Bulletin No. 147 - Range and Ranch Studies in Wyoming

University of Wyoming Agricultural Experiment Station

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Publication Information

University of Wyoming Agricultural Experiment Station (1926). "Bulletin No. 147 - Range and Ranch Studies in Wyoming." University of Wyoming Agricultural Experiment Station Bulletin 147, 91-152.

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Range Cattle on Our National Forests at 11,000 Feet Altitude.

RANGE AND RANCH STUDIES
IN WYOMING

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Range and Ranch Studies in Wyoming

BEEF CATTLE MANAGEMENT

BY A. F. VASS

INTRODUCTION

Wyoming, with almost sixty-two and a half million acres of land, the greater part of which receives insufficient rainfall for cultivated farm crops, has long been a great empire for grazing livestock. Three per cent of the above area is devoted to the Yellowstone National Park, three per cent to farm crops, and the remaining ninety-four per cent must be used, if used at all, for timber and grazing. As grazing does not interfere with timber production when properly handled, it means that we have about fifty-nine million acres in the state for grazing purposes. If we allow forty acres per animal unit as the average carrying capacity, it means that our grazing land alone will carry a million and a half animals such as cows. Our farm crop land, which is largely under irrigation, can supply three months of winter feed and still have sufficient acreage for the cash crops, such as grains and root crops. With the above arrangement which is rapidly coming about, the state can support two million animal units. The cropping systems on our farmed lands should always be made to fit in with our livestock production. Sheep, in most cases, will be fed for a very short time, whereas, cattle and similar types of livestock will be fed longer periods. The development of the state in the past has depended on its livestock and the same rule will govern the future. As more land is brought under irrigation, more winter feed will be produced, which will enable us to make better use of our grazing land. As the livestock industry develops, so will the state develop.

*This bulletin is based on data secured from Wyoming ranches, as a part of a regional cooperative study conducted by the United States Bureau of Animal Industry, the United States Bureau of Agricultural Economics, and the agricultural experiment stations of Montana, North Dakota, South Dakota, and Wyoming. The conclusions based on Wyoming studies are those of the author and not necessarily those of the other cooperating parties. The historical introduction is the result of reading and research on the part of the author, and is not the result of facts brought out in the cooperative investigation. The section on climate is based on studies made by the author, independent of the main cooperative project.
The grazing animals of the ranches and farms may well be regarded as living factories that are continually manufacturing meat, wool, motor power, etc. We use the livestock to market our cultivated and range crops. The production of meat and wool is closely associated with the production of cheap feed.

In the densely populated countries, as the Orient, livestock is scarce. The people there cannot afford to feed the crops to livestock. The loss in food value is too great; so they eat the crop instead, and do the work of the livestock. In those regions of the Orient where the climatic conditions are unfavorable for the growing of the general farm crops, they resort to livestock to harvest the scant vegetation that forms their means of support, and so it is in the semi-arid and arid regions of the West.

There are two main reasons why Wyoming has been, and will long continue to be, a livestock state. First, livestock is the most economical harvester we have for our main crop, which is grass. Our range cattle and sheep have the time to cover the ground and harvest the crop which man could not harvest. Our grass, in most cases, is so short that it requires grazing to harvest it. Second, since we are a long distance from market, livestock places our crop resources in a more concentrated form for the long haul to market, thus lowering the freight rates. The above factors will keep Wyoming in the livestock class for many years. We have no choice in the matter. We may make our choice of the different types of livestock as cattle or sheep, but we must still stay with livestock. That is why our stockmen's losses have been so heavy the last few years. They are in the game and about have to stay with it. A rancher cannot sell his hay one year when the price is high and feed it to his cattle the next year when the price is low. If he could do this, ranching would be comparatively simple. He must either run livestock all of the time or else get out of the business. As one rancher put it, it is the high-priced feed we often have to put into a "critter" sometime during its life that loses us money. The season of 1919-20 is a good example of such losses.

The results given in this bulletin are part of a line of work looking toward a careful appraisal of the status and future of the
livestock industry in Wyoming. The economic aspects of production and marketing are studied, not so much to show the cost of production, but to aid the rancher in the study and analysis of his business. If such studies bring out the strong and weak points in the operation of the ranches studied, they have served their purpose.

Every business manager has his strong and weak points in his management. Every ranch is operated better in some one phase of its business than in another. It is very seldom that we find a ranch well managed in all of its branches. Some ranches were studied on which such important factors as the calf crop was exceptionally well handled, resulting in a large calf crop, but other phases of management, such as the distribution of the investment, or labor, were poorly managed. By a study and comparison of all the ranches it has been possible to determine the strong and weak points of the individual ranches.

