11-1-1930

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Bulletin 255 November, 1930

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SUMMARY

The South Dakota range area has been divided into six districts based on the land classification made by the United States Department of the Interior. Fig. 2.

Ranch operations in South Dakota were generally profitable during 1927 and 1928 due largely to the increase in market prices of cattle above the 1926 prices.

The land area operated per ranch as shown by the average of 15 South Dakota ranches was 5,446 acres, of which 1,731 acres, or approximately 32 per cent were owned, and the remainder leased. Table 45. In addition to these acreages, a majority of the ranches had access to varying amounts of free range.

The sources of income of the 15 ranches were as follows: range cattle, 83 per cent; hogs, 4 per cent; cash crops, 5 per cent; feed crops, 5 per cent; miscellaneous, 3 per cent. Table 44.

Almost without exception, the ranches as now operated produce a high quality of beef cattle. Purebred bulls are in general use and considerable attention is given to culling the breeding herds. The three year average calf crop in South Dakota was 74 per cent. Table 35.

The cost of winter feed was the highest single item in range cattle production. The average cost of feed per head of cattle wintered varied between districts, depending largely on the relative amounts of range and winter feed available. The cost ranged from $6.53 per head in District IV, to $12.08 per head in District II, with an average of $8.82 per head for the 15 ranches. Table 36.

Probably the outstanding handicap in ranch operation is the difficulty of obtaining long-time control of sufficiently large areas of grazing land. Ranchmen generally should have uninterrupted control of large units of grazing land for long periods of time.

Generally speaking, an increase in the numbers of cattle handled with a corresponding increase in the grazing area per ranch seems necessary to insure the permanence and profitableness of the industry.

By the use of breeding pastures and the conditioning of bulls, the calf crop may be increased.

Production of winter feed may be increased by the adoption of good cultural methods and crop rotation systems adapted to the region.

On some ranches, cash crops are desirable supplements to the cattle business, particularly where a surplus of suitable land is available.

Hogs may be an important source of income under certain specific conditions.

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ERRATA

Page 43, Table 39 and Table 40 should read as follows:

TABLE 39.—NUMBERS AND PERCENTAGES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH, BY YEARS, 15 SOUTH DAKOTA RANCHES

1926				1927				1928				3-Year Ave.	
Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Sh'p'd to mkt.	Sold on ranch
No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Pct.	Pct.
568	35	1,036	65	818	60	536	40	870	47	997	53	47	53

TABLE 40.—NUMBERS AND PERCENTAGES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH, BY YEARS, RANGE REGION, 60 RANCHES

1926				1927				1928				3-Year Ave.	
Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Sh'p'd to mkt.	Sold on ranch
No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Pct.	Pct.
2,968	34	5,665	66	2,981	43	3,949	57	2,659	36	4,731	64	37.5	62.5

Cattle Ranch Organization and Management

M. B. Johnson*

During the summer of 1925 the Bureau of Animal Industry and the Bureau of Agricultural Economics of the United States Department of Agriculture in cooperation with the Experiment Stations of North Dakota, South Dakota, Montana and Wyoming conducted a range cattle survey covering the northern Great Plains region, the results of which are given in Technical Bulletin No. 45, U. S. D. A.

This survey of the range cattle industry followed a series of years of low cattle prices, and one of the objects of the survey was to determine what modifications in organization and methods of operation could be suggested to the stockmen that would increase the returns from their business.

Another object was to determine how best to utilize the native range resources of the region. It is generally conceded that a portion of the land area lying within the boundaries of the Great Plains region is potential farming land, and is now, or may at some future time be devoted to grain crop production or general farming. But a large percentage of this vast region will doubtless always remain grazing land because topographic and soil conditions render it unfit for farming. How best to utilize this great natural resource, the native range, is one of the important questions confronting the people of the range states, and one that cannot be answered without a detailed study of the problem.

In the survey of 1925 a total of 304 ranches were visited in southwestern North Dakota, northwestern South Dakota, northeastern Wyoming and southeastern Montana. Complete records of the 1924 business of these ranches were secured in addition to their most important management practices.

Following this preliminary survey, a cooperative project was organized involving the agricultural experiment stations of the four states, the Bureau of Agricultural Economics and the Bureau of Animal Industry of th United States Department of Agriculture, for the purpose of more detailed study of ranch organization and operation in the northern Great Plains region. In the organization of the project, M. L. Wilson of the Montana experiment station was selected to represent the four agricultural experiment stations and V. V. Parr of the Bureau of Animal Industry represented the Department of Agriculture and had direct supervision of the work. M. R. Benedict represented the South Dakota Experiment Station and M. B. Johnson was employed cooperatively by the six agencies for the actual detailed field work.

Sixty ranches were selected, 15 of which were located in each of the four cooperating states, and from these detailed records were obtained over a period of three years—1926-1928. The results of the survey of these ranches and the analysis of other available information having a bearing on range cattle production are presented in this bulletin, particularly as they relate to South Dakota.

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*Credit is due R. D. Jennings of the Bureau of Agricultural Economics for superivising the tabulations, summarizing the data, and assisting in outlining this bulletin; to V. V. Parr of the Bureau of Animal Industry for his assistance in outlining the bulletin and for many helpful suggestions relating to range cattle management; and to C. M. Hampson of the department of agricultural economics of South Dakota State college for his interest in the manuscript, which he constructively criticized and carefully edited. Grateful acknowledgment is extended to the cooperating ranchmen for their splendid cooperation in supplying the data on which this publication is based.

History of Range Production

Range cattle production was the first important agricultural industry in the northern Great Plains region. Beginning with the arrival of the first trail herd in the Wyoming territory in the late 60's, the industry developed during the next few years until at the close of 1885 practically the whole northern Great Plains region was fully stocked and in some areas overstocked, as later events proved.

The open range was the foundation of the cattle industry on the Great Plains during its period of early expansion, and the "law of the range" decreed that the first operator in any given territory had a prior claim to the range he required. This was designed to protect the individual against the encroachment of outsiders, but since the land belonged to the government and the range was free, these claims had no legal status and were not always recognized.

The industry as organized prior to 1885 was one of large scale operation. It was in the hands of a comparatively few large operators, and because it was highly profitable it was well financed. The large profits from the business eventually became a curse rather than a blessing because it resulted in expansion beyond the carrying capacity of the ranges and the managerial ability of the operators, and led to the collapse which came with the disastrous winter of 1886-87. During this memorable winter whole herds were practically wiped out as the result of a severe winter combined with an overgrazed range.*

This, the first serious setback, was followed by reorganization of the industry. Many of the large outfits went out, never to return, while a few remained and reorganized their business.

Following the dispersion of many of the large herds, several new companies and a number of small independent operators engaged in cattle ranching. This was accompanied by the acquirement of land for two reasons: first, certain lands controlled water supplies which in turn determined the limits of considerable areas of range; second, other lands were acquired for the production of winter feed for cattle. The winter of 1886-87 had taught ranchmen that going into the winter with a short range and with no supplementary winter feed was a decidedly hazardous undertaking. A few still operated under the old plan of year-long grazing without any supplementary feeding, and these continued to take their losses during severe winters which occur at intervals throughout the plains area. Many of these men believed that the losses sustained during an occasional bad winter were no costlier than the annual expense of winter feed production.

The production of winter feed continued to increase, however, and gradually the best ranch locations passed into private ownership. The

* "In many sections of the high plains, particularly in the northern end, it was not the pioneer farmer who swept aside the cattlemen, nor was it the pioneer farmer who succeeded to the cattleman's domain after the last rang herd had vanishd. The effort to expand the business far beyond the carrying capacity of the range, the speculation and booming, which the earlier profits engendered, caused his ruin. Most of the problems confronting the industry—and they were many—the range cattlemen would have solved, such as the danger to his property from the cattle thief, the marauding Indian, predatory animals and disease. The elaborate machinery of the roundup and inspection testify to his ingenuity in meeting the problems of ownership and sale. **But the one problem which he did not and could not solve was the control of the range and the prevention of overgrazing.**"—E. O. Osgood, in Agricultural History, Vol. III, p 117.

industry was taking on something of a permanent aspect but it was still largely dependent upon the open range for grazing.

The acquirement of land and the expense of producing winter feed increased production costs and reduced profits. Fewer cattle were handled per man than under the old regime, and the cost of labor increased. Taxes mounted and the business generally was conducted on a closer margin of profit than during the early days.

Following this period came the influx of the homesteader, bring a new problem to the cattle producers. Some states passed laws compelling the stockmen to protect the settlers crops against damage by their cattle. The location of a few homesteads in a range district prevented the use of the adjoining unoccupied range where the settlers were not required to fence their crops. In other states of the range area, fences appeared around settlers holdings, inclosing in some cases valuable watering places and hay meadows. Fences prevented the free movement of cattle and caused many inconveniences which finally forced the range cattle producers from the homestead districts.

Homesteading gradually spread to all but a few isolated districts in the northern Great Plains region, and the last chapter in range cattle production under open range conditions was written with the passing of the public domain into private ownership by the homestead route.

The years that followed brought financial loss and disappointment to many of the homesteaders. Coming from practically every walk of life and all sections of the country where climatic and soil conditions were unlike those in the great plains, radical readjustments had to be made to fit the new conditions. Homesteads of 160 acres, which later were increased to 320, were too small to provide a living for the homesteader in a country having less than 15 inches annual precipitation, coupled in many cases with an inferior soil. A few who were fortunate enough to be located on good land and who were able to adjust themselves to their new surroundings survived, and a still smaller percentage prospered; while the great majority of homesteaders in the Great Plains area moved out after a few short years and left the country much as they had found it, except for an abandoned shack and a patch of weeds to testify to their good intentions of living up to the law, which provided that residence must be established and a certain acreage brought under cultivation before the government would issue title to the land.

Scattered over the region were a few successful men, who by reason of their location, experience or adaptability, or a combination of these, had managed to hang on. Many of these turned to cattle production. They acquired additional land by purchase or lease from their neighbors, and in many cases had the free use of abandoned homesteads for grazing purposes.

A few of the cattlemen of the early days who stayed on, went through the experience of being practically forced out of business by the homesteaders; then upon the homesteaders leaving in a few years, they took a new lease on life, acquired a foothold through purchase or lease, and gradually increased their holdings as opportunity presented itself.

There are still many people however, who, having an erroneous conception of land values in the range country, retain their homestead rights, and thus continue to be a handicap to the orderly blocking out of ranch properties in suitable units for economic operation.

The deflation of cattle values, coupled with continued high operating costs following the late war, added the last burden to many stockmen and one that many were unable to carry. A large percentage of range cattlemen of the Great Plains were either forced out of business or reduced in their operations to where they no longer had sufficient income to meet operating and living costs. This condition prevailed over the northern Great Plains range area in 1925 when the United States Department of Agriculture in cooperation with four state experiment stations conducted a survey of the range cattle industry.

The Northern Great Plains Region

Location and Area: The Northern Great Plains Region is an area comprising portions of the four states of South Dakota, North Dakota, Montana and Wyoming. The total area contains approximately 203,125 square miles and extends from about the 100th meridian on the east in North and South Dakota to the foothills of the Rockies in Montana and Wyoming.

That part of the Northern Great Plains covered by this survey is shown in Fig. 1. This area is approximately 200 miles north and south and 150 miles east and west. It comprises the adjoining corners of the four states mentioned above and is a fairly representative sample of the grazing area of the Northern Great Plains.

Topography and Soil: The topography ranges from gently rolling to rough and broken. The most level topography as well as the most fertile soil is found in the northern and eastern part of the region while the rougher topography is generally found in the western part of the region and in the Bad Lands area of North and South Dakota.

The soils in the northeastern part of the region are of glacial origin, having a surface covering of glacial drift ranging from a few inches to several feet in depth. The soils of the greater part of this region are residual in origin, and range from sand to clay and shale, with a heavy loam predominating. The alluvial soils of the river and creek valleys are formed by deposits from flood waters and are generally more fertile than the upland soils.

Water Supply: A dependable water supply is of primary importance in the range country. In order fully to utilize the range, water for livestock must be available within reasonable distances of the grazing grounds. The distance that livestock will travel to water varies with the season, but if watering places are too widely scattered the range will not be fully utilized.

The Northern Great Plains is generally favorably situated with reference to its water supply. The greater part of the region is well watered by rivers, creeks and springs; and reservoirs and wells may be had over practically the entire region. The Missouri and Yellowstone rivers traverse the region and a number of smaller rivers such as the Little Missouri, Tongue, Powder, Otter, Knife, Heart, Cannonball, Grand, Moreau, Belle Fourche, Cheyenne, White, and Bad rivers furnish a constant water supply except in the dryest seasons.

In addition to the above, numerous smaller creeks and springs supply water during all or a part of the year. Where no dependable natural

water supply is available, reservoirs have been built to catch and store flood water. These reservoirs are common in the region north of the Black Hills and to some extent are found scattered over the entire region.

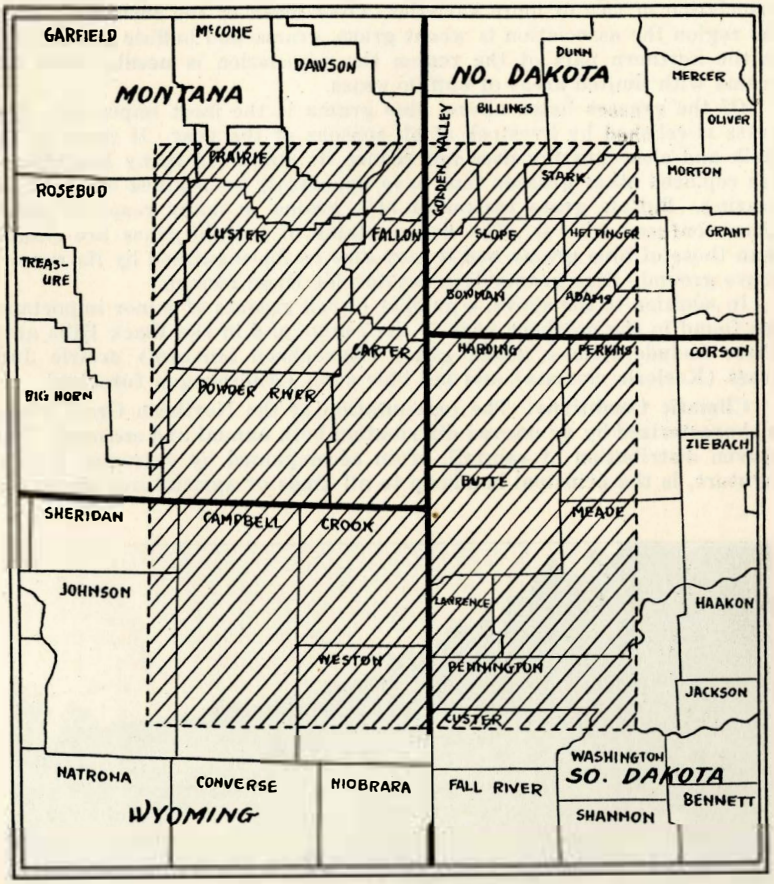

Fig. 1.—Area of Northern Great Plains Study

Native Grasses: The native grasses are the most important natural resource of the range country. They furnish the cheap feed on which the industry is based. These grasses may be roughly divided into two distinct types, the tall and short grasses. The most important tall grasses over much of the area are western wheat grass (Agropyron smithia) and western needle grass (Stipa comata). These two grasses furnish most of the wild hay produced in this region and also supply a large percentage of the grazing.

The most important short grasses are blue grama (Boutelous gracilis) and buffalo grass (Bulbilis dactyloides). These grasses are

utilized almost exclusively for grazing as they seldom grow tall enough to make hay.

With the exception of wheat grass in certain restricted localities, mainly north of the Black Hills, these grasses do not occur singly but in association of two or more varieties. Over much of the southern part of the region the association is wheat grass, grama and buffalo grass, while in the northern part of the region the association is needle grass and grama with limited areas of buffalo grass.

