14		519
Over 450												

Number of cows per ranch	Type of ranch organization	Increase in—		Ranch expenses								Depreciation
		Feed and supplies	Other sources	Total expenses	Current expenses							
					Taxes	Lease	Labor	Feed	Repairs	Other	Total	
50 and less	Cattle and hay with—											
	(1) No grain feed crops.....	\$49	\$59	\$1,154	\$145	\$187	\$230	\$76	\$91	\$181	\$910	\$244
	(2) Grain feed crops to supplement hay.....		68	973	226	77	112	54	115	179	763	210
	(4) Grain feed crops, hogs, and less than 100 acres cash grain.....	117		1,713	265	111	310	22	221	356	1,285	428
	(5) Grain feed crops, hogs, and more than 100 acres cash grain.....	515	83	2,093	250	177	364	29	290	638	1,748	345
51 to 100	(1) No grain feed crops.....		78	1,475	274	161	376	72	139	174	1,196	279
	(2) Grain feed crops to supplement hay.....	125	44	1,303	213	115	303	66	113	209	1,019	284
	(3) Grain feed crops, hogs, no cash grain.....	144	34	1,653	250	151	304	141	210	292	1,348	305
	(4) Grain feed crops, hogs, and less than 100 acres cash grain.....	252	3	2,299	362	239	385	44	337	508	1,875	424
	(5) Grain feed crops, hogs, and more than 100 acres cash grain.....	193	4	2,906	417	233	663	68	369	697	2,447	459
101 to 200	(1) No grain feed crops.....	37		2,622	463	273	810	79	252	297	2,174	448
	(2) Grain feed crops to supplement hay.....	89		2,143	345	236	573	60	209	327	1,760	393
	(3) Grain feed crops, hogs, no cash grain.....	326		3,209	619	231	790	121	320	543	2,624	585
	(4) Grain feed crops, hogs, and less than 100 acres cash grain.....	7	96	4,105	521	346	1,172	232	438	700	3,409	696
	(5) Grain feed crops, hogs, and more than 100 acres cash grain.....	762		4,914	1,169	329	1,337		646	783	4,254	658
201 to 450	(1) No grain feed crops.....	299		3,827	618	481	1,173	139	260	607	3,278	549
	(3) Grain feed crops, hogs, no cash grain.....	670		6,288	868	562	1,782	708	551	805	5,276	1,012
	(4) Grain feed crops, hogs, and less than 100 acres cash grain.....	927	11	6,786	1,118	242	1,898	344	963	1,141	5,706	1,080
	(5) Grain feed crops, hogs, and more than 100 acres cash grain.....	463		6,720	762	377	1,958	33	1,005	1,683	5,818	902
	(2) Grain feed crops to supplement hay.....	679	83	10,876	2,275	1,092	3,425	658	282	1,974	9,706	1,170

TABLE 25.—Investment, receipts, expenses, and income on ranches with different types of organization, 295 ranches, northern Great Plains region, 1924—Continued

Number of cows per ranch	Type of ranch organization	Income			Unpaid labor	Total value of improvements	Area of owned land	Improvements per acre	Land value per acre without improvements	
		Receipts less expenses	Paid interest	Return on investment ¹					Grazing land	Farm land
50 and less.....	Cattle and hay with—			<i>Per cent</i>			<i>Acres</i>			
	(1) No grain feed crops.....	\$745	\$238	-0.1	\$765	\$1,085	547	\$3.63	\$9.93	\$19.72
	(2) Grain feed crops to supplement hay..	874	165	.7	749	2,450	811	3.02	10.86	18.42
	(4) Grain feed crops, hogs, and less than 100 acres cash grain..	1,400	335	1.3	1,017	5,458	1,374	3.97	10.63	11.69
51 to 100.....	(5) Grain feed crops, hogs, and more than 100 acres cash grain..	2,673	343	7.4	1,037	3,881	729	5.32	11.16	20.19
	(1) No grain feed crops.....	1,203	489	2.6	647	4,113	1,372	3.00	8.06	18.70
	(2) Grain feed crops to supplement hay..	1,241	367	2.1	766	3,104	1,327	2.34	6.51	17.80
	(3) Grain feed crops, hogs, no cash grain..	1,576	402	2.6	928	3,657	1,068	3.42	9.08	15.25
	(4) Grain feed crops, hogs, and less than 100 acres cash grain..	2,304	438	3.8	1,067	3,766	1,683	2.24	8.50	15.85
101 to 200.....	(5) Grain feed crops, hogs, and more than 100 acres cash grain..	3,280	444	6.9	1,055	4,901	1,588	3.09	7.71	17.70
	(1) No grain feed crops.....	1,682	588	2.6	632	5,557	2,087	2.66	6.50	18.15
	(2) Grain feed crops to supplement hay..	1,647	687	2.3	826	5,105	1,733	2.95	8.38	17.28
	(3) Grain feed crops, hogs, no cash grain..	1,836	547	1.5	1,038	7,078	3,739	1.89	7.92	22.05
	(4) Grain feed crops, hogs, and less than 100 acres cash grain..	2,032	737	2.5	712	9,559	2,903	3.29	7.12	12.56
201 to 450.....	(5) Grain feed crops, hogs, and more than 100 acres cash grain..	4,680	861	5.0	759	7,250	7,476	.97	5.71	14.64
	(1) No grain feed crops.....	5,404	1,518	7.3	766	7,220	3,537	2.04	6.86	19.02
	(3) Grain feed crops, hogs, no cash grain..	5,646	1,059	5.1	1,309	10,634	5,600	1.90	5.71	18.47
	(4) Grain feed crops, hogs, and less than 100 acres cash grain..	3,198	818	2.8	876	13,453	5,265	2.56	5.90	17.81
	(5) Grain feed crops, hogs, and more than 100 acres cash grain..	317	1,778	- .5	600	10,774	2,380	4.53	4.91	10.02
Over 450.....	(2) Grain feed crops to supplement hay..	15,788	2,911	7.8	937	13,836	8,458	1.64	9.56	26.84

¹ To find return on investment subtract unpaid labor from difference between receipts and expenses and divide by total capital.

Thirty per cent of the ranches studied fell into the groups less than 100 cows and had practically no hogs or grain for sale. The fact that they are still in the business after several years of depression in the cattle industry calls for an explanation.

In Table 26 the ranches with 50 cows or less and those with 51 to 100 cows have been grouped according to type of organization and the actual cash income, expenses, and balance shown. From this it will be seen that the ranches in the group with 50 cows or less, and with no hogs or grain enterprises, had \$440 with which to pay living expenses for the year, although this was not equivalent to ordinary wages to the operator. Wages to the operator and his family, depreciation on his improvements and equipment, and interest on his equity can be left unpaid for several years, provided there is enough cash available or readily available with which to buy provisions and the necessities of life. The hope of better days in the cattle business in the future no doubt explains the existence of so many of these ranches of apparently unprofitable size.