EARLY HISTORY OF WYOMING'S LIVESTOCK-INDUSTRY

Wyoming is primarily a livestock state, always has been, and no doubt always will be. Cattle represented the pioneer industry of the state, and even today, with the development of other lines, it still ranks first in our industries. This is due to the fact that our most important crop is native forage that must be harvested by grazing animals if harvested at all.

The first inhabitants, the Indians, lived on the buffalo, antelope, and the fur-bearing animals; and they in turn were followed by the trappers and traders, who lived by trapping the fur-bearing animals, and trading with the Indians. They roamed over the greater part of the state during the first half of the 19th century. The Hudson Bay Company, the Astors, and similar dealers, had representatives in the state during this period. Missionaries followed the trappers, and then came the stockmen.

From the earliest history up to the present time one of the greatest resources of this state has been its native forage plants.
These plants have supported millions of domestic animals annually. Through the livestock, which have acted as living factories, these plants have supplied us with meat, leather, wool, motive power, and hundreds of other products. In fact, our existence has practically been dependent upon our meadows and ranges. The importance of the grazing land of this state may be realized when we consider that it is conservatively estimated that not less than 59,000,000 acres are annually used for grazing purposes, which is sufficient to graze 1,000,000 head of cattle and 6,000,000 head of sheep the greater part of the year.

This state is naturally adapted to the production of forage crops. The limited amount of rainfall and other climatic conditions prevent general farming to a large extent, and make ideal conditions for forage and its preservation. The grass cures on the ground, where the stock can obtain it long after the growing season, when it still retains its nutritive value.

The value of such land where the grass could be preserved with very little decomposition was realized as early as 1800 by the Spaniards, who had established themselves on the west coast. In 1834, according to Dana in his "Two Years Before the Mast," a single vessel picked up not less than 40,000 steer hides at the California ports, San Diego, Monterey and Santa Barbara.

The methods of these early stockmen were very simple, consisting of turning the animals loose on the unlimited range, where they could find plenty of forage. There was no danger of overstocking in those days. No effort was made to grow feed for the stock. The rounding-up of the animals made up the biggest care.

The industry became more popular and large numbers of cattle were introduced. This, combined with the rush of the gold seekers, pushed the industry farther eastward, over the mountains and into what is now known as Nevada and Arizona. At the same time, the settlers were pushing their way westward from the Mississippi river. As they moved into Kansas they introduced the cattle business into the Great Plains of that state. From here they moved north and westward into Dakota, Minnesota, Wyoming and Montana, and southwestward into Texas and Colorado. In 1847 the Mormons crossed the so-called Great American Desert and
established themselves in Utah. This movement of the settlers introduced the cattle into the parts of this country most important for livestock.

The miners of '49 enroute to the gold fields of California were among the first to discover the value of our native forage plants. At this time hundreds of wagons drawn by oxen crossed the plains, bound for the new El Dorado. Some of these belated freight trains were caught along the eastern foothills of the Rocky Mountains by the first snows of winter. To continue the journey under such conditions was out of the question, so there was nothing left for the men to do but to construct rude winter quarters and turn their oxen loose to shift for themselves, thinking, no doubt, that the cattle would either starve or fall a prey to wild beasts. Greatly to their surprise, however, when spring came, the oxen were found to be in good condition and ready to resume their journey.

Cattlemen of Texas and elsewhere, when learning that animals could exist throughout the winter season on the native grasses of the Wyoming plains and foothills, drove their herds hither, and it was not long until thousands of cattle were quartered in Wyoming, where grass was plentiful and water abundant. Very soon Wyoming became known as one of the best grass range territories in the United States, and as fast as protection could be given to permanent settlers the industry grew to large proportions. The industry soon began to appeal to capitalists of the east as an especially remunerative investment. It also made a romantic and adventurous appeal to the nobility and rich men's sons in Europe.

From 1870 to 1886 the cattle industry grew by leaps and bounds. The cattle business became a fad—a fashion. Rich men's sons, university graduates, college professors, foreign investors in France, England and Scotland, put their money into the business. The fabulous returns of forty to fifty per cent per year were too enticing for even the shrewd Scotchman, and many of the large cattle and land companies were financed in Scotland.

The year of 1882 was the high point in the formation of cattle companies. There were small herds of cattle in the state up to 1870, but it was during the '70s that the cattle business showed
the greatest profits. The reports of the enormous profits reached the east and the European countries, and it was during the early '80s that so many of the well-known cattle companies were organized.