Of the grasses listed above, blue grama is the most important. This grass is relished by livestock at all seasons of the year. It cures on the stalk and close grazing does not reduce its stand. In many localities, it has replaced other grasses that have apparently been killed out by overgrazing. Buffalo grass resembles blue grama in many respects and is often confused with it . The flower stalks of buffalo grass are shorter than those of blue grama and it may also be distinguished by its runners above ground. Blue grama does not develop these runners.

In addition to the above, a number of tall grasses of minor importance are found in the northern part of the region and in the Black Hills area. These include slender wheat grass (Agrophron tenerum) prairie June grass (Koeleria cristata) and tall blue stem (Andropogon furcatus).

Climatic Conditions: The precipitation of the Northern Great Plains is characterized by an uneven distribution both annual and seasonal. This uneven distribution of rainfall, often accompanied by extremes in temperature, is the principal handicap to all kinds of agricultural production

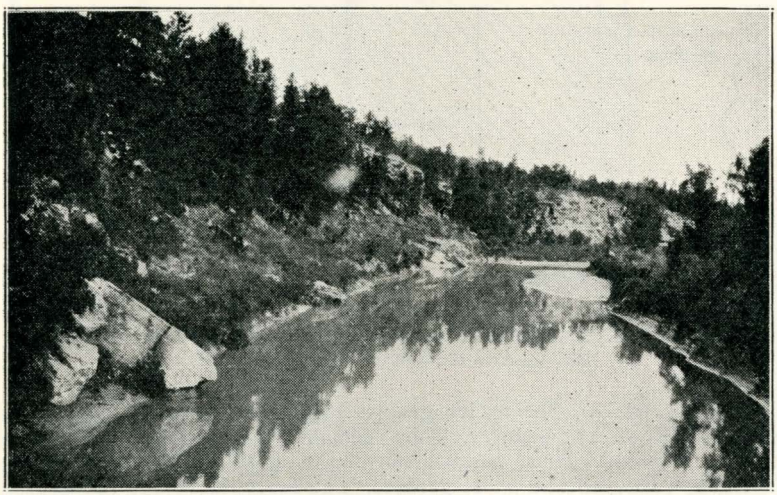

Fig. 2.—A Dependable Water Supply is Highly Important in the Range Country

in the area, but more particularly in the production of grain crops. This indicates the necessity for reserves for tiding over the inevitable dry years. For the stockman a reserve supply of winter feed is most im-

portant, while a cash reserve is important to all classes of agricultural producers.

The annual precipitation at the Newell, South Dakota Station*, Table 1, has varied from 6.64 inches to 24.46 inches with an average of 14.93 inches during the 17 year period covered by the available records. The distribution of both the annual and seasonal precipitation is an important factor in the production of native grasses, and hay and grain crops.

During the 17 year period for which records are available, about 67 per cent of the annual precipitation fell during the five growing months, April to August inclusive. May has been the month of heaviest rainfall with an average of 2.56 inches but has had a range during the 17-year period of from .45 to 7 inches. During the five winter months, November to March inclusive, the precipitation (mostly snow) is equal to 2.49 inches of rainfall or approximately one-half inch per month. Winter precipitation is of little importance in the range country except when the snowfall is too heavy to permit winter grazing, and where a heavy snowfall is accompanied by high winds, resulting in the well known blizzards of the Northern Great Plains. Fortunately, winter precipitation is not subject to the wide extremes that characterize summer precipitation.

Spring precipitation is the most important for the production of native grasses and perennial hay crops, while late spring and summer precipitation is of greatest importance in the production of grain crops and annual hay crops.

During the three year period covered by this survey, the precipitation at Newell was above normal. The season of 1926, while above normal in May and June precipitation, was an unfavorable crop year, partially due to a lack of reserve moisture in the soil following the dry season of 1925. The season of 1927 was a very good crop year as a result of the heaviest

TABLE 1.—PRECIPITATION AT NEWELL, SOUTH DAKOTA, FOR THE 17-YEAR PERIOD 1908 TO 1919, AND 1924 TO 1928

(Data in Inches)

Yr.—	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann'l
1908	.20	.19	1.65	1.16	3.95	1.47	1.26	.62	.52	2.03	.20	.91	14.16
1909	.17	.23	.19	.84	3.87	5.59	2.45	.55	1.07	.76	.73	1.28	17.73
1910	.73	.70	.93	1.57	1.26	1.51	1.42	1.03	2.92	.27	.11	.10	12.55
1911	.13	.05	.09	.17	.45	.50	.80	1.86	.92	.39	.98	.30	6.64
1912	.24	.10	.71	2.32	2.26	.29	3.20	2.80	3.49	.51	.04	.13	16.09
1913	.57	.24	.99	.25	1.98	3.10	.35	.26	2.38	1.86	.10	.45	12.53
1914	*	1.00	.29	1.09	2.22	2.09	1.34	1.12	.35	1.77	.00	.43	11.70
1915	.92	1.01	.16	2.58	2.32	4.74	5.74	.44	1.26	1.25	.43	.17	21.02
1916	.32	.23	.98	.64	3.17	2.19	2.01	2.02	.20	.99	.33	.28	13.40
1917	.92	.74	.27	2.51	3.71	.97	.80	1.67	.35	.46	*	.92	13.32
1918	.99	.64	.81	2.40	1.60	1.17	3.41	2.99	3.08	.22	.15	.85	18.31
1919	.04	.57	.87	2.14	1.14	.35	2.59	1.02	1.20	2.49	1.22	.62	14.25
1924	.08	.88	.70	.81	.68	1.27	1.22	2.00	.72	3.84	.93	.65	13.78
1925	.32	.21	.18	1.53	1.55	3.10	.39	.76	.65	.96	.19	.91	10.75
1926	1.67	.19	.24	.10	4.60	4.56	1.96	1.48	.72	.63	.96	.05	17.16
1927	.36	.13	1.14	3.92	6.96	2.81	4.26	2.13	1.17	.39	.63	.56	24.46
1928	.16	.07	.79	.35	1.81	3.38	4.89	1.44	1.65	.80	.57	.04	15.95
Ave.	.46	.42	.65	1.44	2.56	2.30	2.24	1.42	1.33	1.15	.45	.51	14.93

* Trace

* The precipitation data presented in Table 1 is taken from the U. S. Weather Bureau records for Newell, South Dakota, near the center of the South Dakota range area covered in this report. It is quite probable that the precipitation at this station is influenced by it's proximity to the Black Hills, being undoubtedly somewhat higher on that account than it would be at a more distant point from the hills, but since this is the only point in the range area where data are available for a series of years, it has been used.

precipitation on record for this station. The 1928 season with a lower rainfall than 1926 was a more favorable year for crop production of all kinds than 1926, largely because of a reserve supply of moisture in the soil at the beginning of the season.

The temperature of the Northern Great Plains is characterized by extremes of heat and cold. Summer temperatures of 100° F. are not uncommon and winter temperatures of -40° F. and lower are on record. Usually these extremes are infrequent and of short duration.

The South Dakota Range Area

The range area of South Dakota as here considered is an area extending from the Wyoming and Montana lines on the west to the Missouri river on the east, as far south as Fort Pierre, and from Fort Pierre south along the western boundary of Stanley, Jones and Mellette Counties and the Rosebud Indian reservation to the Nebraska line. Fig. 2. This is an area comprising 22 counties containing a total of 37,130 square miles, equal to 48 per cent of the total land area of the state.

For purposes of this discussion this is termed the range area. This does not imply that the land is all untillable. Several counties contain a high percentage of tillable land but at the present time a large portion of this so-called tillable land is used for grazing.

According to land classification data by the Department of the Interior*, the nontillable land ranges from 24 per cent to 85 per cent per county with an average of 47 per cent for the entire South Dakota range area. This is equal to 17,414 square miles of nontillable land.

The tillable or farming land has been divided into three classes or grades on the basis of quality of soil, topography, etc., as farming land, farming-grazing land and grazing-forage land. The acreages and percentages of each of the various classes of land are given in Table 2.

TABLE 2.—LAND CLASSIFICATION OF SOUTH DAKOTA RANGE AREA

TILLABLE LAND						NONTILLABLE LAND				TOTAL
Farm'g including irrigated		Farming grazing		Grazing forage		Grazing		National forest		
Square miles	Per cent	Square miles	Per cent	Square miles	Per cent	Square miles	Per cent	Square miles	Per cent	Square miles
4,744	13	8,932	24	4,062	11	17,414	47	1,978	5	37,130

* U. S. D. I. Land Classification of the Northern Great Plains, 1929.

More than 50 per cent of the total land acreage is classified as nontillable. In this connection it should be stated that not all land listed as tillable, is necessarily land that can be profitably farmed. Much of the so-called tillable land is submarginal farming land, which at the present time can be more profitably utilized as grazing land. Of the potential tillable land area amounting to 17,738 square miles, only 2,439 square miles or 14 per cent was under cultivation in 1924*.

Division of the South Dakota Range Area into Six Districts

Because of the wide variation in amount and quality of tillable land that prevails, the range area of the state has been divided into six districts for the purpose of this discussion. Fig. 2.

* U. S. D. I. Land Classification of the Northern Great Plains, 1929.

District I: This district contains 75 per cent farming and 25 per cent nontillable grazing land. The farming land in this district is generally of good quality and the grazing land interspersed with it has a good grass cover.

District II: This district contains 70 per cent farming and farming-grazing land and 30 per cent nontillable grazing land. A relatively small percentage of the farming land in this district is of good quality, while a large percentage is second class farming or farm-grazing land, according to the land classification referred to above. Crop production in this district is more hazardous than in District I and a larger percentage of tillable land is devoted to grazing and the production of feed crops than in District I.

District III: This is the so-called "Bad Lands" district and is classified as 5 per cent farming and 95 per cent nontillable grazing land. This is strictly a range cattle producing country with hardly enough tillable land to produce the necessary winter feed for the cattle that the grazing land will carry. Crop production here, except in the creek valleys, is

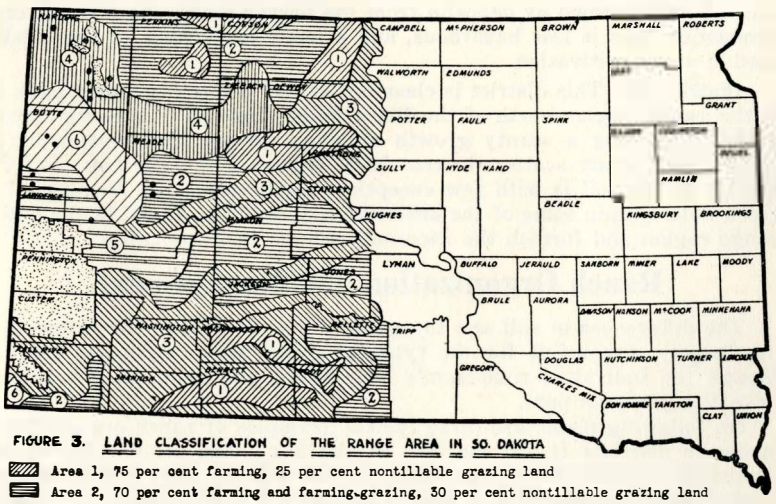

FIGURE 3. LAND CLASSIFICATION OF THE RANGE AREA IN SO. DAKOTA

Area 1, 75 per cent farming, 25 per cent nontillable grazing land
Area 2, 70 per cent farming and farming-grazing, 30 per cent nontillable grazing land
Area 3, 5 per cent farming, 95 per cent nontillable grazing land
Area 4, 10 per cent second class farming, 90 per cent grazing land
Area 5, 40 per cent farming, 60 per cent nontillable grazing land
Area 6, 100 per cent nontillable grazing land
National forests
Cooperating ranch

even more hazardous than in District II. The surface is very rough and broken and has a large percentage of bare clay buttes.

District IV: This district contains 10 per cent second class farming and 90 per cent grazing land. It comprises a large portion of Harding

county, southern Perkins county, northern Meade county and the northeastern corner of Butte county. The grazing land here is much superior to that in District III. Most of the land has a good grass cover and a portion of it is tillable, but because of inferior soil a parge percentage of the tillable land has been classified as grazing land. The land actually under cultivation at this time is of fair quality, but not as good as in District I. The topography is rolling with some scattered buttes and rough areas. The soil ranges from sandy to heavy clay with a heavy loam predominating.

District V: This district contains 40 per cent farming and 60 per cent nontillable grazing land. It is located adjacent to the Black Hills National Forest and extends a considerable distance east of the foothills. The topography ranges from rolling to rough. The grass cover is better than in any other district and as a result the carrying capacity of the grazing land is high.

The soil is better, and to some extent the climatic conditions differ here from the remainder of the range area. Rainfall is heavier and hot winds are not so prevalent as over the rest of the region, due to the proximity of the Black Hills. Many of the creek valleys contain rich alluvial soils formed by deposits from the higher lands. As a result crop production here is less hazardous, and a large percentage of the tillable land is under cultivation.

District VI: This district is classified as 100 per cent grazing land. It is the gumbo region north of the Black Hills. The soil is a heavy clay or shale, supporting a scanty growth of wheat grass. The topography is rolling with many scattered areas level enough for cultivation, but the quality of the soil is with few exceptions unfavorable for farming. The creek flats contain some of the best wild hay meadows found in the entire range region and furnish the necessary winter feed for cattle.

Ranch Organization and Management

The differences in soil and topography that prevail in the range area are largely responsible for the types of ranch organizations in use, although the individual ranchman's inclinations and previous experiences have also played a part.

On following pages are three typical examples of ranch organizations in use in districts II, IV and VI. In districts I and III no records are available. District I contains 75 per cent farming land and cash crop production is relatively more important than the production of livestock. The district is relatively small and does not represent typical range conditions. District III is located outside of the area studied in South Dakota except for a small area in Meade county. District V is located adjacent to the Black Hills and the two ranches involved in the study in this district are not strictly representative. For these reasons no organization set-ups have been prepared for Districts I, III and V.

In the organization set-ups as found on the representative ranches in Districts II, IV and VI, as well as in the suggested reorganizations, current valuations of the land, improvements, livestock, and equipment are set forth in each case; also the acreages of land of the various classes, physical qualities of crops and livestock, and expenses and income. Following the write-up of each of the typical ranch organizations

is a suggested plan of reorganization or adjustment. The bases for the recommendations set forth are as follows:

1. Adaptation—The natural adaptation of the district to the type of organization recommended. By natural adaptation is meant the prevailing soil, topography, native grasses, water supply and climatic conditions.

2. Permanence and stability—It is believed that the organizations outlined have a greater chance for continued profitable operation for a long term of years than the systems now in use, with fewer fluctuations in income from year to year.

3. Flexibility—The recommended organizations are flexible enough to meet the probable changes in market demands for various products. In crop production the various grain crops are interchangeable both as to kinds and acreages produced, so long as the basic principles of the recommended cropping systems are maintained. Alternatives are equally applicable to the production of livestock, both as regards classes of livestock produced and ages of livestock sold. Sheep may be substituted for all or a part of the cattle herd on ranches suitably located and equipped.

4. Simplicity—The recommended organizations are simple enough to be easily applied on a majority of ranches and do not differ radically from the organizations now in use. The physical operations involved can be handled with the average class of available hired labor.

5. Markets—Easily accessible and assured markets for the products raised.

6. Profitableness—The final test of the value of any farm or ranch organization is its profitableness, not for a few years but for a long term of years. The factors listed above will tend to insure the profitableness of the recommended organizations.

7. Size of Business—A business large enough to insure sufficient income to provide a satisfactory standard of living for the ranchman and his family under conditions of average yields and average prices.

Numerous examples in the range area indicate that larger returns than those given in the recommended reorganizations are possible through good management practices in production and marketing. These practices are largely within the individual ranchman's own power to direct.

Ranch Organization, District II

This district has been classified as 70 per cent farming-grazing and 30 per cent nontillable grazing land. A comparatively small percentage of the farming land in this district is under cultivation. A large portion is used for grazing, and cattle production is relatively more important than the production of cash crops.