TABLE 26.—Cash available to meet unpaid labor, depreciation, and return on equity on small-sized ranches, 168 ranches, northern Great Plains region, 1924

Item	50 cows or less			51 to 100 cows			
	Cattle only	Cattle and 50 acres cash grain	Cattle and 100 acres cash grain	Cattle only	Cattle and hogs	Cattle, hogs, and 50 acres cash grain	Cattle, hogs and 130 acres cash grain
Number of ranches.....	45	9	12	45	28	15	14
Cattle sales.....	\$1,051	\$961	\$1,164	\$1,902	\$1,622	\$2,021	\$1,730
Other livestock and livestock products.....	592	971	615	169	847	902	929
Crop sales.....	137	860	2,485	62	217	984	3,181
Miscellaneous receipts.....	1			14	52		
(a) Cash receipts.....	1,781	2,402	4,164	2,147	2,738	3,907	5,840
Increase in feed and supplies inventories.....	7	117	515	81	144	252	193
Increase in livestock inventories.....	422	672	160	845	657	723	280
(b) Total cash receipts plus increase in inventories.....	2,210	3,281	4,839	3,073	3,539	4,882	6,313
Current expenses.....	806	1,285	1,748	1,069	1,348	1,875	2,447
Paid interest.....	192	335	343	405	402	438	444
Livestock purchases.....	343	168	73	487	309	279	127
(c) Total cash paid out.....	1,341	1,788	2,164	1,961	2,059	2,592	3,018
Actual cash on hand to pay family and operator labor, depreciation, and return to equity (a-c).....	440	704	2,000	126	579	1,315	2,822
Cash easily available to cover the above items (b-c).....	869	1,493	2,675	1,112	1,480	2,290	3,295
Items to be met by above income:							
Unpaid labor.....	755	1,017	1,037	713	928	1,067	1,055
Depreciation.....	228	428	345	282	305	424	459
Interest on operator's equity in capital at 7 per cent.....	985	1,708	1,261	1,342	1,398	1,853	1,861
Total.....	1,978	3,153	2,643	2,337	2,631	3,344	3,375

STANDARD ORGANIZATIONS

In the more or less chaotic condition that exists in the region at present there is need for reliable guidance based on actual possibilities on the subjects of ranch organization and operation. This need has not developed from a single cause, but from a combination of causes.

Important among them are the rapid passing of land from the public domain to a condition of wide ownership of small tracts and unsettled operation, changes of market demands as applied to classes of cattle, and the economic condition that has prevailed in agriculture since 1920. During the course of this survey, numbers of ranchmen who have been in the cattle business for periods of 20 to 40 years expressed themselves as bewildered in formulating plans of organization or operation to meet the present demands of the industry because of the abrupt change from open-range conditions under which they have had their experience.

One of the fundamental requirements, and probably the most important one of ranching, is the consolidation of land into suitable units of operation. The quality of the land is not necessarily but is often the determining factor between ranching and farming. A suitable proportion of tillable land (either hay or crop) to grazing land is desirable for ranching. Hay or crop land must be emphasized in this region because of the winter-feed requirements of cattle and other livestock. Bringing together the individually owned small units into tracts that will permit their use in accordance with their greatest adaptation—grazing—will necessitate various policies of organization and operation. It is unreasonable to suppose that the present disturbed condition will prevail for many years. Out of a similar condition in other regions established ranching communities have developed. Notable among them are the sand hills of Nebraska, localities in the western parts of Kansas, Oklahoma, and Texas. The time that will be required to effect consolidation and reorganization in the northern Great Plains region depends largely upon the market prices that may prevail for ranch products, suitable adjustment of tax matters, and land policies.

Many of the smaller operators are considering the possibility of expanding cattle production beyond the present proportion. If more range is acquired and stocked with cattle some changes in crop production will have to be made to meet the increased demand for feed. In some cases the farming operation is of suitable magnitude at present to permit the production of more cattle, and the returns are now in the form of cash crops. The required number of livestock to give equal or greater returns in these cases depends largely upon the prevailing market prices during the next few years.

The question that confronts farmers and cattlemen resolves itself into a consideration of an economic farming unit, an economic cattle-producing unit, or a combination of the two with each of the special enterprises adjusted to an equitable basis so far as labor requirement and other operation phases are concerned. During the survey the opinions of a number of successful ranchmen were asked in regard to the minimum number of breeding cows it was necessary to carry in order to produce sufficient returns from operations. Based on their own experiences, their years of observation in their communities, and the prices of cattle that have prevailed over a period of years, the estimate of no ranchman varied as much as 10 cows from the popular estimate of 160 breeding cows as the minimum.

The estimates were based to a considerable extent on the sale of mature grass-fat steers and use of open range. Examination of individual records that were obtained in the survey which compared favorably with the estimated minimum of 160 cows and the conditions

of operation revealed that the estimates were in line with actualities. For the future it must be considered that a somewhat higher percentage of the range land will have to be owned or leased and that free grazing will probably be confined to comparatively small localities. This condition will probably necessitate carrying more than the 160-cow minimum where practically all of the returns are to be from cattle.

For the purpose of combining desirable phases of ranch organization as gained from the analysis of groups and certain individual ranches, and successful practices in management as related by individual ranchmen, the standard-organization outlines given on pages 76 to 91 have been developed from the data. These outlines are submitted to serve merely as guides for those who are interested in reorganization or expansion of their present enterprises and in knowing the plans of other ranchmen to meet production problems. It is not supposed that every ranch that may be established in this region will have to comply in every detail with these organization outlines to be successful. Nor is it supposed that every ranchman will be endowed with the same managerial ability. It is desirable, however, to consider representative organizations, details in the plan of operation, and the various other possibilities in management that exist. In this instance the experiences of practical cattlemen have been the bases for the suggested organization and operation, for there is probably no better source of information on these points than the ranchmen themselves.

The three sizes, 50, 200, and 500 cow ranches, are set up as standards because marked variations in organization and operation present themselves forcibly when groups or individual ranches of the sizes indicated are analyzed. In addition, either of the stated sizes are suitable bases for expansion to a larger-sized ranch of the same or similar type. The conditions favorable to each size of organization and the possibilities in the plan of operation of each are stated in the following outlines. In addition, an organization outline of a ranch to carry 1,000 steers is set up because of the importance of the steer business in certain localities of the region.