The following list will give an idea of the extent of this development:

- The Prairie Cattle Company.
- The Swan Land and Cattle Company.
- The Texas Land and Cattle Company.
- The Matador Land and Cattle Company.
- The Hansford Land and Cattle Company.
- The Arkansas Land and Cattle Company.
- The American Pastoral.
- The Powder River Cattle Company.
- The Western Land and Cattle Company.
- The Cattle Ranch and Land Company.
- The Western Ranches.
- The Eshuela Land and Cattle Company.

Of the above companies, capitalized at millions of dollars, only two are now in existence—the Swan Land Company and the Matador Land and Cattle Company—and only the latter remains as a cattle company. The “Swan,” as one man expresses it, “fell from grace and went into sheep.” These two remaining ones are the only ones of the entire list that have made a respectable showing. The others represent losses amounting into the millions.

The causes of their failure were, first, purchase of their herds by “book count,” a common practice in the early boom days. The cattle purchased were not rounded up and counted, but the records on the books were taken as representing the number. The calf crop was figured as a certain percentage, and from the number branded, the number on hand was arrived at. The enormous losses that took place during the severe winters were not taken into account. In many cases the number purchased was double the actual number delivered. It required a few years for their losses to show up. Second, the prices paid for the land and cattle were, in many cases, too high. With the overstocking, severe win-
losses, and low prices of 1886 and 1887, many of the companies found themselves bankrupt. Third, the methods used in running the cattle were fitted to the open range when there was plenty of feed, but they were not adapted to the crowded range, and years of drouth.

In 1886 the first big loss came. The summer of 1886 was unusually dry, and the cattle were in poor condition before winter set in. In spite of that fact, companies continued to drive them in from the south. The Continental Cattle Company drove in 32,000 head of steers. The Worsham Cattle Company, with no former holdings, turned loose 5,000 head. The Dickey Cattle Company brought in 6,000 head for the Cheyenne and Arapahoe country. Major Smith brought in 5,500 head.

Even with the best of winters the loss would have been heavy, due to the overstocking. As one man expressed it, "It was murder for the Texas cattle." The winter came early and stayed late. It was a combination of recklessness, want of foresight, and the weather. The loss was estimated at 50 per cent, but in many cases it was much greater. The Worsham outfit never attempted to gather any of their 5,000 head. John Clay reports that of the 5,500 head of three-year-olds belonging to Major Smith, they were able to find about 100 head.

The cowmen of the west were broke and many of them never recovered. Among the notables who made their exit at this time were such men as Sturgis, Stuart, Scott, Kohrs, Prince Russell and Roosevelt. To make matters worse, the year of 1887 was a dry one in the corn states and the demand for feeders was very poor. The work and profits for many years were swallowed up in 1886 and 1887. Failure after failure occurred and those who survived were few in number. Many of the cattle companies were completely wiped out.

A few years later the southwestern states suffered the same fate. The above losses greatly reduced the number of cattle on western ranges. Even to this day the cattle business is materially influenced by the winter weather. Men cannot resist the temptation to try to get something for nothing. That is why the so-called free range appeals to our stockmen today, who make the
mistake of overstocking, and who fail to provide feed and shelter in case of bad weather. The lessons of these heavy losses are soon forgotten and consequently a bad winter always catches a large number unprepared.

Those who survived the heavy losses of the '80s and who still had faith in the industry were taught the value of saving pastures and raising some hay for winter feed. The competition for the range resulted in much damage to our ranges. Too early grazing and overstocking has had disastrous results.

When the stockmen of the West awoke to the value of the native vegetation for grazing, which was in the early '70s, there was no ceasing in the stocking of the range. They could not breed cattle fast enough, so they trailed them in from the south. It was not long before the best ranges were taken and competition became very keen. The cattlemen's one aim seemed to be to get all the grass they could before someone else appropriated it. No effort was made to raise feed. The range became overstocked and in the winter of 1886 the industry suffered a great setback. Thousands of cattle were not able to stand the winter. The northwest states suffered the most.

The range cattle business originated in Texas, and gradually extended northward. Until the Sioux Indians were subdued, Wyoming was not safe for ranching, but with the conclusion of the Indian wars the cattlemen immediately took possession of the old hunting grounds of the Sioux Indians. Cattle replaced the buffalo and antelope on the plains and foothills of the Rockies. Some of the early ranchers employed as many riders to protect their interests from the Indians as they used for running their livestock.