The production of alfalfa seed is an important enterprise on many ranches of the district; it being confined largely to creek valleys which have the benefit of sub-irrigation or the run-off from adjoining lands. Small grain production is hazardous under ordinary methods of farming because of unfavorable soil and deficient moisture. In years of more than average rainfall good crops are produced, but in dry seasons grain crops are often a partial or total failure. Summer fallowing as a preparation for succeeding crops is highly desirable.

The principal problem confronting the ranchmen in this district is that of acquiring sufficient range either by purchase or long-time leases at prices they can afford to pay. This district does not afford the opportunity for expansion in the range cattle business that the rougher districts do. Expansion here should be made along diversified ranching lines rather than along lines of straight cattle production.

The aim should be to build the farm or ranch organization around the production of livestock, range cattle and sheep providing the main source of income wherever sufficient range is available. Where range is limited and farming land is available, hogs may be produced profitably on some ranches, and cash crop production may be expanded by the use of good dry farming methods. The production of alfalfa both for hay and seed should have an important place on the ranches of this district.

Following is the organization of an actual ranch which in many respects is representative of a majority of the ranches located within the district. It is not representative in the amount of alfalfa seed produced, being considerably above the average in this respect. Nor is it representative in the amount of leased land, being considerable below the average. In common with other ranchmen in the district, this operator is short on range, and as a result his cattle are summer herded in a rougher section of the area adjoining the district.

Details of the organization and operation in 1927 with notations referring to the same in 1926 and 1928 follow.

TABLE 3.—LAND OPERATED, 1927

	Farm Land	Hay Land	Grazing Land	Total
Acres owned	85	190	1,628	1,903
Acres	8	90	382	480
Total operated	93	280	2,110	2,383

In addition to the grazing land listed in Table 3, outside range was utilized for summer herding 135 cattle for five months and a small amount of free range was used. There was no change in the amount of owned land during the three year period but the leased land was increased from 320 acres in 1926 to 480 in 1927.

TABLE 4.—CATTLE INVENTORIES AND CHANGES, 1927

Cattle Classes	Jan. 1 '27	Born	Bo't	Sold	Lost	Jan. 1, '28
Cows	120			43	2	106
Bulls	1		3	1		3
Calves		74			10	
Yearling heifers	31					36
Yearling steers	37				1	28
2-year steers	30		1	2		36
3-year steers	23			23		30
Totals	242	74	1	69	13	239

At the beginning of 1926 this ranch had 217 cattle. The age of all cattle had been advanced one year between the opening and closing inventories. Calves are advanced to yearlings, yearlings to twos, etc.

The calf crop was 62 per cent and calf losses 13 per cent of the calves born, leaving a 54 per cent calf crop raised. During 1926 and 1928 the calf crop raised was 71 and 72 per cent respectively. The calf losses during those years were negligible. The average calf crop raised for the

three-year period was 65 per cent. The heavy calf losses during 1927 are accounted for by a severe blizzard during May of that year which took a heavy toll of young calves over the entire range region.

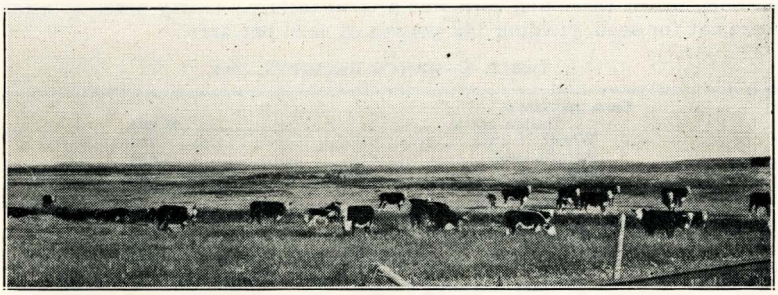

Fig. 4.—Summer Range in the Open Country

TABLE 5.—INVESTMENT, 1927

	Jan. 1, '27	Dec. 31, '27
Land and improvements	$15,500	$17,026
Machinery and equipment	1,279	2,159
Range cattle	9,215	9,405
Hogs	20	100
Horses	525	535
Cash crops on hand	609	588
Feed crops on hand	2 678	2,957
Total investment	$29,826	$32,770

Cattle were inventoried at the same price per head for the various classes at the beginning and at the end of each year. Account is taken of the increase in value due to growth, but no account is taken of the increase in market value due to rise in cattle prices during the year. This increase is a book profit which may be wiped out by declining market prices before the cattle are sold.

This ranch had no indebtedness during the three-year period covered by the survey.

TABLE 6.—CROP PRODUCTION AND VALUES, 1927

	Acres	Yield	Production	Value
Alfalfa hay	200	1.25 tons	250 tons	$1,750
Corn, grain	20	35 bus.	700 bus.	525
Oats	30	35 bus.	1,050 bus.	210
Wheat	18	22 bus.	400 bus.	428
Alfalfa seed	80	141 lbs.	11,300 lbs.	3,164
Alfalfa, new seeding	25			
Total value				$6,077

The 1927 season was a good crop year and the crop yields were somewhat above the average. The season of 1926 was dry and the yields per acre were as follows: alfalfa hay, 1 ton; alfalfa seed, 61 pounds; oats, 20 bushels; and wheat, 11 bushels. The alfalfa suffers less than the other crops on this ranch during dry years because of its location on creek flats that are sub-irrigated in some places, and in other places where it

receives the run-off from adjoining land.

The 1928 crop season was favorable as far as rainfall and temperature were concerned but a destructive hail storm destroyed entirely, or reduced the yields of all crops. Again the alfalfa suffered less than any of the other crops, making a yield of 1 ton per acre while oats made 16 bushels, wheat three and corn was a total failure. Thirty acres of alfalfa were cut for seed, yielding 142 pounds of seed per acre.

TABLE 7.—RANCH RECEIPTS, 1927

Cash receipts:		
Range cattle	$5,264	
Wheat	323	
Alfalfa seed	2,159	
Oats	198	
Total cash receipts		$7,944
Increase in inventory:		
Livestock	280	
Crops	258	
Total inventory increase		538
Total ranch receipts		$8,482

In 1926 the cash sales of range cattle were $2,711; cash crops, $2,528; feed crops, $139; the increase in inventories was $1,459 and the total ranch income was $6,837. In 1928 the cash sales of range cattle were $7,880; cash crops $298, with no sales of feed crops and no increase in inventories. The total ranch income was $8,178. The per cent income from different sources, averaged for the three year period 1926-28 was as follows: range cattle 71 per cent, cash crops 28 per cent, other sources 1 per cent.

The ranch expenses are divided among cash operating expenses, purchases of livestock, depreciation on buildings and machinery, and unpaid family labor where such labor is used. Table 8 gives the actual ranch expenses and net income for 1927.

TABLE 8.— RANCH EXPENSES AND INCOME, 1927

Cash operating expenses:		
Labor, including board	$1,218	
Land lease	50	
Pasture	432	
Taxes	528	
Gas and oil	144	
Seed, twine, threshing	186	
Repairs to buildings and fences	197	
Repairs to machinery, auto, etc.	183	
Miscellaneous	84	
Total cash operating expenses		$3,022
Purchase of livestock		388
Depreciation:		
Buildings	$236	
Machinery and equipment	415	
Total depreciation		651
Total ranch expenses		$4,061
Ranch Income:		
Total ranch receipts less total ranch expenses		$4,421
Value of operator's labor		780
Return on total ranch investment		3,641
Per cent return on ranch investment		12.2

The cash operating expenses for 1926 were $2,871; depreciation, $601; livestock purchases, $251; total ranch expense, $3,723; and ranch income $3,114. In 1928 the cash operating expenses were $2,267; depreciation, $632; livestock purchases, $125; decrease in inventories, $3,358; total ranch expenses, $6,383, and ranch income $1,796. The ranch income averaged $3,110 per year for the three-year period. The per cent return on investment was respectively 8, 12 and 3 for the years 1926, 1927 and 1928.*

The large decrease in inventories in 1928 is accounted for by the fact that all one and two-year-old steers were sold that year, where ordinarily only two-year-olds were sold. The relatively small ranch income can be accounted for by the fact that the cattle sales were made early in the spring before the cattle had made the usual seasonal gains.

The return on investment was 8 per cent in 1926, 12 per cent in 1927 and 3 per cent in 1928. The ranch income averaged $3,110 per year for the three-year period.

Suggested Reorganization, District II

The object of a reorganization plan is to increase the profits and insure the stability of the ranch business. Both of these problems must be considered in any scheme of adjustment.

In studies of ranch organizations it is often found that individual ranches have been operated at a considerable profit for a short period of time, but an analysis of the organization and methods of operation reveals that the system in use is not permanent and must eventually give way to a more stable type of organization if the profits of the ranch are to be maintained.

In the following suggested reorganization of the actual ranch described above, an increase in the total number of cattle is recommended up to the number that can be safely wintered on the available feed supply; for while permanent or long-time control of additional range is not easily secured in this district, additional summer grazing may be had by summer herding on outside range.

Alfalfa hay is a dependable feed crop on this ranch, due largely to the location of the fields on creek flats. The average yields of hay and seed for the past three years are considered normal and are so used in the following estimates of Table 9. The yields of oats and barley are estimates based on average yields in the neighborhood where good cultural methods are used, and are considered conservative when produced under the recommended system

Cropping System: The Cropping system outlined below does not contemplate the production of any cash crops other than alfalfa seed, but is designed to provide winter feed for livestock. The total crop land available for feed production is 120 acres, having been increased from 85 acres during 1927 by breaking 35 acres of grazing land. The following cropping system is recommended.

Corn on spring plowing	30 acres
Oats on disked corn ground	30 "
Summer fallow	30 "
Barley on summer fallowed land	30 "

* The per cent return on investment is based on the same value per head of each class of cattle at the end of the year as on January first of the same year. Account is taken of the increase in value through growth but not through changes in market price.

With the above cropping system one-fourth of the land will be summer fallowed, one-fourth will be in corn and one-half in oats and barley. The grain crops are raised on corn ground and summer fallowed land. With the crops rotated in the above order the chances of low yields or crop failures will be considerably reduced below those likely to occur under the ordinary methods of crop production.

Table 9 shows the estimated yields, total production, and total estimated value of crops grown under the suggested cropping system. The yields of alfalfa hay, seed, and straw are the three-year average yields secured during the three-year period 1926-1928. The yields of grain crops are estimates based on neighborhood yields.

TABLE 9.—ESTIMATED YIELDS OF CROPS

	Yield per acre		Tot. production	
	Tons	Bushels	Tons	Bushels
Alfalfa hay ____ 200	1		200	
Alfalfa seed ____ 36		[illegible]		144
Alfalfa straw __	1		36	
Corn fodder ____ 30	1.5		45	
Oats _____ 30		30		900
Oats straw	.6		20	
Barley _____ 30		25		750
Barley straw ___	.5		15	

The acreage of alfalfa cut for seed is not constant from year to year. During the three-year period covered by the survey the acreage harvested for seed has ranged from 30 to 80 acres per year.

Livestock: An increase of 155 head of cattle is recommended above the average numbers handled during the three year period under discussion. Because of limited range near headquarters all classes of cattle must be fed on this ranch during the winter. Under these conditions it is probable that the sale of yearling heifers and two-year-old steers will result in higher net returns than if either younger or older cattle are sold.

Under the suggested organization the following numbers of cattle will be carried through the winter: 160 cows, 32 two-year heifers, 62 two-year steers, 128 yearlings and 6 bulls, making a total of 388 head.

The number of yearlings reased is based on an 80 per cent calf crop. Close herding or the use of breeding pastures will be necessary to increase the calf crop to that average. The conditioning of bulls is also important as a means of increasing the calf crop on most ranches. On this particular ranch, however, bulls are usually in good condition for the breeding season.

Table 9 shows 316 tons of roughage and 1,650 bushels of grain are available for feed annually. This feed should be distributed as in Table 10.

The combined allowance of hay, corn fodder, and alfalfa straw approximately equals the average amount of hay fed per head during the three-year period, while the grain allowance is approximately double the average amount per head during the same period.

Estimated Receipts: Table 11 gives the estimated numbers and classes of cattle to be marketed under the suggested organization, and the estimated annual ranch receipts with low, medium and high cattle

prices. The estimated returns from alfalfa seed are the average returns actually received during the three years under discussion.

TABLE 10.—PROPOSED DISTRIBUTION OF FEED CROPS

Livestock	Feed per head	Total feed
192 Cows and heifers	.5 T. hay	96 tons
	.5 T. fodder and straw	96 tons
128 Yearlings	.5 T. hay	64 tons
62 2-year-old steers	.5 T. hay and straw	31 tons
6 Bulls	2.0 T. fodder and hay	12 tons
Horses	hay	17 tons
Total roughage		316 tons
Thin cows and heifers	grain	400 bus.
Yearlings	grain	800 bus.
Bulls	grain	50 bus.
Horses	grain	300 bus.
Seed	grain	100 bus.
Total grain		1,650 bus.

TABLE 11.—ESTIMATED CASH RECEIPTS WITH LOW, MEDIUM, AND HIGH CATTLE PRICES

No. and classes of cattle sold	Low prices		Medium prices		High prices	
	Price	Amount	Price	Amount	Price	Amount
26 Cows	$40	$1.040	$60	$1,560	$80	$2,080
30 Yearling heifers	35	1,050	45	1,350	65	1,950
61 2-year-old steers	55	3,355	70	4,270	90	5,490
Alfalfa seed		1,422		1,422		1,422
Total cash receipts		$6,867		$8,602		$10,942

The above prices are the approximate average low, medium and high prices received in the range region during the period 1926-28 for the various classes of cattle listed.

A three per cent death loss has been deducted from all classes of cattle. The number of replacement heifers equals 20 per cent of the cow herd.

Estimated Expenses: The actual cash operating expenses on this ranch during the three year period has been used as a basis for estimating the expenses under the suggested reorganization. Table 12.

TABLE 12.—ESTIMATED OPERATING EXPENSES

Three-year average actual operating expense	$2,720
Additional summer herding, 155 head @ $2.50 per head	387
Additional labor, 4 months @ $75	300
Additional taxes, 155 head @ $.50	77
Total cash operating expense	$3,484
Depreciation, three-year average, actual	628
Total ranch expenses	$4,112

Ranch Income: The ranch income given in Table 13 might be expected from the proposed reorganization, using the receipts given in Table 11 and the expenses of Table 12.

TABLE 13.—ESTIMATED RANCH INCOME

Low prices	Medium prices	High prices
$2,755	$4,490	$6,830

The actual ranch income was $3,114 in 1926, $4,421 in 1927 and $1,796 in 1928.

Ranch Organization, District IV

Following is the organization of an actual ranch in District IV. The organization of this ranch is representative of a majority of ranches in the district. The land acreage operated is somewhat larger than the average of all cooperative ranches, while the number of cattle handled is slightly smaller. A small percentage of the cattle ranches in the district produce more cash crops than this ranch, and a few ranches have an additional income from the sale of hogs, sheep or horses, all of which are of minor importance.

The following tables show the organization of the ranch in detail for 1927, with notations showing the changes in organization in 1926 and 1928.

TABLE 14.—LAND OPERATED, 1927

	Farm land	Hay land	Grazing land	Total
Acres owned	50	525	1,785	2,360
Acres leased			2,620	2,620
Forest range			2,320	2,320
Total operated	50	525	6,725	7,300

This ranch contains 7,300 acres, of which 2,360 acres are owned, 2,620 are leased and 2,320 are National Forest range. The land acreage operated remained the same throughout the three-year period. All other cooperating ranches in the district used either free or forest range, or both. The average size was 6,200 acres, of which 1,800 were owned and 4,400 acres leased.

TABLE 15.—CATTLE INVENTORIES AND CHANGES, 1927

Cattle classes	Jan. 1, '27	Born	Bought	Sold	Lost	Jan. 1, '28
Cows	121			6	3	143
Bulls			1			1
Calves		81			8	
Yearling heifers*	43			8	2	37
Yearling steers	54				2	36
2-year steers	41			24		52
3-year steers	41			41		17
Totals	300	81	1	79	15	286

* Butchered two.