STANDARD 50-COW RANCH

It is evident from the analysis of the small ranches that the income from cattle is not sufficient to meet all needs (Table 26). The income from cash crops is relied upon as much as is the income from cattle. Localities characterized by a high percentage of good tillable land, that are well located with respect to railroads are desirable situations for small ranches or for large livestock farms, as they may be more properly termed. A basic requirement is a sufficient quantity of good farming and hay land and sufficient range land to provide a liberal amount of grazing for all livestock. In addition to producing a cash grain crop, feed must be produced to meet all needs. The situation should permit carrying other livestock than cattle like hogs, or a farm flock of sheep. The owner-operator should have ability as a farmer and as a livestock man. The limited income will not permit excessive indebtedness. A 50 per cent equity in land of conservative valuation and a 75 per cent equity in livestock should be maintained even as the enterprise is being expanded toward more farming or acquirement of more grazing land for livestock production.

ORGANIZATION OF A 50-COW RANCH

Organization of a 50-cow ranch on which crop production is a primary, and livestock production is a secondary enterprise.

The land requirement is 2,425 acres, or approximately $3\frac{3}{4}$ sections, of the following classes:

Range land.....	1,935 acres, at \$5 per acre.....	\$9,675
Farming land.....	340 acres, at \$20 per acre.....	6,800
Hay land.....	150 acres, at \$20 per acre.....	3,000
	<u>2,425 acres.</u>	<u>19,475</u>

Improvements:

Dwelling.....	2,000
Barns and sheds.....	1,000
Granary.....	200
Sundry buildings for hogs, chickens, etc.....	450
Water development.....	500
Fence, 8 miles, four-wire.....	1,200
	<u>5,350</u>

Equipment:

Farm machinery.....	1,250
Sundry equipment.....	250
	<u>1,500</u>

Livestock at beginning of year

Cattle (a 2 per cent death loss on cattle is to be expected but is not deducted in this outline; a 90 per cent calf crop should be obtained):

Breeding herd—	
50 cows, weight 950 pounds, at \$50.....	\$2,500
2 bulls, weight 1,500 pounds, at \$125.....	250
8 replacement—1-year-old heifers, weight 525 pounds, at \$30.....	240
Market cattle. (If calves are sold, the following cattle would not appear in the January 1 inventory):	
14 yearling heifers, weight 500 pounds, at \$22.25.....	312
22 yearling steers, weight 525 pounds, at \$30.....	660
	<u>3,962</u>

Horses:

2 saddle horses, at \$75.....	150
14 work horses, at \$100.....	1,400
	<u>1,550</u>

Hogs (to produce 60 pigs annually):

10 sows—weight 300 pounds, at \$30.....	300
1 boar—weight 400 pounds, at \$50.....	50
	<u>350</u>

Poultry, 200 hens.....	200
------------------------	-----

Distribution of capital

Item	If all land is owned	If 1,000 acres of land is leased
Land.....	\$10,475	\$14,475
Improvements.....	5,350	5,350
Cattle.....	3,962	3,962
Other livestock.....	550	550
Work stock.....	1,550	1,550
Equipment.....	1,500	1,500
Total.....	32,387	27,387

OPERATION OF A 50-COW RANCH

A 50-cow ranch will not permit of a hired manager. Considerable farming will have to be done by the owner-operator, and some seasonal labor must be employed. A grain cash crop in addition to a sufficient quantity of feed for all livestock will be essential. A feed reserve equal to one winter's requirement should be maintained. Possibilities of feeding livestock for market on ranches of this size should be considered.

Farm land required, 490 acres, cropped as follows (possible crop yields based on Table 2 and individual ranch records):

For sale, 160 acres of wheat, at 15 bushels per acre.....bushels.. 2,400

For livestock—

80 acres of corn, at 15 bushels per acre (or 80 acres of barley, at 20 bushels per acre).....bushels.. 1,200

20 acres of oats, at 30 bushels per acre.....do.. 600

150 acres of hay, alfalfa or wild, 1 ton per acre.....tons.. 150

Straw from grain crops, minimum.....do.. 75

80 acres of summer fallow.

Total feed available for livestock, 1,800 bushels grain, 150 tons hay, 75 tons straw.

Feed required annually for breeding and work stock

Class of livestock fed	Per head	Hay	Grain
Cattle:		<i>Tons</i>	<i>Bushels</i>
Breeding herd—			
50 breeding cows, hay, 15 to 20 pounds daily, 120 days.....	1 ton.....	50	
2 bulls—			
Hay, 25 to 30 pounds daily, 150 days.....	2 tons.....	4	
Grain, 10 pounds daily, 75 days (conditioning).....	15 bushels.....		30
3 replacement yearling heifers—			
Hay, 7 to 10 pounds daily, 150 days.....	3½ ton.....	6	
Grain, 3 pounds daily, 150 days.....	9 bushels.....		75
Hogs:			
10 brood sows (access to pasture).....			250
1 boar (access to pasture).....			
Horses, 10 head (8 fed during winter):			
Hay (additional to pasture).....	1½ tons.....	25	
Grain (additional to pasture).....	25 bushels.....		400
Poultry, 200 hens.....			250
Total.....		85	1,005
Approximate amounts of feed available for market livestock under the various plans of operation.....		65	800

Under the possible plans of disposition of the market livestock the feed requirements and numbers of such livestock sold would be as follows:

1. Where calves are sold in the fall and pigs are sold as feeders:	
Feed required—	
Calves, no feed required.	
60 pigs, 75 pounds carried to 175 pounds.....	bushels.. 600
Market livestock—	
8 cull cows from the breeding herd, weight 950 pounds.	
36 calves, weight 375 pounds.	
60 feeder pigs, weight 175 pounds.	
2. Where 30 calves are fed out for market and pigs are sold as light feeders:	
Feed required—	
30 calves—	
10 pounds grain daily for 120 days.....	bushels.. 750
15 pounds hay daily for 120 days.....	tons.. 30
60 pigs, pasturage and limited grain if available.	
Market livestock—	
8 cull cows from breeding herd, weight 950 pounds.	
6 calves in fall, weight 300 pounds.	
30 fed calves, winter, weight 650 pounds.	
60 feeder pigs, weight 100 pounds.	
3. Where cattle are sold as long yearlings and pigs are sold as feeders:	
Feed required—	
36 calves carried to yearling age—	
4 pounds grain daily, 150 days, 600 pounds per head	..... bushels.. 450
7 to 10 pounds hay daily, 150 days, $\frac{3}{4}$ ton per head	..... tons.. 25
60 pigs, 75 pounds carried to 125 pounds (grain on pasture)	..... bushels.. 300
Market livestock—	
8 cull cows from the breeding herd, weight 950 pounds.	
36 long yearlings, weight 700 pounds.	
60 feeder pigs, weight 125 pounds.	
4. Where calves are wintered, pigs are sold as light feeders, and long yearlings fed out:	
Feed required (part of reserve will be required)—	
36 head carried from calves to yearlings require—	
4 pounds grain daily for 150 days, 600 pounds per head	..... bushels.. 450
7 to 10 pounds hay daily for 150 days, $\frac{3}{4}$ ton per head	..... tons.. 25
20 head long yearlings fed for market require—	
15 pounds grain daily for 100 days, 1,500 pounds per head	..... bushels.. 600
20 pounds hay daily for 100 days, 1 ton per head.....	tons.. 20
60 pigs, sold as light feeders, pasture and limited grain.	
Market livestock—	
8 cull cows, weight 950 pounds.	
16 long yearlings off grass, weight 650 pounds.	
20 long yearlings fed out winter, weight 900 pounds.	
60 feeder pigs, weight 125 pounds.	
Labor requirements:	
Operator and family labor for 12 months.	
Extra labor for crop production, six months at \$50 per month.....	\$300
Operating expenses:	
Current expense—	
Salt, 1 ton.....	20
Insurance on buildings.....	50
Labor.....	300
Taxes on land, 1.3 per cent of value, \$24,825 (lease equals taxes).....	325
Taxes on cattle, 1.3 per cent of value.....	50
Miscellaneous expense.....	500
Threshing, twine, etc.....	350
	1,595
Depreciation on improvements, \$5,350 at 5 per cent.....	270
Equipment, \$1,500 at 10 per cent.....	150
	2,150