An interesting and characteristic feature of the early cattle industry was the Old Texas Trail. This was the highway over which a tide of cattle was moved from southwestern and western Texas to the Northern Great Plains and Rocky Mountain states. These states were Kansas, Colorado, Nebraska, Wyoming, Montana, and the Dakotas. The cattle were of the Spanish breed and originated from the cattle taken into Mexico by the Spaniards in the 16th century.
The movement was started in the '60s and reached its high point in 1884, when it was estimated that 800,000 head of cattle moved over the trail. A large number of these cattle came into Wyoming. The first trail herd came into the state in 1871, and consisted of 1,500 head. These cattle were reported to have sold for the following prices: Yearling steers, seven dollars; two-year-old steers, twelve dollars; and cows, seventeen dollars, an average price of twelve dollars per head.

Texas, with its extensive plains of so-called short grass and with its mild winters, took the lead in the production of cattle and horses. Later, sheep became very popular. The large surplus of stock found its way to the eastern markets by the trails to the northeast. These Texas cattle were of the long-horned, inferior type, and their effect is still noticeable in some of our herds. It has taken many generations of good breeding to develop the type of cattle shown in Figure 1, the type that is now found on many of our ranches.

The Texas cattle were rounded up and trailed up to Kansas, where they met the railroads. The stock were not hurried along the trail, but allowed to feed as they traveled, and so they reached the market in fair condition. Many interesting tales are told by the "old-timers" about their experiences on these trails. Thousands of long-horned steers were taken to the market in this way.

The trailing outfits consisted of about fifteen men; twelve to handle the cattle, one man to look after the horses, one cook, and the foreman of the outfit. The cook wagon was often drawn by oxen, and carried the provisions, bedding, etc. Each rider kept a night horse saddled and ready to mount.

The cattle were bedded down at night and the men divided into four watches of two men each, who, going in opposite directions, rode around the sleeping cattle. There were, as a rule, some 3,000 in a herd. During good weather there was little danger of the herd stampeding, but during storms there was great danger. When the thunder and rains started, the cattle were restless and likely to stampede. The cattle were trailed for a few hours and then allowed to graze. They were driven about twelve miles per day.
Figure 1. Type of Herefords that Gives the Best Returns on Our Ranges.

Many of the herds came up what was known as the Old Chisholm Trail, which ran through Throckmorton, Baylor and Wilbarger counties of Texas, crossed the Red river over into the Indian territory and then up the north fork of the Red river through the Wichita mountains. Dodge City was in the path of most of the herds and many of them were disposed of there; if not, they were moved on north through Kansas and into Nebraska. Ogallala, Nebraska, was where many of the Texas herds were dispersed. There the northern buyers met the cattle men from the south. It was not uncommon to be on the trail five or six months. The advantage of this system was that it was easier to raise the young stuff in the south and to finish the three- and four-year-olds on the ranges of the north, where the grass was much better, than to raise the calves in the north.

Due to the unsettled condition of the country and lack of control of the cattle there were always heavy losses due to strays, thieves and similar causes. In order to protect their interests the stockmen of the state organized the Wyoming Stock Growers Association in 1872, which was the first organization of this kind ever formed. It represented a capitalization of over $100,000,000,
when Wyoming was still a wilderness. The headquarters of the association were in Cheyenne, which was the center of the livestock industry of the state. The association was and always has been a very important factor in the government of the state.

When cattle were first introduced in the state the land was owned by the government and ranges were free to the cattle owner. Stock in the cattle companies returned good dividends and herds were increased to the highest possible number. This had the effect of over-crowding the ranges, and a shortage of feed naturally followed. Prices of beef in the eastern cities also declined, managers of the cattle companies found it difficult to keep up the dividends, and the stockholders began to inquire why. Then the expedient was resorted to of shipping every animal available, culled were rounded up and sold as feeders.

In 1889 another factor entered into the conditions. Wyoming was about to be admitted as a state. Many who preferred a state to a territorial government, knowing that Wyoming was likely to be admitted, came flocking into the territory, settling along the valleys where water could be secured for irrigation, and these homesteaders restricted the great cattle ranges. These settlers and the shortage of herbage finally caused some of the large cattle companies to pass a dividend. The stockholder demanded to know the reason and was informed that the reason was due to "rustlers" who were stealing the cattle.

The country up to this time has been any man's land and so the cattlemen took possession. Very few of the great cattle companies took the trouble to file on land under the government homestead laws. A company organized to go into the cattle business would start by first selecting a range. The managers would ride over the country and examine its grazing facilities, water supply, timber, and hill protection. They would select the range they wanted, and then find the best place on it for the home ranch, or headquarters. They then established definite natural boundaries of the range, naming the north, south, east and west lines. As soon as they got their cattle moved and brands recorded they would issue a public announcement in the advertising column of the newspaper as follows:
1. A cut of a steer or horse with the company brand thereon.
2. Name of common lists of brands and then a notice as follows:

“Our range extends from the Big Muddy north to the Platte, east to Sheep Buttes and west to Poison Spider.” This domain was taken possession of and all parties warned not to trespass.