The total number of cattle was decreased on this ranch from 323 head on January 1, 1926 to 286 on January 1, 1928, while in the South Dakota area there was an average increase on the cooperating ranches from 346 to 364 during the same time. In the entire range region including 60 cooperating ranches the average numbers on January first were 337 in 1926, 318 in 1927, 372 in 1928, and 404 in 1929. The decrease in 1926

occurred during the latter part of the year as a result of heavy marketing following the dry season of that year.

The calf crop on the ranch under discussion was 69 per cent in 1926, 67 per cent in 1927 and 69 per cent in 1928, an average of 68 per cent for the three-year period. The calf losses for the same period were 4 per cent, 10 per cent and 2 per cent respectively. The three-year average calf crop raised was 66 per cent.

TABLE 16.—INVESTMENT, 1927

	Jan. 1	Dec. 31
Land and improvements	$31,766	$31,377
Machinery and equipment	2,400	2,310
Range cattle	10,535	10,262
Horses	420	300
Cash crops on hand	358	554
Feed on hand	2,365	1,280
Total investment	$47,844	$46,083

Table 16 shows the ranch investment for 1927. The total investment was decreased from $47,929 on January 1, 1926 to $46,083 on January 1, 1928 due largely to a decrease in cattle numbers. No account has been taken of the increase in market value of cattle due to rise in market prices.

The ranch indebtedness in 1926 was $4,000. This was reduced to $3,400 in 1927 and paid in full in 1928.

TABLE 17.—CROP PRODUCTION AND VALUES, 1927

	Acres	Yield	Value
Alfalfa hay	50	60 tons	$600
Wild hay	150	140 tons	980
Oats	32	1,190 bus.	595
Total value			$2,175

The crop yields of 1927 were above the average. Alfalfa hay yielded 1.2 tons, wild hay 0.9 ton and oats 37 bushels per acre. The season of 1926 was dry and alfalfa hay yielded 0.8 ton, wild hay slightly less than 0.5 ton. Ten acres of wheat was a failure and 30 acres of oats were cut for hay, yielding 0.5 ton per acre. The season of 1928 was favorable and the yield of alfalfa hay was 1.4 tons per acre, wild hay 0.5 ton, millet 1.8 tons, oats 28 bushels, and barley 30 bushels.

TABLE 18.—RANCH RECEIPTS, 1927

Cash receipts:	
Range cattle	$6,650

This ranch had no cash receipts except from the sales of range cattle. However, an increase in feed inventories during 1926 and 1928 was reflected in a small increase in inventory values. The percentage of receipts from different sources, average for the three-year period, was: range cattle 94 per cent, feed crops 6 per cent.

TABLE 19.—RANCH EXPENSES AND INCOME, 1927

Cash operating expenses:		
Feed bought	$296	
Labor, including board	268	
Grazing land lease	158	
Forest fees	125	
Taxes	456	
Gas and oil	177	
Seed, twine, threshing	60	
Repairs of machinery, auto, etc.	35	
Miscellaneous	5	
Total cash operating expenses		$1,580
Purchase of livestock		238
Depreciation:		
Buildings	$389	
Machinery and equipment	368	
Total depreciation		757
Decrease in inventories:		
Livestock	393	
Crops	658	
Total decrease in inventories		1,051
Total ranch expenses		$3,626
Ranch Income:		
Total ranch receipts less total ranch expenses		$3,024
Value of operator's labor		780
Return on total ranch investment		$2,244
Per cent return on ranch investment		4.7

The cash operating expenses amounted to $1,078 in 1926, $1,580 in 1927 and $1,882 in 1928. The steady increase in operating expenses was largely due to an increase in the items of hired labor, repairs, and gas and oil for automobiles.

The ranch income was $3,317 in 1926, $3,024 in 1927 and $7,445 in 1928. The relatively large income in 1928 resulted from profits from cattle purchased during the year and from an increase in inventory values of feeds raised.

Suggested Reorganization, District IV

This district has been classified as 90 per cent grazing and 10 per cent farming land. There is undoubtedly a somewhat higher percentage of potential farming land in this district than indicated above, but with the exception of lands located on creek flats, the potential farming land is generally inferior in quality, and a large percentage of these lands can probably be better utilized as grazing lands at the present time. The topography ranges from rolling to rough with sufficient natural protection over most of the district to provide shelter for winter grazing.

The limiting factors in an expansion program in this district are about equally divided between need of grazing lands, and good farming lands for the production of winter feed. The fact that a limited amount of free range is available indicates that some additional range may be had.

The estimated carrying capacity of range lands on the ranch under discussion is 20 acres per head. This is approximately the average estimated capacity of the entire district. The ranch contains 6,725 acres of

grazing land, 110 acres of farm land and 465 acres of hay land at the present time. Sixty acres of native hay land were broken up in 1927, and at least an additional 100 acres could be broken up and farmed.

Feed Production: Wild hay is an important source of winter feed on the ranches of this district. The ranch under discussion has 465 acres of wild hay land at the present time. Under the proposed reorganization, this will be reduced to approximately 400 acres by breaking up a part of the hay land

The hay land is mainly upland and should be cut only every second year. In other words, one-half of the acreage will be cut each year. The three-year average yield of wild hay has been 0.6 ton per acre for each acre harvested, and the additional yields of alfalfa have been 1.2 tons per acre. Very little additional land is suitable for alfalfa on this ranch and any increase in feed crops must be made through farming. At the present time 110 acres is under cultivation. This should be increased to 180 by breaking up 70 acres of wild hay land.

Because of the prevailing soil and moisture conditions in this district, crops should be grown on summer fallowed land only, in order to insure paying yields.

With 180 acres of land under cultivation, the cropping system given in Table 20 is recommended; one-half of the cultivated land will be summer-fallowed and one-half in crops each year, with two-thirds of the crop land in hay and one-third in grain. In dry years it might be best to cut the entire acreage for hay; and in years when the hay crop is good, the entire grain crop might be harvested as grain, and the amount of concentrated feeds bought could be reduced.

TABLE 20.—ESTIMATED YIELDS OF CROPS

Crop	Acres	Yield per acre		Total production	
		Tons	Bus.	Tons	Bus.
Oats	30		30		900
Grain hay	60	1		60	
Summer fallow	90				
Wild hay harvested	200	.6		120	
Alfalfa hay	50	1.2		60	
Totals				240	900

Livestock: The 6,725 acres of grazing land is sufficient to handle 325 head of mature cattle, and the available hay and farming land will produce the necessary winter feed for that number.

Largely because of the hazards of crop production and the relatively low costs of grazing land, the sale of three-year-old steers is recommended rather than younger cattle, and cull heifers should be sold as long-aged yearlings because of the market discrimination against mature heifer beef. The spread in price between steers and heifers widens with the increase in age. A diversified system of ranching that involves the production of other than range cattle and sheep is not recommended. Range cattle provide 85 per cent of the incomes on the cooperating ranches in the district and the only other dependable source of income is from range sheep. The district is equally well suited to the production of cattle and sheep, and a combination of both on the same ranch may prove more profitable over a term of years than either alone, but since no data are available on sheep production in this region, recommendations are confined to cattle.

The calf crop can be increased to 80 per cent by the methods outlined elsewhere in this publication. Assuming an 80 per cent calf crop raised, and deducting a 3 per cent loss in cows and yearlings and a 2 per cent loss in other cattle, the following numbers of cattle would be carried through the winter: 125 cows, 100 yearlings, 25 2-year heifers, 48 2-year steers, 47 3-year steers and 4 bulls, making a total of 349 head.

The above number is equal to 23 head more than the average number on hand January 1, 1926 to 1929 inclusive. The estimated carrying capacity of the available range is 335 head of mature cattle, but since nearly 30 per cent of the above cattle are yearlings, the range requirements of the above herd will be no greater than for 335 head of mature cattle.

Table 21 gives the estimated feed requirements of the cattle recommended for this ranch.

TABLE 21.—FEED REQUIREMENTS FOR LIVESTOCK

Livestock	Feed per head	Total feed
150 Cows and heifers	1 ton hay	150 tons
100 Yearlings	.5 ton hay	50 tons
85 2- and 3-year steers	.25 ton hay	22 tons
4 Bulls	2 ton hay	8 tons
Horses		10 tons
Total hay		240 tons
Thin cows and heifers	Cottonseed cake	7,500 lbs.
Bulls	Cottonseed cake	500 lbs.
Yearlings	Cottonseed cake	8,000 lbs.
Yearlings	Oats	400 bus.
Horses	Oats	350 bus.
Seed	Oats	150 bus.

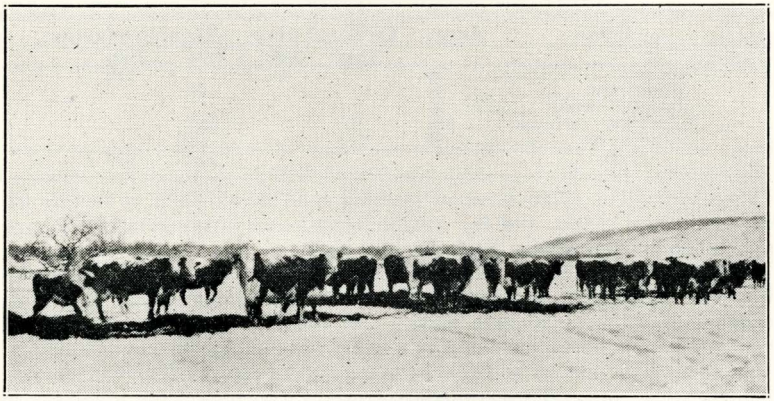

Fig. 5.—A Good Supply of Winter Feed Means Contented Cattle Although There May be Snow on Their Backs

It provides for the consumption of the estimated hay and oats raised on the ranch and the purchase of eight tons of cottonseed cake to supplement the feeds raised.

The grain allowance per head is approximately the same as the average amounts fed during the three-year period, while the average amount

of cottonseed cake actually fed was 26 pounds as compared with 46 pounds under the suggested organization. The average amount of roughage fed was 950 pounds as compared with 1,300 pounds per head recommended. In addition, the proposed organization contemplates an increase in a class of cattle that requires a minimum amount of winter feed, namely three-year-old steers. Where winter grazing is available this class of cattle is not fed execept in extremely severe winters.

Estimated Receipts: Following are the estimated cash receipts from the sale of cattle at low, medium and high cattle prices from a breeding herd of 125 cows and with an 80 per cent calf crop; selling the surplus heifers as yearlings and the steers as three-year-olds after deducting a three per cent death loss in cows and yearlings and a two per cent loss in other cattle.

TABLE 22.—ESTIMATED CASH RECEIPTS WITH LOW, MEDIUM AND HIGH CATTLE PRICES

Numbers and classes of cattle sold	Low prices		Med. prices		High prices	
	Price	Amt.	Price	Amt.	Price	Amt.
20 Cows	$40	$800	$60	$1,200	$80	$1,600
23 Yearling heifers	35	805	45	1,035	65	1,495
46 3-year-old steers	70	3,220	90	4,140	110	5,060
Total cash receipts		$4,825		$6.375		$8,155

Estimated Expenses: The three-year average operating expenses on this ranch have been used as a basis for estimating the expenses for the suggested organization, making additions to the actual expense as the increased numbers of cattle and increased feed production seems to warrant. Table 23.

TABLE 23.—ESTIMATED OPERATING EXPENSES

Three year average operating expense, actual	$1,513
Additional labor for handling increased numbers of cattle and increased amount of farming, 5 months @ $75	375
Additional taxes, 23 head @ $0.50	12
Additional feed, 8 tons cottonseed cake @ $50	400
Depreciation, 3-year average, actual	833
Total ranch expenses	$3,133

Ranch Income: The ranch incomes given in Table 24 might be expected from the proposed organization, using the receipts given in Table 22 and the expenses of Table 23.

TABLE 24.—ESTIMATED RANCH INCOME

Low prices	Medium prices	High prices
$1,692	$3,242	$5,022

Ranch Organization, District VI

This district has been classified as 100 per cent grazing land. It is the gumbo region north of the Black Hills. While classified as straight grazing land, the district represents an entirely different type of range from District III which is classed as 95 per cent grazing. District III which includes the Bad Lands area is characterized by a very rough and broken surface, while District VI may be designated as rolling with many

areas only gently rolling. The reason for its classification as grazing land lies in the quality of its soil which is mostly a heavy gumbo or shale generally unsuited to cultivation, but where moisture is adequate it produces a very good crop of native grass. This is particularly true of the creek flats that are subject to flooding or that receive the run-off from adjoining land. The soil is probably of better quality on the creek flats than on the adjoining uplands.

Because of its open and unprotected character this district is not as favorably situated for winter grazing as the rougher districts, and more dependence must be placed on winter feeding. Natural shelter in the form of brush draws are limited, and the use of sheds for winter protection is relatively important

Following is the organization of a ranch in this district which is typical of a large majority, both as to size and type of organization. It varies from the typical in the relative amounts of owned and leased land.

This ranch contained 4,000 acres in 1927, of which 2,080 acres were owned and 1,920 acres leased, while the strictly representative ranch in this district has a higher percentage of leased land.

The land acreage was increased to 4,160 acres in 1928 by the purchase of 160 acres of grazing land. Of the owned land, 480 acres is wild hay and the balance grazing. Additional grazing land is available at low rental costs and a limited amount of free range is also available. The average annual production of wild hay is estimated at three-fourths ton per acre. This ranch contains no tillable land, or at least no land is under cultivation at the present time, and it is doubtful if any of the potential farming land on this ranch should be broken up since it produces a very good crop of wild hay.

The following tables give the details of the ranch organization as operated in 1927, with notations concerning the organization and operation in 1926 and 1928.

TABLE 25.—LAND OPERATED, 1927

	Hay land	Grazing land	Total
Acres owned	480	1,600	2,080
Acres leased		1,920	1,920
Total operated	480	3,520	4,000

In addition to the land listed in Table 25, approximately 640 acres of free range was used.

TABLE 26.—CATTLE INVENTORIES AND CHANGES, 1927

Cattle classes	Jan. 1, '27	Born	Bot.	Sold	Lost	Jan. 1, '28
Cows	140			23	*14	102
Bulls	2					4
Calves		95			30	
Yearling heifers	40					32
2-year heifers						40
Yearling steers	40					33
2-year steers	34			32	2	40
	256	95		55	47	251

* One cow was slaughtered for home use.

On January 1, 1926, this ranch had 301 head of cattle. This number was reduced to 256 head by January 1, 1927 and further reduced to 251 head by January 1, 1928. The calf crop was 68 per cent in 1927, and the

calf losses were 31 per cent of the calves born, making a 47 per cent calf crop raised. In 1926 the calf crop was 70 per cent, calf losses were seven per cent of all calves born, and the calf crop raised was 65 per cent. In 1928 the calf crop was 85 per cent, calf losses were seven per cent, and the calf crop raised was 80 per cent. The three-year average calf crop was 75 per cent, average calf losses were 15 per cent, and the calf crop raised was 64 per cent.

TABLE 27.—INVESTMENT, 1927

	Jan.	Dec.
Land and imprevements	$13,341	$13,287
Machinery and equipment	1,423	1,226
Range cattle	10,730	11,025
Horses	540	540
Feed on hand	39	12
Feed crops on hand	2,930	3,900
Total investment	$29,003	$29,990

The cattle are inventoried at the same price per head for the various classes at the end as at the beginning of the year. Account is taken of increase in value due to growth but no account is taken of the increase in market value due to rise in market prices during the year.

The ranch indebtedness was $10,000 in 1926. This was reduced to $7,800 in 1927 and further reduced to $6,828 in 1928.