Work calendar for 50-cow ranch

Month	Livestock work	Farm work
January.....	Winter feeding; feeding cattle for market where practiced.	Chores.
February.....	do.	Do.
March.....	Winter feeding; feeding cattle for market where practiced; begin conditioning bulls.	Do.
April.....	Turn cattle on grass; care of calving cows; conditioning bulls.	Seeding small grain.
May.....	Care of calving cows; distribute cattle for summer range; salt; condition bulls.	Plant corn; seeding small grain.
June.....	Care of calving cows; put bulls in cow herd; care of farrowing sows (month earlier in some districts).	Cultivating corn; summer fallow.
July.....	Brand, vaccinate, and castrate calves; attend to breeding herd; care of pigs.	Cultivating corn; hay harvest.
August.....	Ride through cattle weekly; salt.	Harvest.
September.....	Castrate, brand, vaccinate, and dehorn.	Threshing; corn harvest.
October.....	Sales of cull or other cattle; take up bulls; sell pigs, if favorable.	Corn harvest; fence repair.
November.....	General care of breeding stock; wean calves; begin fall feeding where practiced.	Chores and other fall work.
December.....	Sell feeding cattle where practiced; begin winter feeding, if necessary.	Chores.

STANDARD 200-COW RANCH

Ranches carrying 200 cows may be of two general types: Type A, on which considerable farming is done and a grain cash crop is produced or the equivalent crop used to feed out some cattle, and type B, on which the farming enterprise is confined entirely to feed production. Type A will require a considerably greater acreage of farm land than type B, but the requirement of hay land will be approximately the same in both cases. Desirable situations for ranches of this size are characterized by the more broken range areas where the ratio of tillable land to grazing land is much lower than referred to under the standard 50-cow ranch. A basic requirement is ownership of sufficient range land to carry the breeding herd and work stock. Leased land may be used for the growing cattle. Good-quality range is essential for the cattle that are expected to go to the market. A well-protected wintering place about the headquarters for cows and calves and good winter range for steers are desirable. Under type A, livestock diversification may extend to the production of a limited number of hogs. Under either type, consideration may be given to producing sheep or horses in limited numbers. The owner-operator should have ability as a livestock man and as manager of the business. Fifty per cent equity in owned land conservatively valued and 75 per cent equity in cattle should be maintained by the owner. The 200-cow ranch organization is set up as the approximate minimum size where all of the returns are to be from sales of cattle.

ORGANIZATION OF A 200-COW RANCH

Organization of a 200-cow ranch where cattle production is the principal enterprise:

Type A ranch, where farming includes a grain cash crop.

Land requirement, 12,780 acres or approximately 20 sections of the following classes:

Range land.....	11, 660 acres, at \$4 per acre.....	\$46, 640
Farming land.....	400 acres, at 20 per acre.....	8, 000
Hay land (native).....	320 acres, at 15 per acre.....	4, 800
Subirrigated hay land (alfalfa).....	400 acres, at 20 per acre.....	8, 000
	12, 780	67, 440

Type B ranch, where farming is limited to feed production.

Land requirement, 12,540 acres, or approximately 20 sections, of the following classes;

Range land.....	11, 660 acres, at \$4 per acre.....	\$46, 640
Farming land.....	160 acres, at 20 per acre.....	3, 200
Hay land (native).....	320 acres, at 15 per acre.....	4, 800
Subirrigated hay land (alfalfa).....	400 acres, at 20 per acre.....	8, 000
	12, 540 acres	62, 640
Improvements:	Type A	Type B
Dwelling.....	\$3, 000	\$3, 000
Barns and sheds.....	2, 000	1, 500
Granary.....	200	
Sundry buildings (hogs, etc.).....	450	450
Water development.....	2, 000	2, 000
Corrals.....	250	250
Fence, 30 miles, four wires.....	4, 500	4, 500
	12, 400	11, 700
Equipment:		
Farming and haying machinery.....	3, 000	1, 500
Sundry equipment.....	500	500

Livestock at beginning of year

Cattle—(A 3 per cent death loss on cattle is to be expected but is not deducted in this outline. An 80 per cent calf crop should be obtained, or 160 calves.)

Breeding herd—

200 breeding cows, weight 950 pounds, at \$50 per head.....	\$10, 000
8 mature bulls, weight 1,500 pounds, at \$150 per head.....	1, 200
2 yearling bulls, weight 700 pounds, at \$125 per head.....	250
25 replacement 2-year-old heifers, weight 700 pounds, at \$37.50 per head.....	938
30 replacement 1-year-old heifers, weight 500 pounds, at \$30 per head.....	900

Market cattle—If steers and spayed heifers are sold at 3 years old. Those sold at younger ages would be eliminated from the inventory:

50 yearling heifers, weight 475 pounds, at \$25 per head.....	1, 250
80 yearling steers, weight 500 pounds at \$30 per head.....	2, 400
45 2-year-old heifers (spayed) weight 650 pounds at \$35 per head.....	1, 575
75 2-year-old steers, weight 700 pounds at \$45 per head.....	3, 375
45 3-year-old heifers (spayed) weight 850 pounds, at \$50 per head.....	2, 250
75 3-year-old steers, weight, 950 pounds, at \$60 per head.....	4, 500
	28, 638

Horses:

Type A—

Work horses, 14 head, at \$100.....	1, 400
Saddle horses, 10 head, at \$75.....	750
	2, 150