The early cattle men all respected these defined ranges, because they were operating under the same rules. The above method held sway during the '70s and '80s without objection or interference. It was a wild, unsettled country that no one cared to use, and the cattle fattened thereon were shipped to market. The cattle business was then one of rounding up, branding and cutting out the fat cattle that were ready for market. It did not require the amount of capital required today, when large sums must be invested in lands.

The early cattlemen looked upon the so-called settler with disfavor. The settler was required to fence his range in order to protect it and a wire fence was an abomination to the range cattle men. It prevented the herds from drifting with the storms and finding a natural shelter in the timber and brush on hillsides. Cattle, if left alone, will, in most cases, take care of themselves. They drift with the storms and later graze back. When they encounter fences they walk back and forth until they are exhausted.

That there were a few settlers scattered throughout the territory who lived by stealing cattle and horses is undisputable. This made the large stockmen look upon the small stockmen and settlers as undesirable. When some of the large cattle companies failed to pay their dividends, due to the reasons already mentioned, they attributed their loss to the rustlers and settlers. This explanation was used until “settlers”, “nesters”, and “rustlers” became synonymous terms. The story of Cattle Kate and James Averiall, two settlers on the Sweetwater, who were taken from their homes in the night in the summer of 1889 and hanged, illustrates conditions at that time. A man named Waggoner, a settler near Newcastle, was killed by three men. Jones and Tisdale, two settlers in Johnson county, were waylaid and killed in November, 1891.
The stealing of cattle became so common that the Territorial Legislature, in 1884, passed the maverick bill, which was prepared by the Stock Growers Association. This law made it a felony to brand a maverick, except under the supervision of an authorized agent, and then with the letter “M”.

It was reported that in the early days certain unscrupulous cowmen paid their riders an additional wage for branding all calves found without a brand. This was contrary to the law and caused a great deal of trouble. Stockmen complained of the failure to convict men under the maverick law, which increased the bitter feeling between the stockmen and settlers. This led to the Johnson county invasion, or what is known as the War on the Rustlers.

A body of men were brought in to terrify the “settlers” or “rustlers”, as they were called. The armed troop of fifty or sixty men left Cheyenne for Casper by special train on April 5, 1892. On April 6 the raiders left Casper on horseback for Buffalo, the section where there had been so much trouble. Nick Ray and Nathan Champion were killed at their ranch on Powder river. Near this ranch they met Jack Flagg and his nephew, whom they tried to capture, but who escaped, and gave a warning in Buffalo. The raiders were warned that a force of 200 armed men awaited them in Buffalo. They went into camp at the T. A. ranch on Crazy Woman creek, about twelve miles from Buffalo, where they threw up fortifications. They were attacked by about 400 armed men, and would probably have been annihilated had not the acting governor, Barber, wired President Harrison to send the United States troops to the scene. Colonel Van Hain appeared on the scene with three troops of cavalry and took the raiders prisoners. They were taken to Fort McKinney, and later to Cheyenne, but never brought to trial.

From the standpoint of handling the forage the following steps may be noted:

In the first, or initial, stage the forage was accepted as it was found. No attempt was made to improve it in quality or quantity. The range was absolutely open and the cattle roamed at will, winter and summer, unmolested except for the annual or semi-annual roundups. It did not take long for the range to reach the limit of
its stock-holding capacity. Overstocking and short feed led to disastrous years. This was shown in the losses of 1886 and 1887.

The second step was the control and irrigation of certain favorably situated lands. These lands were fenced and used as winter pasture.

It required a number of years to develop the fact that it would pay to put up hay, not so much to carry the stock through the winter, but for securing a limited supply of feed for an emergency.

Step by step the idea of the importance of a supply of feed forced itself upon the stockmen. Thus the fourth period saw most of the land which could be irrigated, fenced, and the feed stacked for winter feeding. Figure 2 shows cattle on such irrigated meadows.

The fifth period is the one where crops other than native hay, such as alfalfa, were grown for winter feed. The large ranches were cut up and we have more of the farm type of livestock raising.
REVIEW OF LITERATURE

Very little investigation and study has been done on the problems of the range livestock men. The hundreds of publications dealing with livestock production have to do chiefly with livestock in the Middle West, East, and feed lots of the western experiment stations. These results have been of little value to the stockmen, as they, as a rule, are producers of stockers or feeders and do very little feed-lot work.