TABLE 28.—CROP PRODUCTION AND VALUE, 1927

	Acres	Production	Value
Wild hay	200	400 tons	$4,000

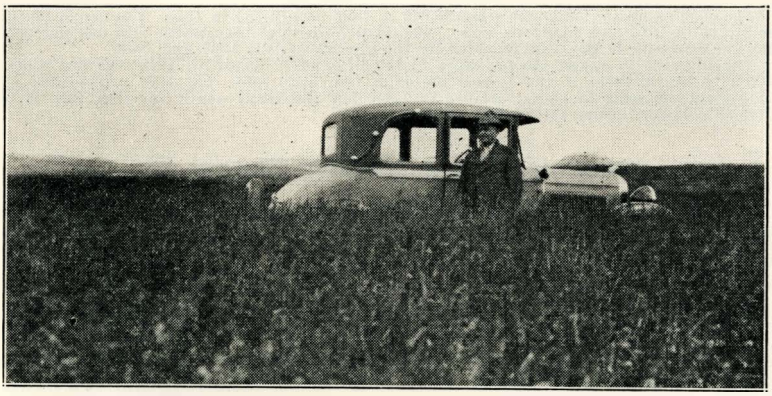

Fig. 6.—Hay on Creek Flats is the Cheapest Source of Winter Feed

This ranch is very favorably situated with reference to its hay supply. The hay meadows are all located on creek flats that are subject to flooding and receive the benefit of run-off from adjoining land. The 1927 sea-

son was quite favorable for hay production and the yield of hay on this ranch was two tons per acre, as compared with the three-year average of slightly more than one ton.

TABLE 29.—RANCH RECEIPTS, 1927

Cash Receipts:		
Range cattle		$4,265
Increase in inventory:		
Livestock	$295	
Crops and feed	943	
Total increase in inventories		1,238
Total ranch receipts		$5,503

The total ranch receipts were $5,992 in 1926 and $7,586 in 1928.

TABLE 30.—RANCH EXPENSES AND INCOME, 1927

Cash operating expenses:		
Feed bought	$ 30	
Labor, including board	375	
Grazing land lease	161	
Taxes	458	
Gas and oil	66	
Repairs to buildings and fences	10	
Repairs to machinery, auto, etc.	43	
Miscellaneous	113	
Total cash operating expenses		$1,256
Livestock purchased		300
Depreciation:		
Machinery and equipment	197	
Buildings and improvements	54	
Total depreciation		251
Value unpaid family labor		520
Total ranch expenses		$2,327
Ranch Income (receipts less expenses)		$3,176
Value of operator's labor		780
Return on total ranch investment		2,396
Per cent return on ranch investment		8.3

The cash operating expenses were $1,264 in 1926 and $1,584 in 1928. The ranch income was $1,110 in 1926 and $5,005 in 1928 . The return on total investment was one per cent, eight per cent and 11 per cent respectively for the years 1926, 1927 and 1928.

The increase in ranch income from $1,110 in 1926 to $5,005 in 1928 was due almost entirely to the increase in the market prices of the cattle sold. The 1927 prices were approximately the same as those received in 1928, but the heavy death loss that year is reflected in a lower income for 1927.

Suggested Reorganization, District VI

The limiting factor in an expansion program on this ranch as well as over the balance of the district is the winter feed supply. Because of the prevailing soil conditions, diversified ranching is out of the question. Range cattle and sheep constitute the only sources of income from the ranches of this district. Wild hay is a fairly dependable source of winter feed, but a feed reserve is necessary to tide over the inevitable dry seasons. Some grain feed or cotton seed cake should be purchased to supplement the hay, particularly for wintering calves, bulls and thin cows.

The ranches of this district having good wild hay meadows and an abundance of cheap range can be operated more profitably than those located where farming must be carried on for the production of winter feed, even though a small amount of supplementary concentrates is purchased.

The heavy death loss of calves on this ranch (15 per cent as compared with the three-year average of 6 per cent for all ranches involved in the survey), indicates the need of more adequate shelter and more liberal feeding to prevent the heavy losses.

Livestock: The average annual production of wild hay on this ranch is estimated at 300 tons. This feed supply with the addition of a relatively small amount of purchased concentrates justifies an increase in the numbers of cattle up to 365 head. The number of cows should be increased to 150. The cull heifers should be sold as long-aged yearlings and the steers as long-aged two-year-olds. The calf crop could be increased to 80 per cent by more liberal feeding, by the use of breeding pastures or riders during the breeding season, and by providing shelter against the late spring storms to prevent death loss.

Assuming an 80 per cent calf crop raised, the following numbers of cattle would be carried through the winter: 150 cows, 30 two-year heifers, 58 two-year steers, 120 yearling steers and five bulls, making a total of 363 head.

Table 31 gives the estimated feed requirements of the above numbers of cattle.

TABLE 31.—FEED REQUIREMENTS FOR LIVESTOCK

Livestock	Feed per head	Total feed
180 Cows and heifers	1 ton hay per hd.	180 tons
120 Yearlings	.5 ton hay per hd.	60 tons
58 2-year steers	.5 ton hay per hd.	29 tons
5 Bulls	2 ton hay per hd.	10 tons
Horses		21 tons
Total feed		300 tons

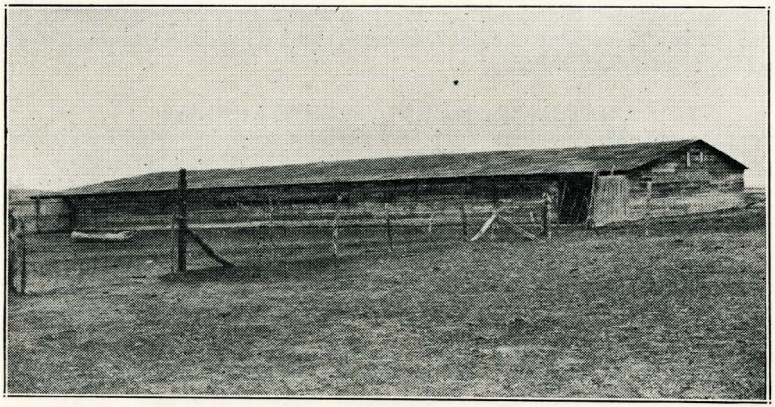

Fig. 7.—Sheds are Necessary Where no Natural Shelter is Available

In addition to the hay, 10 tons of cottonseed cake or 20 tons of grain should be purchased to supplement the hay. The grain should be fed to the yearlings, bulls and thin cows. The hay allowance is approximately the same as the average amounts fed during the three year period. The

concentrates are equal to 55 pounds of cottonseed cake or 110 pounds of grain per head for all cattle wintered, while the average consumption of concentrates during the three years has amounted to five pounds per head yearly. The use of additional concentrates will increase the weight of the yearlings, reduce the death losses and increase the calf crop by conditioning the bulls for the breeding season.

Estimated receipts: Following are the estimated ranch receipts from the sales of cattle at low, medium and high cattle prices from a breeding herd of 150 cows and an 80 per cent calf crop; selling the cull heifers as long yearlings and the steers as long two-year-olds. A three per cent death loss in cows and yearlings and a two per cent loss in two year olds has been deducted.

TABLE 32.—ESTIMATED CASH RECEIPTS WITH LOW, MEDIUM AND HIGH CATTLE PRICES

Numbers and classes of cattle sold	Low prices		Med. prices		High prices	
	Price	Amt.	Price	Amt.	Price	Amt.
25 Cows	$40	$1,000	$60	$1,500	$80	$2,000
28 Yearling heifers	35	980	45	1,260	65	1,820
57 2-year steers	55	3.135	70	3,990	90	5,130
Total cash receipts		$5,115		$6,750		$8,950

The above prices are the approximate average low, medium and high prices received in the range region during the three-year period for the various classes of cattle listed.

Estimated Expenses: As in the case of the suggested ranch organization for District II and District IV, the average yearly operating expenses on this ranch have been used as a basis for estimating the expenses for the suggested reorganization. As a basis for estimating the additional expense necessary to handle the increased numbers of cattle, the rates used are the same per head as the actual average yearly expense for the three-year period. This seems fair where the income is from the sale of range cattle only.

TABLE 33.—ESTIMATED OPERATING EXPENSES

Three-year average actual operating expenses	$1,368
Additional expense for handling the increased number of cattle	350
Additional, 10 tons cottonseed cake	500
Total cash operating expenses	$2,218
Additional taxes, 62 head @ $.50	31
Depreciation, three-year average, actual	264
Unpaid family labor average, actual	605
Total ranch expense	$3,118

Estimated Income: The ranch income given in Table 34 might be expected from the proposed reorganization, using the receipts given in in Table 32 and the expenses of Table 33.

TABLE 34.—ESTIMATED RANCH INCOME

Low prices	Medium prices	High prices
$1,997	$3,632	$5,832

The actual ranch income was $1,110 in 1926, $3,176 in 1927, and $5,005 in 1928.

Summary of Principles of Ranch Organization and Management

1. According to recent census figures the farms and ranches in this area are too small in many cases to provide a satisfactory income. Where additional land can be added either through purchase where prices are reasonable, or through long time leases, the stockmen and farmers should increase their land holdings to a size that will assure them a satisfactory income in years of average yields and average prices.

2. The acreage necessary to provide a satisfactory income will be determined by the quality of the land, the local climatic conditions and the ranch organization in use. With the most common types of organization, the acreage requirements increase as the quality of the land decreases.

3. Crop production is hazardous because of limited rainfall, but with the use of good tillage methods and proper crop rotation much of the risk can be taken out of farming.

4. In order to carry on a permanent type of agriculture which at the same time promises the greatest net returns, a system of cash grain and livestock production should be adopted wherever practicable, even though all the land used may be tillable.

5. Beef cattle and grain production make a good organization, because beef cattle get considerable feed from the by-products of grain farming, and the two enterprises do not compete seriously for labor. Grain farming involves summer labor and beef cattle require mainly winter labor. Beef cattle do not require expensive buildings.

6. Where farms and ranches are small with no prospect of increasing their size, an intensive type of organization should be adopted. This will generally involve two or more of the following enterprises: dairying, beef production, pork production, lamb and wool production, and in some cases poultry production on a rather extensive scale, in conjunction with cash crops. This type of organization requires a cheap and dependable supply of labor throughout the year.

7. Intensive systems require close attention to details by the operator. With large scale operations, close supervision is generally difficult, and where extensive acreages are covered a system of operation should be adopted that can be handled with the available class of hired labor.

8. The expenses of labor and equipment are the two biggest items of cost . This suggests a type of organization that involves the most effective use of labor, a coordination of enterprises to avoid competition for labor, and sufficient acreage to make the fullest possible use of equipment—in other words, handle a maximum acreage with a minimum amount of labor and equipment.

9. Where only a limited acreage of land is available for cultivation in conjunction with comparatively large acreages of grazing land, the tillable land should be utilized mainly for feed production. The operator under these conditions should plan to make the fullest possible use of his grazing land and to use a minimum amount of winter feed. This generally implies running cattle to long ages.

10. It is generally agreed among stockmen that good native hay meadows provide the cheapest and most dependable source of winter

feed, especially where the meadows are located on creek flats that are subject to flooding or sub-irrigation. On lands that are not so favorably located, alfalfa is the most dependable hay crop, except on the poorer soils and rolling lands where the run-off is heavy. Here annual feed crops should be produced.

11. Summer fallow, plowed early and kept free from weeds during the balance of the season, is the best preparation of the land for grain crops the following year. The next best preparation is clean corn ground.

12. In order to provide for the inevitable dry years, at least one year's supply of feed should be on hand before any considerable investment is made in livestock. This is most important in districts where feed production is quite hazardous.

13. In the selection of enterprises, that combination should be chosen which promises the greatest total net returns over a period of years for the capital and labor expended. This necessitates a knowledge of labor, land and other capital requirements for each of the enterprises selected, as well as the relative permanence when compared with alternative enterprises which might be selected. The last is particularly important where large capital expenditures are required which cannot be readily converted to use in other enterprises.

Range Cattle Management

Herd Improvement: With few exceptions the quality of cattle produced in the range areas is high at the present time. Pure bred bulls have been used on many ranches for a quarter of a century or more, and now their use is an almost universal policy among ranchmen. However,

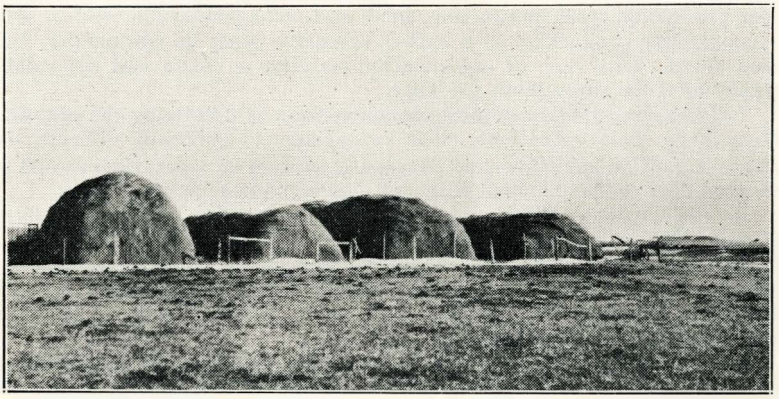

Fig. 8.—A reserve Hay Supply is the Best Insurance Against Dry Years and Hard Winters.

many cow herds show lack of uniformity and poor individuals are found in most herds, indicating insufficient attention to culling. Close culling of the cow herds as well as careful selection of the bulls is necessary to the further improvement of range herds.

On the best managed ranches, cows are culled on performance as well as on age, type and conformation. Cows that are shy breeders, poor keepers, or that raise poor calves are culled out on these ranches. Cows that are shy breeders may also be poor keepers in that they come through the winter in poor condition, breed late in the season or do not breed at all. In other cases abortion disease may be present in the herd and this invariably results in a low calf crop and a certain percentage of non-breeders.

In herds that have not been carefully culled for several generations, or that have been recently brought to the range country there is always a number of poor keepers, that is, cows that winter poorly or are poor rustlers. Old cows are sometimes overlooked and remain in the breeding herd longer than good management practices dictate. In other cases, cows with late calves are carried through the winter without weaning, and where the feed supply is short these cows are usually in poor flesh before the winter is over. They go on grass in a weakened condition in the spring and are apt to breed late in the season and calve late the following year. These cows make up the bulk of the "hospital bunch" on every ranch and are a source of worry and expense to the ranchmen who handle them.

Cows that do not raise good calves are generally poor milkers. In the selection of replacement heifers, preference should be given to heifers from heavy milking cows that are known to raise good calves.

The time of culling is largely an individual problem and will be determined largely by the facilities for handling cattle that prevail on each ranch. One of the most successful ranchmen makes a practice of culling his cow herd at branding time in the spring. The cull cows are separated from the breeding herd, turned into a pasture with the yearling heifers, and are sold the following year as dry cows. This ranchman feels that the cost of carrying the cull cows through one year is more than compensated for in the extra value of the dry fat cows as compared with canners. Other ranchmen cull at shipping time in the fall. The inferior individuals do not show up as well at this time of the year, however, as in the spring.

A few ranchmen make a practice of shipping all their dry fat cows regardless of any and all considerations. Under this system the best cows in the herd are often shipped. A cow that has become a non-breeder should be disposed of as soon as this fact is known definitely, but all dry cows are not non-breeders. Except in the presence of contagious abortion disease, a majority of dry cows will breed after missing one year.

One ranchman makes a practice of branding dry cows with a tally mark the year they are dry and when cows are known to be dry two years in succession they are considered non-breeders and are shipped as soon as they become fat.

The age at which cows are culled varies from 8 to 12 years, with 9 to 10 years as an approximate average where age is the only consideration. Cows that have proved unsatisfactory for any other cause are generally culled at an earlier age. The care and management of the breeding herd determines to a considerable extent the age at which cows are culled. Their life of usefulness is increased where they are consistently well cared for and brought through the winters in strong, thrifty condition.

In the selection of replacement heifers the ranchman should keep in mind the type of cows he wants to raise. Conformation, size and scale, and milking and rustling qualities are all important. Until recent years, cross breeding was generally considered necessary to retain size and scale in the herd; but during later years many ranchmen have found that careful selection of herd bulls, and breeding to cows of the same breed accomplish equally good results, and at the same time produce more uniformity in color and conformation which makes stock more attractive to buyers.