Type B—

Work horses, 6 head, at \$100.....	600
Saddle horses, 10 head, at \$75.....	750
	1, 350

Hogs (to produce 60 pigs annually):

10 sows, at \$30.....	300
1 boar, at \$50.....	50
	350

Poultry, 200 hens.....	200
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Distribution of capital

Item	Type A		Type B	
	If all land is owned	If approximately 4,500 acres are leased	If all land is owned	If approximately 5,600 acres are leased
Land	\$67,440	\$49,440	\$62,640	\$40,240
Improvements	12,400	12,400	11,700	11,700
Cattle	28,638	28,638	28,638	28,638
Work stock	2,150	2,150	1,350	1,350
Other livestock	550	550	550	550
Equipment	3,500	3,500	2,000	2,000
	114,678	96,678	106,878	84,478

OPERATION OF A 200-COW RANCH

It is essential for a ranch of this size to be operated under a flexible general plan that permits the operator to meet emergencies without necessarily incurring heavy financial loss. A feed reserve equal to the requirements for one winter should be maintained. A plan to sell mature grass-fat 3-year-old steers and spayed heifers will give the desired elasticity in operation because of the possibility of marketing any particular class of feeder cattle or all cattle except the breeding herd during critical years. The owner-operator should devote practically his entire time to cattle. A regularly employed farm laborer would be necessary and additional seasonal labor for the cattle and farm work. Many possibilities exist with respect to what may be done under this size organization and plan of operation to mature the market cattle some of which are hereafter considered.

Type A

Farm land required, 1,120 acres, cropped as follows:

For sale--80 acres wheat, at 15 bushels per acre	bushels	1,200
For livestock--		
80 acres corn, at 15 bushels per acre	do.	1,200
20 acres oats, at 30 bushels per acre	do.	600
30 acres barley, at 20 bushels per acre	do.	1,600
140 acres summer fallow.		
Straw from above crops available, approximate	tons	75
320 acres dry land hay (160 acres cut each year) 1 ton per acre	tons	160
400 acres alfalfa and wild hay, $1\frac{1}{4}$ tons per acre	do.	500
Total available for livestock, hay and straw, 735 tons; grain		
3,400 bushels.		

Feed required annually for breeding and work stock

Class of livestock fed	Per head	Tons hay	Bushels grain
Cattle:			
Breeding herd—			
200 cows, hay, 15 to 20 pounds daily, 120 days, straw, stover, etc.	1 ton	200	
8 mature bulls—			
Hay, 20 to 25 pounds daily, 120 days	1½ tons	12	
Grain 10 pounds daily, 75 days	15 bushels		120
2 young bulls—			
Hay 10 to 15 pounds daily, 150 days	1 ton	2	
Grain, 7.5 pounds daily, 100 days	15 bushels		30
25 short 2-year-old heifers, hay, 15 to 20 pounds daily, 120 days	1 ton	25	
30 short 1-year-old heifers—			
Hay, 7 to 10 pounds daily, 150 days	¾ ton	22	
Grain, 3 pounds daily, 150 days	9 bushels		270
Horses, 24 head:			
Hay (pasture additional)	2 tons	50	
Grain (pasture additional)	25 bushels		600
Hogs:			
10 sows, 1 boar (pasture additional)			250
60 pigs, 75 pounds carry to 125 pounds (pasture additional)			450
Poultry, 200 hens			200
Total		311	1,920
Feed available for market cattle or other livestock		424	1,480

Feed required for wintering market cattle where the plan of operation is to sell 3-year-old steers and spayed heifers

Class of cattle fed	Per head	Tons hay	Bushels grain
50 short 1-year-old heifers:			
Hay, 7 to 10 pounds daily, 150 days	¾ ton	38	
Grain, 3 pounds daily, 150 days	9 bushels		450
80 short 1-year-old steers, hay, 7 to 10 pounds daily, 150 days	¾ ton	60	
45 short 2-year-old heifers (spayed), hay, 15 to 20 pounds daily, 120 days	1 ton	45	
75 short 2-year-old steers, hay, 15 to 20 pounds daily, 120 days	do	75	
45 short 3-year-old heifers (spayed) (pasture)			
75 short 3-year-old steers. (If needed, from reserve.) To be wintered on reserved pasture, and fed.			
Total		185	450

The surplus feed would be approximately 200 tons of hay and 1,000 bushels of grain that may be used for wintering other livestock, finishing pigs for market, or fed to market cattle.

Type B

Farm land required, 880 acres cropped as follows:

For sale, none.

For livestock—

80 acres corn at 15 bushels per acre	bushels	1,200
20 acres oats at 30 bushels per acre	do	600
60 acres barley at 20 bushels per acre	do	1,200
Straw, approximately	tons	40
320 acres dry land hay, one-half cut annually	do	160
400 acres alfalfa and wild hay	do	500

Total feed available for livestock, hay, 700 tons; grain, 3,000 bushels.

Feed required annually for breeding and work stock

Class of livestock fed	Per head	Tons hay	Bushels grain
Cattle:			
Breeding herd—			
200 cows, hay, 15 to 20 pounds daily, 120 days, straw, stover, etc.	1 ton	200	
8 mature bulls—			
Hay, 20 to 25 pounds daily, 120 days	1½ tons	12	
Grain, 10 pounds daily, 75 days	15 bushels		120
2 yearling bulls—			
Hay, 15 to 20 pounds daily, 150 days	1½ tons	3	
Grain, 7.5 pounds daily, 100 days	15 bushels		30
25 short yearling heifers, hay, 10 to 15 pounds daily, 150 days	1 ton	25	
30 short 2-year-old heifers, hay, 15 to 20 pounds daily, 120 days	do	30	
Horses, 16 head:			
Hay (additional pasture) approximate	2 tons	30	
Grain (additional pasture)	25 bushels		400
Hogs:			
10 brood sows (pasture)			250
1 boar			
60 pigs carried from 75 to 125 pounds (pasture additional)			450
Poultry, 200 hens			200
Total		300	1,450
Feed available for market cattle or other livestock		400	1,550

Feed required for wintering market cattle where the plan of operation is to sell 3-year-old steers and spayed heifers

Class of cattle fed	Per head	Tons hay	Bushels grain
50 short yearling heifers, hay, 10 to 15 pounds daily, 150 days	1 ton	50	
80 short yearling steers:			
Hay, 7 to 10 pounds daily, 150 days	¾ ton	60	
Grain, 4 pounds daily, 150 days	12 bushels		960
45 short 2-year-old heifers (spayed), hay, 15 to 20 pounds daily, 120 days	1 ton	45	
75 short 2-year-old steers, hay, 15 to 20 pounds daily, 120 days	do	75	
45 short 3-year-old heifers (spayed) (pasture)			
75 short 3-year-old steers (pasture)			
(Reserved pastures, fed during emergency from reserve.)			
Total		230	960

The surplus feed would be approximately 170 tons of hay and 600 bushels of grain that may be used for wintering other livestock, finishing hogs, or fed to market cattle.