Barnes and Jardine (1916) give the results of some investigational work done in the eleven western range states. They forecasted a 15 per cent increase in livestock in the next 10 years, due to settlers, increased carrying capacity of the range, and better management. For that section of the state of Wyoming in which our recent survey was made the above investigation found the following results:

- Cattle were run on range and pasture...... 7.85 months
- Pasture cost per cow.........................$3.76
- All feed costs for 12-month calf...........$8.65
- Feed costs per year after the first 12 months......$6.64
- Winter feed cost per head, including labor......$7.30
- Number of bulls per 100 cows..................5.52
- Average value of bulls.....................$160.50
- Calves per hundred cows of breeding age.......73.20
- Death loss: calves, 5.87; yearlings, 3.82; over two, 2.79
- Yearly depreciation of a range cow............$3.58
- Yearly depreciation of range bulls...............$18.00
- Interest rate on money loans................9.56%
- Average weight long 2-year-old steers........937 lbs.
- Average weight long 3-year-old steers.........1155 lbs.
- Annual labor cost per cow....................$2.33
- Rate of taxation per $100....................$1.62½
- Value per head of cattle for taxation..........$30.42
- Cost of producing a yearling..................$31.88
- Cost of producing a 2-year-old.................$46.17

The above figures give the costs in 1914 and are somewhat lower than the costs would be at the present time. Based on the
wholesale index price number of prices today compared with 1914 prices the costs would be about one and one-half times the 1914 costs. The estimated increase in livestock has not taken place. Homesteaders on our dry lands have not increased the number of our livestock. In some cases the number of livestock has been reduced.

Klemmedson (1923), in his studies of cattle on the National Forests, found that the cost of running on the National Forests for 140 days was $3.63. The grazing fee was 56 cents, or about one-sixth of the total cost. Death and other causes of loss was the greatest item of expense, with labor costs second. Where the ranchers had less than 500 head it was found to be more economical to use the "pool" system of running them. The steers were disposed of, in most cases, when they were from 2 to 3 years of age. Very few calves or yearling steers were sold. The (1924) report gives results very similar to those of the previous year. There was a reduction in the costs where the cattle were run under the "pool" system. This saving was made in the labor costs, due to the operation of larger units.

Klemmedson (1924) found in his studies of prairie and mountain ranches that the gross cost, including interest on investment, of carrying a calf to weaning to be $36.66 on the prairie ranches and $43.22 on the mountain ranches for the year 1922. The mountain ranches had a calf crop of 56.0 per cent and the prairie ranches one of 56.7 per cent. The calves on the mountain ranches weighed 400 pounds and the prairie ranch calves 350 lbs. The cost per hundred pounds was $10.80 for the former and $10.48 for the latter. The size of the calf crop, the winter feed bill, and the labor cost on each ranch are the factors having the most influence upon the cost of calf production. Upon the 17 prairie ranches studied the cost per calf varies from $19.46 to $82.69. On the mountain ranches the variation was from $28.66 to $66.12 per head. The calves on the prairie ranches sold for $21.50 and the mountain ranch calves for $25.00. The bull charges per calf on the mountain ranches was $3.82. The calf crop ranged from 33 per cent to 83 per cent. Of the 24 mountain ranches, 7 used pasture breeding, the remaining 17 ranches breeding on the
range. The average calf crop of the pasture-bred herds was 72.7 and for the open forest range-bred herds it was 50.0 per cent.

The average size of the prairie ranches was 15,914 acres and represented a total investment of $80,952. The mountain ranches averaged 5,071 acres, exclusive of forest range, and represented an average investment of $123,167. In order that cattle may be produced at a profit in the area studied, one, and probably both, of the following changes must come about: (1) an increase in the market price of beef cattle; (2) a decrease in the cost of production.

Adams (1924), in his investigational work on California ranches in 1922-23, found that the cost of production per hundred pounds of live weight decreased as the age of the animal increased up to three years of age. Above that age there was an increase in the cost per pound. At the end of the first year the cost was $8.80 per hundred pounds. At the end of the second year, $7.70 per hundred, and at the end of the third year $7.60 per hundred. Above that age the cost went up to $9.00 per hundred. The calves weighed 433 pounds at nine months of age and had cost $38.00.

The average age of selling cattle came when they were 33 months of age and weighed 1000 pounds. The sale price ran from 6 to 7 cents, and the cost from 7 to 8 cents.