The cull heifers should be separated from the breeding herd and handled in a separate pasture or they should be spayed. When kept beyond the yearling age spaying is the most practical treatment of inferior heifers because they can be handled the same as the steer herd. They are equally hardy and can be fattened on grass fully as well as the steers.

The type of bulls selected will be determined to a considerable extent by the age at which the steers are sold. During the days of big steer production the big rangy bull was in demand and is still in demand where three and four-year-old steers are produced. On the other hand, the ranchmen who sell calves to the corn belt feeders will find that buyers prefer calves from a rather small, early maturing, low down, compact type of bull. For the average man selling yearlings or two-year-olds, an intermediate type will prove satisfactory.

Ranchmen should not lose sight of the fact that a range bull must be able to travel, and often covers long distances in a rough country; and while all ranchmen are eager to produce the kind of steers that are "beef to the hocks," their bulls must have a good set of legs under them and not be overburdened with excessive fat if they are to be of the most use. This may seem contradictory to the oft repeated statement that bulls should be in good condition. There is, however, a wide difference between good breeding condition and show ring finish.

Where young bulls are purchased they should be selected from herds that are handled under as nearly the same conditions as those prevailing where the bulls will be used. If bulls must be brought in from outside the range territory they should be purchased as yearlings and acclimated for one year before they are placed in full service. Wherever possible, the bulls should be selected from dams of good milking qualities, size, and conformation as well as from the right type of sire.

Ranchmen generally do not give enough attention to the purchase of approved sires. Many good bulls have gone to the shambles long before their time because nobody, apparently, appreciated their value. Bulls that have sired one or more crops of calves that can be seen by the prospective purchaser, have proved their worth or lack of it as the case may be, and the buyer is not taking the chances that attend the purchase of young untried bulls.

Calf Crop: The object of maintaining a breeding herd is to produce calves. Cows that do not produce calves are maintained at a loss. These facts are so obvious that they require no further comment, yet many ranchmen in the Great Plains region keep a large percentage of cows that do not raise calves. On many ranches, one-third or more of the cows are dry every year. Some of the causes for the low calf crops are beyond

the control of the ranch operator, but many of the contributing factors are within the ranchman's own power to direct.

The three year average calf crop for the 60 ranches involved in the study was 74 per cent, including all calves born. The calf losses, that is, losses between calving time and December 31 of the same year, were six per cent, leaving a 70 per cent calf crop raised. The South Dakota ranches had a three-year average calf crop of 74 per cent; calf losses were nine per cent of the calves born, and the calf crop raised was 67 per cent.

In the region as a whole there was a variation in the calf crop from year to year, ranging from 76.6 per cent in the year of highest calf crop to 72.6 per cent in the lowest year. In South Dakota, this variation was greater than in the region as a unit. The range was from 76 per cent to 68 per cent. There was a still greater variation in calf losses both in the region and in the South Dakota area. The calf losses in the whole region were two per cent in 1926, 11 per cent in 1927, and four per cent in 1928. In South Dakota, the calf losses were two per cent in 1926, 18 per cent in 1927, and six per cent in 1928. Table 35.

TABLE 35.—CALF CROPS AND CALF LOSSES, ENTIRE RANGE AREA AND SOUTH DAKOTA RANGE AREA, BY YEARS

	Entire range area			South Dakota range area		
Year	% Calf crop	% Calf losses	% Calf crop raised	% Calf crop	% Calf losses	% Calf crop raised
1926	73	2	72	68	2	66
1927	73	11	65	76	18	62
1928	77	4	74	76	6	71
3-year average	74	6	70	74	9	67

Table 35 reveals no marked variation between South Dakota and the region as a whole except in the percentage of calf losses which averaged four per cent greater in South Dakota than in the region. There was a big variation in calf crops and calf losses between individual ranches. The range in South Dakota was from 55 per cent to 74 per cent calf crop raised during the three year period. In the region the variation was still greater. These variations appear to be largely the result of variations in the type of range used and methods of handling the breeding herd. In a few cases the presence of disease, such as contagious abortion, has been an important factor.

Controlled Breeding: A majority of ranchmen practice controlled breeding to the extent of limiting the breeding season to periods ranging from two to six months, while a smaller number make a practice of cutting out the yearling heifers from the breeding herd and breeding them as two-year-olds rather than as yearlings. Most ranchmen, however, are not equipped with the necessary pastures to separate the yearling heifers from the cow herd.

The practice of breeding yearlings has resulted in a high percentage of death loss among the heifers at calving time, and a short calf crop from this class of cows. This is particularly true where heifers are wintered poorly and are in thin condition at calving time. Where heifers are bred to calve at two years of age they should receive better than ordinary care during the winter and particularly during calving time in the spring, to prevent death loss.

One successful ranchman maintains a maternity pasture close to headquarters where heifers and thin cows are closely watched and where they may be moved to shelter during storms. This operator also has a convenient feed supply at hand and weak heifers are fed when necessary to maintain strength. Unless choice range is available, heifers that calve at two years of age tend to develop into undersized cows, and are also likely to be dry the following season.

The usual breeding season begins July first and extends over the following two to six months. On a majority of ranches, bulls are not taken out of the herd until weaning time, usually in November or December. With a breeding season of this length calves are strung out over the same length of time and while a majority of the calves are dropped early there are always a few late calves too young to wean before winter sets in. These calves are of doubtful value. To avoid this class of calves many stockmen make a practice of shipping both cows and calves in the fall. This sometimes results in a sale of some of the best cows.

The breeding season may be shortened by approximately one-half by the use of breeding pastures and by maintaining the breeding herd in good condition. The result is a uniform calf crop and frequently a larger calf crop, not necessarily due as the result of shortening the breeding season, but as the results of improved condition of the breeding herd and the use of breeding pastures.

A few ranchmen are considering breeding for earlier calves than has been customary heretofore. On ranches having a surplus feed supply and adequate shelter, this will undoubtedly prove a profitable practice. When cows are bred to calve before April 1, extra feed and shelter must be provided, but the value of early calves will undoubtedly more than offset the additional expense. Early calves winter better than late calves, and may be weaned early, allowing the cows to make some additional gains on grass before winter. By going into winter in good condition less than the usual amount of winter feed will be required.

For the ranchman who is not provided with a liberal feed supply and adequate shelter the present breeding season is early enough, but in the development of the range cattle industry more attention will undoubtedly be given to feed production and other important phases of management in the future than in the past. With it will come additional opportunities to increase the ranch income.

Wintering Cattle: Winter feed is the highest single item of cost in range cattle production. Table 36 shows the quality and value of each class of feed fed per head of cattle wintered, by districts and by total South Dakota range area, three-year averages.

TABLE 36.—AVERAGE QUANTITY AND VALUE OF FEEDS FED PER HEAD* 15 SOUTH DAKOTA RANCHES BY DISTRICTS

No.	Hay and corn fodder			Straw			Grain		
Dist	lbs.	value	% of total value	lbs.	value	% of total value	lbs.	value	% of total value	value
II	1,967	$9.84	81	592	$ .59	5	110	$1.65	14	$12.08
IV	1,203	6.01	93	70	.07	1	31	.45	6	6.53
V	1,837	9.18	92	42	.04	0	50	.75	8	9.97
VI	1,284	6.42	96				19	.29	4	6.71
Average	1,573	$7.86	89	176	$ .18	2	52	$ .78	9	$ 8.82

* Hay and corn fodder are valued at $10 per ton, straw at $2 and grain at $30. These are approximate average valuations placed on the vrious classes of feeds by the ranchmen.

It also shows that the highest average cost of wintering cattle for the three-year period 1926-1928 was in District II. This can be explained by the fact that in this district range is limited and winter grazing is consequently restricted. The district also has very limited winter protection for cattle, necessitating more than an average amount of winter feeding. The same conditions prevail in District V so far as available range is concerned, but it has more natural winter protection than District II.

The grain feeds used consist of oats, barley and corn. A small amount of cottonseed cake was used on some ranches but the amount was too small to be a factor in the feed cost and is not listed separately. In some range areas cottonseed cake is of considerable importance as a winter feed.

Trials conducted by the animal husbandry department at the sub-experiment station at Havre, Mont., where weather and range conditions are comparable to those in South Dakota, indicate that one pound of cottonseed cake per head daily is enough to maintain the weight of cows throughout the winter when they have access to all the straw they will eat. The cost of wintering cows at Havre was $2.90 per head for a feeding period of 96 days, with cottonseed cake valued at $50 per ton but no charge made for the straw.

The Havre trials also indicate that from 430 to 500 pounds of cottonseed cake will take the place of one ton of alfalfa hay when fed with straw to mature cattle. With alfalfa hay at $10 per ton, cottonseed cake at $50 per ton, and straw at $2.50 per ton the alfalfa and straw was a cheaper ration than the cottonseed cake and straw. The cost per head for wintering was $3.70 for the alfalfa hay and straw combination, and $4.20 per head for the cottonseed cake and straw. The cattle in both cases were wintered in the open, fed 102 days, and came through the winter with

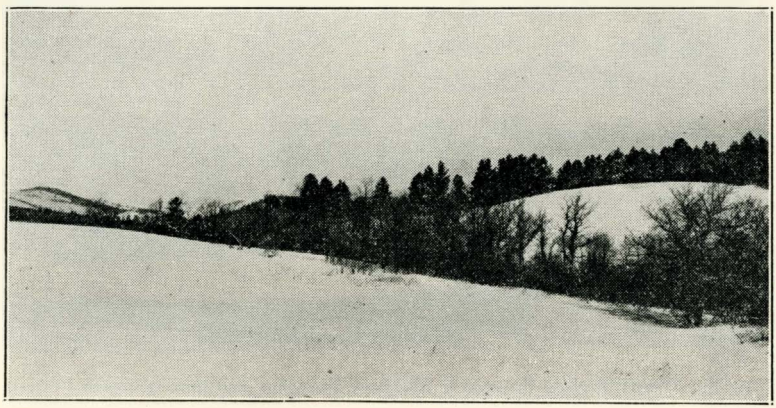

Fig. 9.—A Brush Draw Makes Fine Shelter

*The value of corn fodder is determined largely by the stage of maturity of the corn when the fodder is cut. Early varieties of corn that are nearly mature when the fodder is harvested are worth considerable more than the late maturing fodder corn.

less than 6 pounds shrink per head. The Havre trials also indicate that corn fodder is worth about one-half as much as alfalfa hay for wintering cattle.* Oat hay is slightly better than alfalfa, and both wheat grass and sweet clover hay are slightly less valuable. Alfalfa hay is the best single feed for wintering calves.

It is important for the ranchman to winter his cattle as cheaply as possible, but there is a limit beyond which he cannot go without danger of death loss in his herd. This applies particularly to breeding cows, and more particularly to heifers that are bred to calve at two years of age. When heifers are brought through the winter on a minimum amount of winter feed they need close attention at calving time. A feed reserve is important to ranchmen handling this class of cattle and may be the means of preventing heavy losses in years of late spring storms.

The experiences of practical ranchmen indicate that the condition of the cows at calving time does not affect the size of the calf crop of the succeeding year, provided the cows are strong enough to calve without assistance. The condition of the cows at breeding time, however, has an effect on the calf crop, and for the man who is trying to increase the calf crop it is more important to have his cows on good grass and gaining flesh at breeding time than to keep them fat throughout the winter.

The ranchmen who produce the biggest calf crops make a practice of feeding their bulls liberally during the winter. Bulls usually go into the

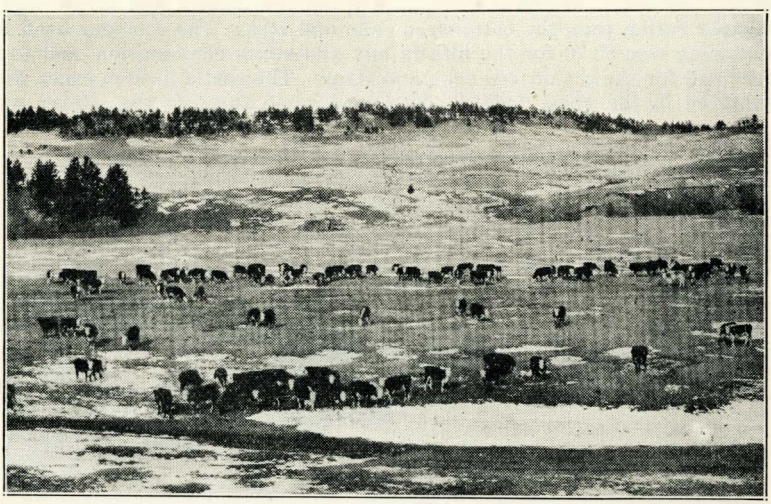

Fig. 10.—Winter Feeding Grounds in Sheltered Locations Attribute to Ranch Projects

winter in thin condition and should be fed to make winter gains in order to be in good condition for the breeding season.

Too much emphasis cannot be placed on careful feeding of young calves after weaning. At this stage many ranchmen sustain heavy losses largely because of exposure and improper feeding. Coarse, spoiled and

otherwise unsuitable feeds, and an inadequate or unclean water supply have been responsible for many of the disease conditions with their accompanying losses and heavy shrink among young calves.

As previously stated alfalfa hay is the best single feed for calves. In addition to the hay young calves should be fed a small amount of whole oats. This is particularly important where alfalfa hay is not available and other hay must be fed. The amount of grain fed need not be sufficient to keep the calves fat but should be enough to keep them in good thrifty condition. Where winter range is available less supplementary feed will be required than where calves are corralled throughout the winter, but even with the best range, calves can be profitably fed a small amount of concentrates. This is particularly true of late calves. After calves have been accustomed to eating grain it may be found profitable, on some ranches, to change gradually to cottonseed cake as a more economical concentrate.

Marketing Cattle

Age of Cattle Sold: Relatively few ranchmen have a fixed policy as to the age of marketing cattle. A majority are governed from year by market demands and by available supplies of winter feed and range. With an adequate supply of both range and supplementary winter feed on hand ranchmen sell the class of cattle which in their own judgment will make them the most money. When feed is scarce and herds must be reduced to the number that can be wintered safely, the breeding herd is generally kept intact and those classes of cattle sold which require the greatest amount of winter feeding.

A majority of South Dakota ranches are equally well situated for the production of calves, yearlings or older cattle; the exceptions being the ranches located in the rougher sections of the area where range is plentiful and cheap and where land suitable for feed production is relatively scarce. On ranches in this area big steers can undoubtedly be produced more economically than younger cattle for the obvious reason that less winter feed is required per head of cattle handled. Other exceptions are the ranches located where winter feed is relatively plentiful and range is short. Here the younger cattle will perhaps continue to be the most profitable.

The above observations apply particularly to the production of steers. With the present discrimination against heifer beef it is doubtful if it will pay ranchmen to carry cull heifers, that is, those that are not needed for replacement in the breeding herd, beyond the yearling age. Where heifer calves sell as high as steer calves it may be found even more profitable to dispose of them as calves.

Spaying has been suggested as a means of carrying heifers to long ages without breeding. Undoubtedly spaying is one of the best known means of culling, but with the present disparity in price between grass fat steers and heifers it is doubtful if, as a general policy, this practice can be recommended. However, the conditions that prevail on each individual ranch with reference to supplies of range and winter feed should largely determine the policies to be adopted. In the rougher sections of the range area where winter feed is the limiting factor in an expansion

program, it may be profitable to carry spayed heifers to long ages in order to handle a maximum number of cattle with a minimum amount of winter feed. The heifers will undoubtedly be less profitable than the steers, but they may, at present prices at least, show a margin of profit which in turn will increase the total profits of the ranch. Cows that are unsatisfactory should be shipped at the youngest possible age. Young grass fat cows often sell as high as spayed heifers.