Products that may be sold: Normally 3-year-old steers and heifers would be sold.

Type A

Cattle:	Average weight, pounds
25 cull cows	850
2 cull bulls	1,400
50 long 1-year-old heifers (spayed)	650
80 long 1-year-old steers	700
45 long 2-year-old heifers (spayed)	850
75 long 2-year-old steers	950
45 long 3-year-old heifers (spayed)	1,050
75 long 3-year-old steers	1,150

Where yearlings are held for maturing, a 5 to 10 per cent cut for culls ought to be made the first fall.

Hogs:	
60 feeder pigs, average weight	pounds 125
If fed out, average weight	do 250
Crops, wheat	bushels 1,200

Type B

Cattle: As shown under type A.

Hogs: As shown under type A.

Crops, none.

Labor requirements:

Type A—

Operator's full time on cattle.	
1 regular farm man, 12 months at \$50.....	\$600
Extra labor, seasonally, farm and cattle, 12 months at \$50.....	600
	<u>1,200</u>

Type B—

Operator's full time on cattle.	
1 regular farm man, 6 months at \$50.....	300
Extra labor, seasonally, farm and cattle, 12 months at \$50.....	600
	<u>900</u>

Operating expenses:

Vaccine, 160 doses.....	25
Dip, etc.....	20
Salt, 4 tons.....	80
Building insurance.....	100
Taxes on real estate 1.3 per cent of value (lease equals taxes).....	800
Taxes on cattle 1.3 per cent of value.....	600
Gas and oil.....	200
Auto repairs.....	150
Repairs, improvements.....	250
Repairs, equipment.....	200
Miscellaneous.....	500
	<u>2,925</u>

Type A:

Labor.....	1,200
	<u>4,125</u>
Depreciation on improvements.....	600
Depreciation on equipment.....	350
	<u>5,075</u>

Type B:

Operating expenses (as above).....	2,925
Labor requirements (as above).....	900
	<u>3,825</u>
Depreciation on improvements.....	600
Depreciation on equipment.....	200
	<u>4,625</u>

Work calendar for 200-cow ranch

Month	Livestock work	Farm work
January.....	Winter feeding.....	Chores.
February.....	do.....	Do.
March.....	do.....	Do.
April.....	Turn cattle on range; care of calving cows; condition bulls; salt.	Seed small grain; fences.
May.....	Care of cows and calves; shape herd for summer range, spay yearling heifers; condition bulls.	Seed small grain; plant corn.
June.....	Care of cows and calves; salt; condition bulls; special attention to hogs (farrowing a month earlier in some distr.pts).	Cultivating corn; summer fallow; care of farrowing sows.
July.....	Brand, castrate, and vaccinate calves; turn bulls to cows; close attention to breeding herd.	Corn cultivation; hay harvest; attention to pigs.
August.....	Close attention to breeding herd; salt.	Care of pigs; harvest; fences.
September.....	Shape cattle for sale in September or October.	Threshing; care of pigs.
October.....	Take up bulls; beef shipment; brand, vaccinate, castrate, and dehorn calves.	General repairs; corn harvest.
November.....	Shape herd for wintering; wean calves and begin feeding.	General repairs; feed pigs ready for sale.
December.....	General care; begin winter-feeding thin cattle.	Finish marketing hogs; general.

STANDARD 500-COW RANCH

Desirable locations for ranches to carry 500 cows are in the broken-range areas where the possibilities of farming are limited principally to hay production. There is little probability that a 500-cow ranch would permit extensive grain production unless exceptionally good farming land were available and the plan of operation were to sell all cattle at young ages, which would tend to keep the numbers of cattle at a minimum. Type B under the standard 200-cow ranch is applicable to this size ranch, and the stated desirable qualities with respect to proportionate ownership and lease of land, wintering facilities, and owner's equity apply in this case. Livestock diversification in this instance should be confined to sheep, horses, or mules. A ranch of this size would probably qualify for company ownership and hired management. The manager should possess unusual qualifications as a livestock man.

ORGANIZATION OF A 500-COW RANCH

Organization of a 500-cow ranch where cattle production is the principal enterprise.

Land requirement, 29,400 acres, or approximately 46 sections, of the following classes:

Range land.....	27, 800 acres, at \$4 per acre.....	\$111, 200
Crop land.....	160 acres, at \$20 per acre.....	3, 200
Hay land (native).....	640 acres, at \$20 per acre.....	12, 800
Subirrigated hay land.....	800 acres, at \$35 per acre.....	28, 000
	<u>29, 400</u>	<u>155, 200</u>
Improvements:		
Dwelling.....	.....	3, 000
Camps.....	.....	1, 000
Barns and sheds.....	.....	2, 000
Granary.....	.....	200
Water development.....	.....	3, 500
Corrals.....	.....	500
Fence, 45 miles, four wires.....	.....	6, 750
		<u>16, 950</u>

Equipment:		
Farm and hay machinery.....	-----	\$2, 500
Sundry.....	-----	500
		3, 000

Livestock at beginning of year

Cattle—A 3 per cent death loss to be expected but is not deducted in this outline. A 75 per cent calf crop should be obtained, or 375 calves.

Breeding herd—		
500 breeding cows, weight 950 pounds, at \$50 per head.....	-----	25, 000
20 mature bulls, weight 1,500 pounds, at \$125 per head.....	-----	2, 500
5 yearling bulls, weight 700 pounds, at \$100 per head.....	-----	500
65 replacement 2-year-old heifers, weight 700 pounds, at \$35 per head.....	-----	2, 275
65 replacement 1-year-old heifers, weight 500 pounds, at \$30 per head.....	-----	1, 950
Market cattle—If steers and spayed heifers are to be sold at three years old. Sales at younger ages would eliminate the classes sold from the inventory.		
110 yearling heifers, weight 475 pounds, at \$25 per head.....	-----	2, 750
175 yearling steers, weight 500 pounds, at \$30 per head.....	-----	5, 250
100 2-year-old heifers (spayed), weight 650 pounds, at \$35 per head.....	-----	3, 500
160 2-year-old steers, weight 700 pounds, at \$45 per head.....	-----	7, 200
100 3-year-old heifers (spayed), weight 850 pounds at \$50 per head.....	-----	5, 000
160 3-year-old steers, weight 950 pounds at \$60 per head.....	-----	9, 600
1, 460 head.....	-----	65, 525
Horses:		
Work horses.....	20 head at \$100.....	2, 000
Saddle horses.....	30 head at \$75.....	2, 250
Range mares.....	30 head at \$50.....	1, 500
Stallion.....	1 head at \$200.....	200
	81 head.....	5, 950
Hogs and sows, 3 head, at \$30.....	-----	90
Poultry, 200 hens.....	-----	200