The calf crop ranged from 50 per cent to 90 per cent, with an average of 67.3. Cows were used 6 to 8 years and the bulls 3 to 4 years. The lowest cost of production was on those ranches where the beef cattle were finished on beet tops, hay, and barley. The next lowest cost was on the ranches that did not do winter feeding. The cost of production increased as the rancher increased his amount of hay fed.

The cost on the California ranches are somewhat lower than those on the Texas and Colorado ranches, due, I think, to the fact that Adams did not attempt to use land value. Instead, he used the value of pasture, hay and concentrates, making his results more comparable with those from the Colorado and Texas ranchers who were leasing their land.
The investigational work of Parr and Klemmedson (1925) on the costs and methods of range cattle production gave some very excellent results on the management of cattle in North Central Texas. The average gross cost of running a cow for one year was $29.46 in 1923. The calf crop was 65 per cent, which made the gross cost per calf $45.11. The average weight of the calves was 358 pounds, which made a gross cost of $12.59 per hundred. The average price received per calf was $18.39. The above costs represent 6 per cent interest on all capital invested in land, cattle, and equipment, labor performed by the owner and his hired men, and all cash and other expenses. The cost of producing a calf when the owner was not allowed interest on his investment and wages for his labor was $29.15, which is the figure commonly used by our ranchmen. The gross cost per calf on the 40 ranches studied ranged from $27.68 to $71.07. The bull charges were $3.36 per calf. The calf crop varied from 37 per cent to 93 per cent, with an average of 65 per cent.

The medium-sized ranch of from 9 to 12 sections was the most successful. The larger ranches made more efficient use of their labor but had a smaller calf crop. The average value of the owned land was $12.64 per acre and the leasing rate 34c per acre. The depreciation on cows was $4.50 and on bulls $25.42 per head.

Potter (1925), in his report, gave the cost of running a mixed herd in the Blue Mountain country of Oregon, at $21.40 per head. The cattle were grazed on the National Forest for 5½ months, and fed one ton of hay. Hay was valued at $8.00 per ton. The cost of maintaining a cow one year, including bull charges, was $27.18. The calf crop was 65 per cent, which made the calf cost $41.82 at 6 months of age. The calves weighed 451, which made the cost $9.27 per hundred pounds. The cost of animals up to 18 months of age was $8.72 per hundred, and the cost per pound for animals 30 months of age $8.94 per hundred pounds.

The cost of running cattle on deeded and leased land was $24.54 per head, compared to $21.40, the cost of running on the National Forest. The cost of running on the free range was $16.10 per head. The saving in the running costs were needed to counteract the low calf crop and other losses that took place on the
free range. The cost of producing 2-year-old grass-fed steers was $9.75 per hundred and the selling price $7.00 per hundred, showing a loss of $2.75 per hundred pounds.

A preliminary report from the Wyoming station (1926) gives the results secured in feeding calves under Wyoming ranch conditions. It would be possible for a rancher to secure similar results if he selected just his best calves for feeding and would build and use a silo. The calves were grouped into the following four so-called types: Lot 1, very low-set; lot 2, low-set; lot 3, rangy; lot 4, very rangy. There seemed to be a noticeable change in the so-called type of the calves during the experiment. The very rangy group made the cheapest and greatest gains and the low-set the most expensive gains.

The following table shows some of the results of the experiment:

<table>
<thead>
<tr>
<th>TABLE I. TYPE IN BEEF CALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOT</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Initial weight . . . . . . .</td>
</tr>
<tr>
<td>Final weight . . . . . . .</td>
</tr>
<tr>
<td>Total gain . . . . . . .</td>
</tr>
<tr>
<td>Daily gain . . . . . . .</td>
</tr>
<tr>
<td>Feed Consumed Daily . . . .</td>
</tr>
<tr>
<td>Shelled corn . . . . . . .</td>
</tr>
<tr>
<td>Cottonseed cake . . . . . .</td>
</tr>
<tr>
<td>Alfalfa hay . . . . . . .</td>
</tr>
<tr>
<td>Sunflower silage . . . . .</td>
</tr>
<tr>
<td>Cost of feed lot ($8.00 cwt.)</td>
</tr>
<tr>
<td>Cost of feed 180 days . . . .</td>
</tr>
<tr>
<td>Feed cost per 100 lbs. gain .</td>
</tr>
<tr>
<td>Expense of selling . . . . .</td>
</tr>
<tr>
<td>Cost of calf at Denver . . . .</td>
</tr>
<tr>
<td>Estimated weight Denver (2% shrinkage)</td>
</tr>
<tr>
<td>Estimated value at Denver . . .</td>
</tr>
<tr>
<td>Estimated loss . . . . . . .</td>
</tr>
</tbody>
</table>

Feed Costs: Corn, $38.00 per ton; cottonseed cake, $44.00 per ton; alfalfa hay, $15.00 per ton; sunflower silage, $5.00 per ton.