Young cattle from the range country go to corn belt feeders almost exclusively, either direct or by the stockyard route. Aged grass fat steers, however, often have competition from packer buyers. This has the effect of increasing the price, but the big steer in order to attract the packer buyer must be fat. Aged steers that are not fat enough to attract the killers often run into a draggy market since the market for

TABLE 37.—NUMBERS AND CLASSES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH, BY YEARS, 15 SOUTH DAKOTA RANCHERS

	Cows		2-Year Heifers		1-Year Heifers		Calves		1-Year Steers		2-Year Steers		3-Year Steers		Spayed Heifers	
Year	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch
1926	130	229	60	18	4	80	8	162	1	18	204	285	90	225	71	19
1927	184	137	8	10	3	27	16	0	78	3	435	183	56	172	38	4
1928	193	293	30	49	48	56	50	207	257	30	186	109	106	253	0	0
Totals	507	659	98	77	55	163	74	369	336	51	825	577	252	650	109	23
Total Marketed	1,166		175		218		443		387		1,402		902		132	

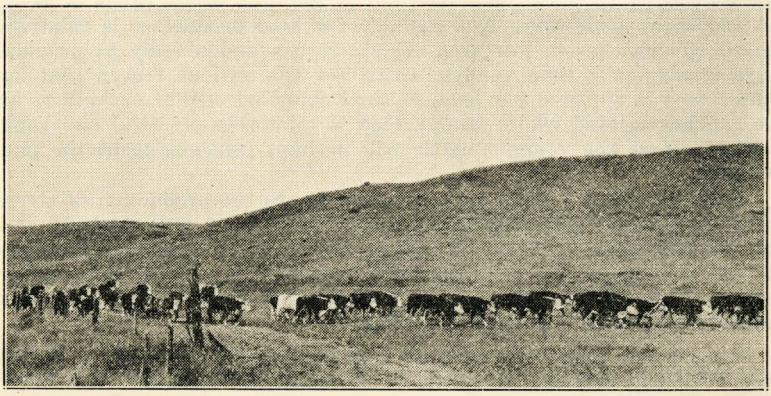

Fig. 11.—From the Range to the Railroad. A Beef Herd on the Trail

this class of cattle is decidedly limited at the present time. This suggests the need of an abundance of grass where big steers are produced. The most successful big steer producers make a practice of keeping their shipping steers on their best grass throughout the summer and fall of

the year they are sold. In that way they get the best possible grass finish on their cattle before shipping.

Marketing Practices: No fixed marketing policy prevails among any considerable number of ranchmen in the northern Great Plains region. Cattle may be sold on the ranch one year and shipped to market the next, and they may be sold either by the head or by weight. Table 37 shows the numbers and classes of cattle sold on the ranch and shipped to market by years on the South Dakota ranches and Table 38 gives the same information for the entire range area.

In addition to the above sales, 94 four-year-old steers were shipped to market, 77 four-year-olds were sold on the ranches, 15 bulls were shipped to market and 31 were sold at home.

TABLE 38.—NUMBERS AND CLASSES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH BY YEARS, RANCH REGION, 60 RANCHES

	Cows		2-Year Heifers		1-Year Heifers		Calves		1-Year Steers		2-Year Steers		3-Year Steers		Spayed Heifers	
Year	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch	Shipped to Market	Sold on Ranch
1926	893	719	153	18	384	614	185	1,947	245	1,148	553	761	484	439	71	19
1927	850	856	40	46	189	373	137	659	662	763	681	825	323	417	99	10
1928	789	1059	50	70	247	331	119	1,015	596	1,286	397	526	460	397	1	47
Tot.	2532	2634	243	134	820	1318	441	3,621	1503	3,197	1631	2112	1267	1253	171	76
*	5,166		377		2,138		4,062		4,700		3,743		†2,520		247	

* Total marketed
† Includes 267 4-year-old and 57 5-year-old steers.

In addition to the sales listed in Table 38, 105 bulls were shipped to market and 141 were sold at home.

TABLE 39.—NUMBERS AND PERCENTAGES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH, BY YEARS, 15 SOUTH DAKOTA RANCHERS

1926				1927				1928				3-yr. ave.	
Shipped to Market		Sold on ranch		Shipped to Market		Sold on ranch		Shipped to Market		Sold on ranch		Shipped to Market	Sold on ranch
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	%	%
568	35	1,036	65	818	60	536	40	870	47	997	53	47	53

Table 39 shows the numbers and percentages of all cattle shipped to market and sold on the ranch, by years, on 15 South Dakota ranches. Table 40 gives the same information for the entire region including South Dakota.

TABLE 40.—NUMBERS AND PERCENTAGES OF CATTLE SHIPPED TO MARKET, AND SOLD ON THE RANCH, BY YEARS, RANGE REGION, 60 RANCHES

1926				1927				1928				3-yr.ave.	
Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Shipped to market		Sold on ranch		Shipped to market	Sold on ranch
No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Pct.	Pct.
2,968	34	5,665	66	2,981	43	3,949	57	2,659	36	4,731	64	37.5	62.5

The marketing of cattle during 1926 was the heaviest of the three-year period in the region as a whole, while in South Dakota the marketing was heaviest during 1928. Tables 39 and 40. The marketing of calves was particularly heavy in the region during 1926, being 92 per cent greater than in 1928. Table 38. The relatively heavy marketing of cattle during 1926 was due to the dry season which prevailed that year throughout the range region. As a rule, the largest increase in marketing during years of feed shortage is in the classes of cattle that must be fed. This accounts for the heavy marketing of calves during 1926.

TABLE 41.—NUMBERS, AGES, AND PERCENTAGES OF THE VARIOUS AGES OF STEERS SOLD BY YEARS, SOUTH DAKOTA AND ENTIRE RANGE REGION

	South Dakota area						Entire range area					
	Yearlings		2-yr. steers		3-yr. steers		Yearlings		2-yr. steers		3-yr.	
Year	No.	Ptc.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1926 ____	19	3	489	59	315	38	1,393	38	1,314	36	923	26
1927 ____	81	9	618	67	228	24	1,425	39	1,506	41	740	20
1928 ____	287	30	295	31	359	39	1,882	51	923	25	857	24

Table 41 shows a steady increase in the marketing of yearling steers, both in South Dakota and the region as a whole. The increase is greater in South Dakota than in the entire region, indicating a change in policy from selling two-year-olds, to yearlings, while in the sales of three-year-olds there is no pronounced change. Tables 39 and 40 show there was no significant change in the numbers of cattle sold on the ranch as compared with the numbers shipped to market. There are, however, seasonal fluctuations both in South Dakota and the entire region. These seasonal changes are brought about largely by the activities of country buyers, while the buyers activities in turn are determined by market conditions.

Country buyers are of two classes: the feeder buyer, which includes order buyers who fill feeder orders; and the speculator who buys either on his own account or for others, to ship to the central markets or to sell to feeders. The functions of both are often combined in one person and the members of either class may switch their activities to those of the other as conditions warrant. Country buyers in the range country buy almost exclusively for future delivery, the time varying from a few days to three months or more, depending on the season of the year, the class of cattle bought and the purpose for which they are purchased. Calves and yearlings are usually contracted early in the season for late fall delivery, while mature steers are usually bought late and called for in a relatively short time.

The amount of cash payment made at the time of purchase varies considerably and is largely a matter of agreement between the buyer and seller. High cattle values are subject to relatively wide fluctuations in market prices, as for example, the action of the cattle market in the fall of 1927 when certain classes of steers dropped approximately $4 per hundred in 60 days. Many stockmen learned to their loss that year, that where cash payments are insufficient to cover the drop in market prices between the time of sale and delivery, they may be left with the cattle on their hands. To check such practices, cash payments have been substantially increased since that time.

Tables 37 and 38 show that a larger percentage of calves than any other class of cattle has been marketed on the ranch. The reason given

by stockmen is that almost without exception higher prices were received on the ranch than could be realized on the central markets for this class of catlle. Country calf buyers are feeder buyers, and feeder calves have brought higher prices on the ranch than the killers were paying on the central markets. Apparently not enough feeder calves are shipped to the central markets from the Northwest to establish a market for this class of calves.

The ranchman who sells his cattle at home must know cattle values if he is to deal with country buyers on an equal basis. In many cases the buyer has the advantage of a broader knowledge of market values of all classes of cattle than the ranchman, many of them coming directly from the stockyards with a background of many years of buying experience. If the range cattle producers continue selling their cattle at home to the extent that has prevailed during the three year period under discussion, they can well afford to spend some time and effort in acquainting themselves with the various market grades and classes, and to study their own herds in order to form a reasonably accurate estimate of the value of their cattle based on current market quotations.

A comparison of prices received on the ranch and on the central markets would be misleading and valueless because of market fluctuations and differences in quality of cattle. A comparison to be of value would require a comparison of prices received at the central markets with prices of comparable classes and grades sold in the country on the same dates, and taking into account shipping expenses including shrink in transit. For those reasons no such comparison is made in this bulletin.

Cash Crops and Feed Production

The production of cash crops has an important place on many ranches. Among the 15 South Dakota ranches, 10 per cent of the total ranch income for the three year period was from cash crops. However, the production of winter feed for livestock is more important to the range cattle producer than the production of cash crops, for while cash crop production is of considerable importance as a supplementary enterprise on ranches having suitable land, the growing of feed crops is necessary to the success of the major enterprise—range cattle production.

In producing either cash crops or annual feed crops a systematic and well planned cropping system will reduce the hazards of production and increase the yields. The simplest form of crop sequence that will accomplish the objects stated is alternate cropping and fallow. Under this system, one-half of the land is summer fallowed and one-half is cropped each year. A better system, and one that will increase the net return from the land as well as the returns from the labor expended, is one in which corn is substituted for fallow. A still more profitable system, from the standpoint of permanence, and particularly for the men engaged in the livestock industry, is one where a leguminous hay crop has a place in addition to the grain crop and corn fodder.

Grain Crops: Table 42 gives the results of trials at the Dickinson, North Dakota substation in the production of wheat, oats and barley under different cropping systems. The soil and climatic conditions at Dickinson closely resemble those prevailing in the South Dakota range area.

TABLE 42.—CROP YIELDS AT DICKINSON EXPERIMENT STATION
Results with Crop Rotations as Compared with Alternate Fallow and Continuous Cropping. Average Yields 1908-1923*
(Bushels per acre)

	Crops grown in rotation			Alternate fallow	Continuous cropping
Crop	After fallow	After corn	After small grain	After fallow	After small grain
Wheat	21.6	19.7	15.9	20.9	12.6
Oats	25.5	39.8	36.0	45.5	27.7
Barley	26.6	27.6	20.8	26.6	20.9

* Unpublished data.

The yields of small grain in the rotation experiments are the average yields for 24 different rotations, one-half of which were three-year rotations, the remainder longer. In the alternate fallow and cropping experiments the land is summer fallowed every second year and seeded to one crop only. On the continuously cropped land, the same crop is seeded continuously every year. That is, wheat follows wheat, oats follows oats, etc.

The summer fallowed land is usually plowed between May 25 and June 10, and cultivated with a duckfoot cultivator as often as necessary to keep down weeds during the summer and fall. Usually three cultivations a season are enough. In the preparation of the land for grain after grain in the rotation experiments, the land is either spring or fall plowed. Slightly better yields of wheat were obtained on spring than on fall plowing.

The corn stubble is disked in the preparation for small grain crops. There is no advantage in plowing corn land, as slightly better yields have been obtained after disking. The alternate fallow and cropping is handled the same as the fallow in rotations.

In the preparation of the land for continuous cropping, fall plowing has given slightly better yields of wheat than spring plowing, while the yields of oats and barley have been lowest on fall plowing. The increase in wheat yields on fall plowing compared with spring plowing has been less than one-half bushel per acre. This is not enough to warrant a recommendation to fall plow for wheat under all conditions. Perhaps the best rule to follow is to plow in the fall when the plowing can be done reasonably early and when the soil is in good condition to plow; otherwise plow in the spring.

The use of the duckfoot cultivator as a substitute for plowing is coming into general use in some sections of the Northwest. The returns in crop yields after duckfooting as compared with plowing have been slightly in favor of the duckfoot. The use of this machine as a means of reducing the cost of plowing and killing weeds is well worthy of consideration.

Hay and Forage Crops and Pastures: Table 42 shows that the early-plowed summer fallow in the rotation made the highest average yield of wheat for the sixteen-year period 1908 to 1923, while wheat after corn made opproximately two bushels per acre less. In exchange for these two bushels of wheat and the extra labor involved, nearly two tons of dry fodder corn were produced per acre in the corn rotation. The twenty-three year average yield of corn fodder, 1907 to 1929, grown in rotation

on spring plowing after small grain was 3,849 pounds. During this twenty three-year period there was only one complete failure of the corn crop. During the same period the average yield of corn fodder after fallow was 3,674 pounds per acre, or 165 pounds less than after small grain in rotation, indicating no advantage in summer fallowing for corn fodder, although a somewhat higher yield of shelled corn was obtained after fallow.

In the production of hay crops a permanent wheat grass meadow, such as is sometimes found on creek flats which flood or are subject to sub-irrigation, is perhaps the cheapest and surest source of a hay supply. Very few such meadows remain in the range country, however, and the stockman is faced with the necessity of raising tame hay.

Table 43 gives the results of trials with hay crops at Dickinson for periods varying from five to 23 years. Grain hay (wheat and oats) have produced yields which compare favorably with those listed in the table but no data are available at this time.

TABLE 43.—YIELDS OF HAY AND FORAGE CROPS AT DICKINSON EXPERIMENT STATION (Pounds per acre)

Grimm alfalfa 5-yr. ave. 1925-1929	Sweet clover, 2nd yr. 7-yr. ave. 1923-1929	Siberian millet 8-yr. ave. 1922-1929	Corn fodder 23-yr. ave. 1907-1929
2,403	2,711	4,307	3,849

Alfalfa does not fit into a rotation but should be seeded where it may be left for several years before plowing. Creek flats that do not produce satisfactory yields of wild hay, and small or irregular pieces of land that are inconvenient to cultivate, should be seeded to alfalfa.

Sweet clover, millet, grain hay and corn fodder all fit into the live-stock business. The only objection to corn as a substitute for fallow is the difficulty of cleaning up weedy land with corn, while fallow can be kept clean throughout the season with the use of a duckfoot or similar cultivator.

In any cropping system where the production of cash crops is an important enterprise, wheat or flax should be given the most favorable place in the rotation. This implies that the cash crops should follow corn or summer fallow. If sweet clover is raised it should be seeded with the wheat on the fallow or corn land. The sweet clover will have a better chance here than on fall or spring plowing, because in addition to containing more moisture, the fallow and corn land will be firmer than other land and the sweet clover can be seeded in moist soil without seeding too deep.

Sweet clover seeded with a grain crop provides a cheap hay crop when a satisfactory stand is secured. The chances of securing a stand are good enough to warrant seeding it every year in rotation as outlined above. When sweet clover fails to make a satisfactory stand the land may be spring plowed and seeded to millet or grain hay. In tests at Dickinson, the yellow-flowered sweet clover has given better stands than the white flowered variety.

On many of the farms in Districts I and II, as well as on some of the smaller ranches, native pastures have been overgrazed until their carrying capacity has been greatly reduced. This reduction of the stand

of native grasses is due in large measure to early spring grazing. If pastures can be so arranged as to keep livestock off a portion of them during the early spring until the grasses have made a fair growth, their carrying capacity can be increased. This is often impossible, however, without seeding down tame pastures.

The two best known tame grasses in this region are brome grass and slender wheat grass. A more recently introduced species, crested wheat grass, has given promise as an early pasture grass. This grass starts growth earlier in the spring than any of the native grasses, alfalfa or sweet clover, and during April, May and early June will provide more pasture than other plants. It seems particularly promising on the more sandy soils, and makes a good quality of hay when cut soon after blossoming. The yield is about equal to brome or slender wheat grass, but less than alfalfa or sweet clover.