Distribution of capital

Item	All owned	60 per cent leased
Land.....	\$155, 200	\$88, 640
Improvements.....	10, 950	10, 950
Cattle.....	65, 525	65, 525
Work stock.....	5, 950	5, 950
Other livestock.....	290	290
Equipment.....	3, 000	3, 000
	240, 915	178, 355

OPERATION OF A 500-COW RANCH

The requirements in the plan of operation stated under the standard 200-cow ranch would prevail, except the possibility of feeding for market. A general plan that will permit taking advantage of possibilities to avoid a crisis is to be emphasized. The manager should spend practically his entire time on his cattle. An additional regular man for the cattle would be necessary and a combination farm and cattle laborer. Additional seasonal labor would be necessary for haying and cattle work.

Farm land required, 1,600 acres, cropped as follows:

For sale, none.

For livestock—

100 acres barley, at 20 bushels per acre.....	bushels..	2,000
60 acres oats, at 30 bushels per acre.....	do.....	1,800
Straw, approximately.....	tons..	50
640 acres dry land hay (one-half cut annually).....	do.....	320
800 acres subirrigated alfalfa and wild hay.....	do.....	1,000

Total feed available for livestock, hay, 1,370 tons; grain 3,800 bushels.

Feed required annually for breeding and work stock

Class of livestock fed	Per head	Tons hay	Bushel grain
Cattle:			
Breeding herd—500 cows, hay, 15 to 20 pounds daily 120 days (straw).....	1 ton.....	500	
20 mature bulls—			
Hay, 20 to 25 pounds daily, 120 days.....	1 1/4 tons.....	30	
Grain, 10 pounds daily, 25 days.....	5 bushels.....		100
5 young bulls—			
Hay, 7 to 10 pounds daily, 150 days.....	1 ton.....	5	
Grain 7.5 pounds daily, 100 days.....	15 bushels.....		75
65 short 2-year-old heifers, hay, 15 to 20 pounds daily, 120 days.....	1 ton.....	65	
65 short 1-year-old heifers, hay, 7 to 10 pounds daily 120 days.....	3/4 ton.....	50	
Horses, 50 head:			
Hay (pasture additional).....	2 tons.....	100	
Grain (pasture additional).....	15 bushels.....		750
Stock horses on range.....			
Hogs, 3 head, and 15 pigs.....			150
Poultry, 200 hens.....			100
Total.....		750	1,175
Feed available for market cattle and other livestock.....		620	2,625

Feed required for wintering market cattle where the plan of operation is to sell three-year-old steers and spayed heifers

Class of cattle fed	Per head	Tons hay	Bushels grain
110 short 1-year-old heifers, hay, 7 to 10 pounds daily, 150 days.....	3/4 ton.....	80	
175 short 1-year-old steers—			
Hay, 7 to 10 pounds daily, 150 days.....	3/4 ton.....	130	
Grain, 3 pounds daily, 150 days.....	10 bushels.....		1,750
100 short 2-year-old heifers (spayed), hay, 10 to 15 pounds daily, 120 days.....	3/4 ton.....	75	
100 short 2-year-old steers, hay, 10 to 15 pounds daily, 120 days.....	3/4 ton.....	120	
100 short 3-year-old heifers (spayed) (pasture).....			
100 short 3-year-old steers (pasture).....			
(To be wintered on reserved pasture and fed, if necessary, from reserve.)			
Total.....		405	1,750

The surplus feed would be approximately 200 tons of hay and 675 bushels of grain, which may be used for wintering other livestock or fed to market cattle.

Products that may be sold: Normally 3-year-old steers and heifers would be sold.

Cattle:	Average weight, pounds
65 cull cows.....	850
5 cull bulls.....	1,400
110 long yearling heifers (spayed).....	650
175 long yearling steers.....	700
100 long 2-year-old heifers (spayed).....	850
160 long 2-year-old steers.....	950
100 long 3-year-old heifers (spayed).....	1,050
180 long 3-year-old steers.....	1,150

(Where yearlings are held for maturing, a 5 to 10 per cent cut for culls to be made.)

Horses, 5 to 10 head to be sold annually.

Labor requirements:

Operator's full time on cattle.....	
If paid manager, 12 months, at \$200 per month.....	\$2, 400
1 regular cattle hand, 12 months, at \$50 per month.....	600
Extra labor on cattle, equivalent to 8 months, at \$50 per month.....	400
1 farm man and part-time cattle, 12 months, at \$50 per month.....	600
10 men haying, 2 months, at \$60 per month.....	1, 200

Operating expenses:

Vaccine, 375 doses.....	50
Dip, etc.....	75
Salt, 10 tons.....	200
Building insurance.....	100
Taxes on land, 1.3 per cent of value (lease equal taxes).....	1, 250
Taxes on cattle, 1.3 per cent of value.....	900
Gas and oil.....	300
Auto repairs.....	300
Repairs, improvements.....	450
Repairs, equipment.....	300
Miscellaneous.....	750

Hired labor.....	4, 675
Depreciation on improvements.....	2, 800
Depreciation on equipment.....	800
	200

Total expenses where operated by owner.....	8, 475
Total expenses including a paid manager.....	10, 875

Work calendar for 500-cow ranch

Month	Livestock work	Farm work
January.....	Winter feeding.....	Chores.
February.....	do.....	Do.
March.....	do.....	Do.
April.....	Turn cattle on range; care of calving cows; ride pastures; special attention to hogs; condition bulls.	Seeding small grain.
May.....	Care of cows and calves; further shaping of cattle for summer range; spay yearling heifers; condition bulls; salt.	Seeding small grain; fences.
June.....	Care of cows and calves; condition bulls; ride fences, etc.	Fences; general repairs; care of farrowing sows.
July.....	Brand, castrate, and vaccinate calves; turn bulls to cow herd; close attention to breeding herd.	Haying.
August.....	General care; salt; close attention to breeding herd.	Haying; threshing.
September.....	Shape cattle for sale in September or October.....	General repairs.
October.....	Take up bulls; beef shipment; brand, castrate, and dehorn calves.	Do.
November.....	Shape herd for wintering; wean calves and begin feeding.	Do.
December.....	General care; begin winter feeding thin cattle.....	Do.