Crested wheat grass pastures have a high carrying capacity for a short time in the spring and early summer. The ideal pasture arrangement would be to have a relatively small crested wheat grass pasture for spring and early summer grazing while the native range makes its most rapid growth. It is here that crested wheat grass has its most important place. The cattle should be moved from the tame pasture to the native pasture or range while they are still gaining and before the tame pasture is entirely grazed down. For hardening cattle for shipment to market, no pasture surpasses the native range.

Sources of Income

While cattle production is the major enterprise on all ranches involved in the study, a number of supplementary enterprises, particularly hogs or cash crops, are of considerable importance on some ranches. The class of land on which a ranch is located is the principal factor that determines the type of organization and class of products raised.

Table 44 shows the per cent of income from different sources by districts. The figures are three-year averages.

TABLE 44.—SOURCES OF INCOME BY DISTRICTS

District No.	Per cent beef cattle	Per cent Hogs	Per cent cash crops	Per cent feed crops	Per cent Miscellaneous
II	60	12	23	2	3
IV	86	2	2	5	5
V	87	7	2	3	1
VI	94	0	0	6	0
Average	83	4	5	5	3

Miscellaneous receipts consist of returns from the sale of horses, poultry products, outside labor, etc.

There are not enough ranches involved to make average figures very reliable, but in general the table indicates the relative importance of the various enterprises.

The average figures for all the ranches are more truly representative of the whole range area than the figures for the various districts. For example, 12 per cent income from hogs is undoubtedly too high for District II. This average for the district was brought up because one ranch specialized in pork production and has an income from the sale

of hogs amounting to 22 per cent of the total ranch income. In other respects, the figures are fairly representative.

During years of low cattle prices, the cattlemen have resorted to the production of other commodities than those for which they are best situated and best equipped in order to increase their incomes. When cattle are relatively high, beef production assumes increased importance and other products are proportionately decreased or dropped entirely.

The production of cash crops (wheat and alfalfa seed) is second to beef cattle in the range region as a whole. In District II which contains a high percentage of tillable land, this enterprise is relatively more important than in any of the other districts.

During years favorable for crop production a surplus supply of feed is often produced, and a majority of men sell small quantities of feed crops, generally as an accommodation to neighbors, but sometimes because it is believed that the surplus will not be needed. Many ranchmen have learned to their loss that this is an unprofitable practice. A surplus feed supply is the best insurance against the inevitable dry years and one of the best means of stabilizing the business.

The Land Situation

Range Control and Utilization: The greatest handicap that confronted the ranchman during the open range days, and one which contributed most to the abandonment of cattle production under open range conditions, was the ranchmen's inability to control the range and thereby prevent overgrazing. The same handicap prevails today, but to a less degree. Very few ranchmen are in a position to exercise either permanent or long-time control of their range. A few own all the range necessary for their operations, and a few own some land and lease state owned land for considerable periods; but the majority depend largely on free range, or on short time leases of land in addition to the small tract of land they own.

Range control is not only desirable, but is necessary for efficient utilization of the land, economic ranch operation and the permanence of the range cattle industry.

Grazing experiments at Mandan, North Dakota station show that the carrying capacity of the range can be increased 40 per cent by the adoption of a system deferred and rotation grazing. Such a system can be established and the original carrying capacity be restored only by long-time control of the range. No ranchman is justified in incurring the necessary expenses of fencing, water development, and other things incident to a system of rotation grazing without the assurance of several years use of the range. For this reason the common policy seems to be to get the greatest possible amount of grazing from the land each year, for the next year it may be controlled by others.

Largely because of the lack of range control, the range cattle industry is in a somewhat disorganized and unstable condition, is faced by some uncertainity as to its future, and affords small opportunity for the exercise of high class managerial ability and development of a permanent and profitable business.

Fortunately there has been enough room for all since the slump in

cattle prices following the World War, and overgrazing is not a serious problem at this time. But high cattle and sheep prices may cause a repetition of the early-day competition for pasture lands, and result in another setback to the industry.

Under present conditions the ranchman's best plan is to acquire control through purchase where prices are reasonable, or through long-time leases where possible, of all suitable lands adjoining his present holdings. But long-time leases are hard to secure because many of the present land owners are reluctant to enter such an agreement: they have slight hope of disposing of their lands at an early date, or in some way realizing greater returns than the ranchman can afford to pay for the privilege of grazing.

The final goal of acquiring a ranch unit of suitable size for economical operation may be reached by purchase or long-time lease in some sections of the range area without too much expense and effort; while in others the process must be slow, but could be hastened by the proper form of public control of the free range area.

Table 45 shows the average acreages and percentages of owned and leased land, and the total land used per ranch, 1926-1928, for the 15 South Dakota ranches and the 60 ranches of the entire region.

TABLE 45.—ACREAGES AND PERCENTAGES OF OWNED AND LEASED LAND PER RANCH BY YEARS, 15 SOUTH DAKOTA RANCHES AND ENTIRE REGION, 60 RANCHES

	15 South Dakota ranches					Entire region				
	Owned		Leased		Total	Owned		Leased		Total
Year	Acres	Pct.	Acres	Pct.	Acres	Acres	Pct.	Acres	Pct.	Acres
1926	1,667	35	3,030	65	4,697	2,743	46	3,276	54	6,019
1927	1,750	32	3,769	68	5,519	2,861	43	3,754	57	6,615
1928	1,777	29	4,345	71	6,122	2,956	46	3,430	54	6,386
Average	1,731	32	3,715	68	5,446	2,853	45	3,487	55	6,340

Table 45 shows that there has been a steady increase in the average size of the South Dakota ranches during the three years involved in the survey. The increase in leased land has been greatest. The average increase in the amount of owned land has been 90 acres per ranch while the leased land has been increased by 1,315 acres per ranch from 1926 to 1928.

In the region as a whole, there has also been a steady increase in the acreage of owned land. The average increase per ranch has been 213 acres while the leased land has increased 154 acres per ranch. This increase indicates there is a greater interest in land purchases outside of South Dakota than in this state, but is explained by the fact that two ranchmen in an adjoining state purchased two large tracts of land. This was an important factor in increasing the average size of the region.There is, however, less interest in land purchases among ranchmen of South Dakota than in some of the adjoining states, largely because of the favorable lease terms secured by them through the lease of large blocks of state owned land. These conditions do not prevail outside of South Dakota.

Land Values and Ownership as Affecting Ranch Layouts

Another handicap confronting the range cattle producers in their efforts to block out suitable ranch units is the difficulty of acquiring range

lands suitably located for the most economical operation on account of a diversity of ownership and high prices asked for certain lands in the range area.

During the period of high cattle values many ranchmen increased their land holdings at high prices. Most of these lands were bought on contracts and with the decrease in cattle values a large percentage of them reverted to the original owners. Title to many of these lands has since reverted to the various counties for non-payment of taxes. Tax titles can generally be acquired at reasonable prices and many ranchmen are availing themselves of this opportunity to increase the size of their ranches.

Throughout the range area, however, are scattered pieces of land that are held at higher prices than the ranchmen can afford to pay. The location of these lands often prevents the satisfactory blocking out of ranch units. In a majority of cases these lands are held by non-resident investors who hope eventually to recover their investments. These investors' faith in the country is admirable, but a study of the situation indicates that any substantial and permanent increase in the value of range lands is highly improbable. Stockmen generally are not given to speculation in land and will buy only when prices are based on the productive value of land.

Grazing lands vary widely in value. Lands that are favorably located and that have a good grass cover may be worth several times as much as other lands not so favorably located and having a poor stand of grass. This difference in value is not the principal factor, however, that determines the prices placed on land by many non-resident land owners.

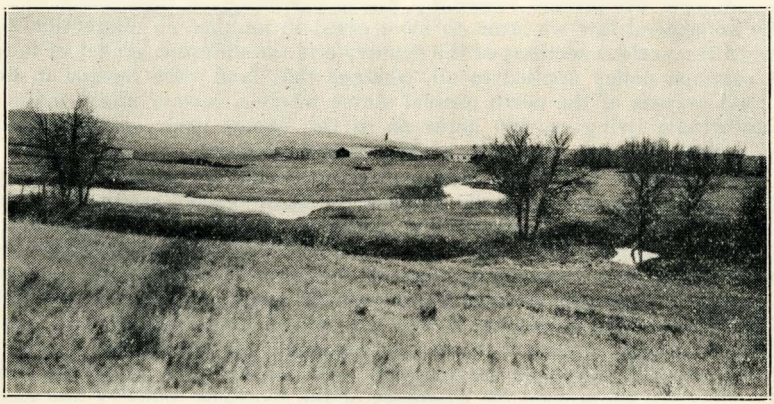

Fig. 12.—Water, Feed, and Shelter Near Headquarters Make an Ideal Ranch Location.

At the Mandan station it has been shown that seven acres of grazing land is enough to carry a two-year-old steer for five months—June to October. This kind of land is worth several times as much as land requiring 25 to 30 acres to graze a steer for the same period. Not only is less land required to pasture a given number of cattle, but less fencing is required per head of cattle handled on the better land, and more rapid gains are undoubtedly made since less traveling is required by the cattle. Very

little is known about actual values of grazing lands based on their productive capacity. In the past, land values were determined largely by their maximum loan value, while back of the loan value there was no logical basis of valuation.

Winter feed requirements is another factor that has an important bearing on the value of grazing lands. Cattle make economical gains on grass during the summer months only. Generally no winter gains are made, and in many cases losses in weight are sustained and supplementary feed must be supplied to maintain strength. The cost of winter feed in the range area is high whether purchased or produced on the ranch. The cost of this feed increases the cost of production of range cattle; and since winter feed must be provided in some areas in order to utilize the grazing lands, the value of these lands is proportionately reduced below the value of similar lands in districts where little or no feeding is required or where feed is relatively cheap.

On the 60 ranches involved in the survey the cost of supplementary winter feed for cattle ranged fro $5.65 per head of cattle wintered on the ranch having the lowest feed cost to $12.45 per head on the ranch having the highest cost, an average of $9.35 per head yearly for all the cattle wintered on the 60 ranches.*

Effects of Public Land Policies on the Range Cattle Industry

Some of the effects of our public land policies on the range cattle producers have been pointed out. It was inevitable that the public lands which were mainly valuable for the production of agricultural commodities should pass into private ownership, but in parceling out these lands under the homestead law we seem to have erred in making no distinction between the various sections of the country and the different grades of land. A common policy applied to all, whether that land were located in the humid regions of the north central states where a farmer might make a comfortable living on 160 acres or in the "great open spaces" where sometimes 50 acres are required to pasture one cow.

The 160-acre homestead was increaseed to 320 acres in 1909, but by that time practically all lands suitable for farming, and many that were not suitable, has been homesteaded, except in the very dryest districts of the Great Plains, and in these districts 320 acres were as inadequate as the 160 had been immediately west of the 20-inch rainfall line. In 1916, however, the 640-acre grazing homestead act was applied to the Northern Great Plains. The provisions of this act limited the homestead to a quality and acreage of land that was as inadequate for its purpose as either the 160 or 320 had been for farming west of the 100th meridian. This act, however, recognized the existence of the livestock industry and gave to it a measure of public support and encouragement.

Largely as a result of our public land policies the range livestock industry is still in a disorganized condition, not fully adjusted to the relatively new order of controlled range, and with limited opportunities for

* Hay was valued at $10 per ton, straw at $2, grain at $30 and cottonseed cake at $50. These are approximate average values placed on feed by the ranchmen themselves and represent very nearly the avrage purchase prices of the various classes of feed. The amount of winter feed required depends largely on age and condition of cattle, amount of available winter grass, severity of the weather and depth of snow.

acquiring suitable sized ranch units. The scattered ownership of lands in the range area is the biggest single handicap to acquiring range lands. This is the direct result of our policy of parceling out the public lands in 160 and 320-acre units regardless of quality and location.

Table 46 shows the land classification by the United States Department of Interior* of four representative townships in one part of the range area. The number of owners and size of farms have been taken from the county records. In this territory a minimum sized ranch should contain approximately 10,000 acres. Farming is out of the question except for the production of feed for livestock.

TABLE 46.—LAND CLASSIFICATION OF FOUR TOWNSHIPS IN THE RANGE AREA

Twp. No.	Farming land		Farming grazing		Grazing forage		Total tillable		Untillable grazing land		Total all land		
	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	Pct.	Acres	
I	none		1,200	5.5	1,461	6.6	2,661	12.1	19,192	87.9	21,853	62
II	600	2.6	880	3.8	3,000	12.0	4,480	18.4	19,113	81.6	23,593	45
III	1,300	5.4	none		1,819	8.6	3,119	14.0	20,570	86.0	23,689	38
VI	3,200	13.6	120	.5	1,702	7.4	5,022	21.5	18,348	78.5	23,370	46
Average	1,275	5.5	550	2.4	1,995	8.6	3,820	16.5	19,305	83.5	23,126	48

* U. S. D. I. Land Classification of the Northern Great Plains, 1929.

Instead of the above classes—farming, farm-grazing, and grazing-forage—these lands might well have been classified as first, second, and third class farming lands, the third class being generally considered of little value for farming at the present time. Practically none of this third class of land has been broken up and only a small portion of the second class is under cultivation. The total tillable land ranges from 12 per cent to 20 per cent per township, with an average of 16.5 per cent for the four twonships. By leaving out the third class, or grazing forage land which is of doubtful value for farming, the tillable land averages slightly less than eight per cent of the total.

A study of the records indicates that 54 per cent of the land owners in these townships own 160 acres or less each, while 31 per cent own from 161 to 320 acres, and 15 per cent own more than 320 acres. One of the reasons for absentee land ownership in the range country is apparent when it is realized that more than 50 per cent of the owners have but 160 acres of land in a district where only eight per cent of the land is tillable. Even assuming that these 160-acre homesteads contain twice as much tillable land as the average, they still would have only 26 acres of tillable land per farm—not a cheerful outlook for a prospective farmer.

Table 47 shows the land classification for the entire Great Plains region.

About 40 per cent of the total Great Plains region is classed as potential farming land. According to the 1925 census only 34 per cent of the total tillable area was actually broken up in 1924. This is equal to 13.4 per cent of the total area of the region and somewhat less than the combined areas of the irrigated and first class farming land in the region as a whole. Apparently we are not utilizing the lower grades of land for farming purposes at the present time.

The land actually under cultivation, added to the national forests lands, equals approximately 20 per cent of the total land area of the

Northern Great Plains. In view of the public expenditures for the development of the farming industry and forestry on 20 per cent of the total land area, it would seem that the remaining 80 per cent is entitled to a degree of consideration somewhat commensurate with the relative importance of the industry dependent on this class of land for its existence. Range livestock producers in the past, have themselves met and solved many of their perplexing problems, but the resources at their command are inadequate for the solution of the fundamental problem of range control.

TABLE 47.—LAND CLASSIFICATION OF THE NORTHERN GREAT PLAINS BY STATES AND REGION, 1924

	POTENTIAL FARMING LAND											NONTILLABLE LAND				
	Irrigated		Farming		Farming grazing		Grazing forage		Total tillable		Per cent of tillable under cultivation	Grazing		National forests		
State	Square miles	Per cent	Square miles	Per cent	Square miles	Per cent	Square miles	Per cent	Square miles	Per cent		Square miles	Per cent	Square miles	Per cent	Total sq. mi.
North Dakota	120	0.5	14,571	52.0	3,039	10.8	265	1.0	17,995	64.3	57.8	9,991	35.7	none		27,986
South Dakota	389	1.0	4,355	11.7	8,932	24.1	4,061	10.9	17,737	47.7	20.0	17,415	46.9	1,978	5.4	37,130
Montana	2,939	2.7	6,722	6.1	12,093	11.0	16,918	15.4	38,672	35.2	35.3	61,515	56.1	9,589	8.7	109,776
Wyoming	480	1.7	none		997	3.6	4,416	15.8	5,893	21.1	21.1	19,910	71.5	2,055	7.4	27,859
Region	3,928	2.0	25,648	12.6	25,061	12.4	25,660	12.6	80,297	39.6	33.9	108,831	53.7	13,622	6.7	202,750