STANDARD 1,000-STEER RANCH

A basic requirement for the steer business in this region is the availability of good fattening range. Owned headquarters, hay land for feed production, and a small percentage of the required summer range are desirable conditions. The remainder of the summer range may be leased. A local supply of young steers is a decided advantage and a good wintering place for them is essential. A 100 per cent equity in the headquarters and 25 per cent equity in steers is a safe financial basis, if calves or yearlings are purchased and grown out to maturity. Owner-operator with business ability to handle sales and purchases is essential. Possible production of limited number of

horses may be considered as a possible means of diversification. An adequate feed reserve is recommended, especially a winter's supply of hay.

ORGANIZATION OF A 1,000-STEER RANCH

Land requirement for this ranch is 20,000 acres, or approximately 31 sections, of the following classes:

Range land.....	19, 300 acres, at \$4 per acre...	\$77, 200
Crop land.....	100 acres, at \$20 per acre...	2, 000
Hay land (native).....	600 acres, at \$35 per acre...	21, 000
	20, 000 acres	100, 200
Improvements:		
Dwelling.....	.....	3, 000
Barns and sheds.....	.....	2, 000
Sundry buildings.....	.....	200
Water development.....	.....	3, 000
Corrals.....	.....	500
Fences, 30 miles, four wires.....	.....	4, 500
		13, 200
Equipment: Hay machinery, farm implements.....	.....	2, 500

Livestock at beginning of year

Cattle—A 2 per cent death loss is to be expected but is not deducted in this outline:		
375 yearling steers, weight 450 pounds, at \$30 per head.....	.....	11, 250
325 2-year-old steers, weight 700 pounds, at \$45 per head.....	.....	14, 625
300 3-year-old steers, weight 900 pounds, at \$60 per head.....	.....	18, 000
	1, 000 head	43, 875
Horses:		
20 work horses, at \$100 per head.....	.....	2, 000
20 saddle horses, at \$75 per head.....	.....	1, 500
	40 head	3, 500
Hogs, 2 sows, at \$30 per head.....	.....	60
Poultry, 200 hens.....	.....	200
Milk cows, 5 head, at \$75 per head.....	.....	375

Distribution of capital

Item	If all land is owned	If 15,000 acres range is leased	If all land is leased
Land.....	\$100, 200	\$40, 200	.....
Improvements.....	13, 200	0, 700	.....
Cattle.....	43, 875	43, 875	\$43, 875
Work stock.....	3, 500	3, 500	3, 500
Other livestock.....	635	635	635
Equipment.....	2, 500	2, 500	2, 500
	163, 910	100, 410	50, 510

OPERATION OF A 1,000-STEER RANCH

The safest system of operation would include a plan to buy calves in the fall if wintering facilities are desirable, or yearlings in the spring. The plan to sell 3-year-old grass-fat steers would permit the sale of steers at younger ages as feeder cattle if the market was satisfactory. The owner-operator should spend his time on the

cattle and the management of the business. One regularly employed man, to spend part time on cattle and part time on farm work, would be required, with additional seasonal labor.

Farm land required, 700 acres cropped as follows:

For sale, none.

For livestock—

100 acres oats, at 30 bushels per acre.....	bushels..	3,000
600 acres hay, at 1 ton per acre.....	tons.....	600
Total feed available for livestock, hay, 600 tons; grain, 3,000 bushels.		

Feed required for cattle and other stock

Class of livestock fed	Per head	Tons hay	Bushels grain
Cattle:			
325 long yearling steers, hay, 15 to 20 pounds daily for 120 days.....	1 ton.....	325	
150 head of thinnest long yearlings, grain, 5 pounds daily for 60 days, approximately.....	7 bushels.....		1,000
300 long 2-year-old steers to be wintered out.			
Hay available for thinnest 2-year-olds.....		200	
(15 per cent of yearlings and 10 per cent of 2-year-olds to be culled in the fall.)			
Horses, 40 head (8 fed during winter):			
Hay.....	1 1/4 tons.....	60	
Grain.....	15 bushels.....		600
Hogs, 2 sows, 10 pigs.....			100
Poultry, 200 head.....			100
Milk cows, 5 head.....	3 tons.....	15	200
Total.....		600	2,000

The purchase of calves in the fall to be developed into steers would necessitate a condition whereby the long yearlings and 2-year-old cattle could be wintered with less feed than shown above and the available feed fed to calves. The per-calf requirement would be the same as that shown under the 500-cow-organization outline, or, in some localities, wintering the calves could be contracted to farmers who produce surplus feed. The cost of wintering in those cases observed is determined by the local prices of feed.

Labor requirements:

Operator's entire time to working, marketing, and buying cattle.....		
1 regular man for crops and cattle, 12 months, at \$50.....		\$600
Extra labor spring cattle work and shipping cattle.....		100
Haying labor, 10 men for 1 month, at \$60 each.....		600
		1,300

Operating expense

Item	If all land is owned	If 15,000 acres of range is leased	If all land is leased
Labor.....	\$1,300	\$1,300	\$1,300
Salt.....	125	125	125
Cattle purchase expenses, travel, etc.....	600	600	600
Auto, repair, gas, and oil.....	300	300	300
Taxes, cattle and equipment.....	700	700	700
Lease, on land, rate \$1 per acre for hay and farm and 12 cents for range land.....		1,800	3,016
	3,025	4,825	6,041
Depreciation on improvements, 5 per cent.....	660	485	
Depreciation on equipment, 10 per cent.....	250	250	250
	3,935	5,560	6,291
Capital to buy 375 yearlings.....	11,250	11,250	11,250
	15,185	16,810	17,541

The above exclusive of interest on borrowed capital.

Steers that may be sold, any one, two, or all of the following classes on a desirable market:

	Pounds
325 long yearling steers, tops, average weight.....	750
300 long 2-year-old steers, tops, average weight.....	975
300 long 3-year-old steers, tops, average weight.....	1, 175
50 long yearling steers, culls, average weight.....	600
25 long 2-year-old steers, culls, average weight.....	800

Work calendar for 1,000-steer ranch

Month	Livestock work	Farm work
January.....	Winter feeding.....	Chores.
February.....	do.....	Do.
March.....	do.....	Do.
April.....	Turning on summer range; salting.....	Fence repair.
May.....	Receiving yearlings; dehorning; ride fence.....	Sowing grain.
June.....	Riding fences; salting.....	General repairs.
July.....	Riding pastures and fences.....	Haying.
August.....	do.....	Do.
September.....	Shaping up yearlings and 2-year-olds for September or October sale of culls or feeder steers, or fat steers.	General.
October.....	Shipping.....	Do.
November.....	Shipping cattle for winter.....	Do.
December.....	Beginning winter feeding of thinnest steers, if necessary.....	Do.

**ORGANIZATION OF THE
UNITED STATES DEPARTMENT OF AGRICULTURE**

February 20, 1928

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