In the above experiment no charge was made for the items of interest on investment in feed, steers, equipment and buildings. The value of the manure was supposed to take care of the labor charges.

Table II is by the author and is the average of the above four lots. It is assumed that the value of the manure is equivalent to equipment and building charges, which is as much as the Wyo-
ming ranchmen would care to give it. A 6 per cent instead of the estimated 2 per cent shrinkage is used, as it is more nearly what we would expect on silage-fed calves.

TABLE II. COST FIGURES ON FEEDING BABY BEEF

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial cost, 434.5 lbs @ $8.00</td>
<td>$34.76</td>
</tr>
<tr>
<td>Feed cost</td>
<td>40.39</td>
</tr>
<tr>
<td>Labor cost: 1 man, $3.50, 1 team, $1.75 per day; feeding 160 steers for 180 days</td>
<td>5.91</td>
</tr>
<tr>
<td>Interest on investment in cattle and feed 75.15 @ 8 per cent for 6 months</td>
<td>3.01</td>
</tr>
<tr>
<td>Expense of selling (estimated)</td>
<td>4.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$88.07</strong></td>
</tr>
<tr>
<td>Received at Denver, 6% shrinkage, 736 pounds @ 9.15</td>
<td>67.34</td>
</tr>
<tr>
<td>Lost per steer</td>
<td>$20.73</td>
</tr>
<tr>
<td>Cost per pound of finished beef</td>
<td>$.12</td>
</tr>
<tr>
<td>Cost per pound of feeder calf</td>
<td>.08</td>
</tr>
<tr>
<td>Spread necessary to feed under above conditions</td>
<td>$.04</td>
</tr>
</tbody>
</table>

As the spread in price between feeder and slaughter calves is, on the average, less than 2 cents the above required spread of over 4 cents explains, in part, why Wyoming ranchmen prefer to spread their charges for calves over a longer period. Selling at an older age distributes this first cost. This phase of the work is discussed later in the bulletin under the heading, Age of Marketing. The change in the so-called type of the calves was probably due to the fact that the calves were all selected from one herd of rather similar animals, and were not the offspring from parents that had the low-set, or rangy type.
METHOD OF PROCEDURE

During the summer of 1925 the Bureau of Agricultural Economics and Bureau of Animal Husbandry of the United States Department of Agriculture in co-operation with the Agricultural Experiment Stations of Wyoming, Montana, North Dakota and South Dakota, undertook the task of making a study of the cattle industry in the Northern Great Plains Area and determining the factors and methods of management that would prove best for the stockmen in that area.

Crook and Campbell counties were selected in Wyoming for the work. These two counties are representative of that area in the state that makes up part of the Northern Great Plains Area. Two men were sent into the above counties to interview the stockmen and take the records necessary for the study. Harry Pearson for the Agronomy Department of the University of Wyoming, and G. S. Klemmedson of the United States Department of Agricultural Economics, did the field work in Wyoming.

Sixty of the largest and most representative ranches in the area were selected for the study. Only those ranches on which beef cattle production was the chief industry were used. A record sheet especially prepared for this survey was used. The ranchmen were interviewed and with their records and assistance the inventories, purchases, sales, losses, receipts and expenses for the year's business was determined. The records were sent in to the office that had been established at Miles City, Montana, and there some of the tabulation was done.

A meeting of the representatives of the states, and the United States Department of Agriculture was held at Miles City in August, at which time the preliminary report of the survey was made. The records were then taken to Washington, where further tabulation was completed and photostatic copies were made for the use of the respective states.

In so much as capital is more important than labor in the production of livestock on the range, the author deemed it advisable to use "rate of return on investment" in measuring the success of a business rather than "labor income" or what a man receives for his labor. The operator was allowed ranch wages, which was
$600 per year for his labor. An allowance for his ability as a manager was not made in his wages, as that would show in the return on investment. The “returns on investment” figures used in the correlation tables is the amount above six per cent that was made by the operator after allowing six per cent interest on all investment, wages for the operator and other unpaid family labor, and other expenses. Any return above or below this amount is credited to management and represented by “return on investment,” which is shown in the correlation tables.

DESCRIPTION OF THE AREA

CLIMATE

The area in which the investigation was carried on is located in the northeastern part of Wyoming and comprises the counties of Crook and Campbell. The region is typical of the greater part of the plains area of Wyoming lying east of the foothills of the Rockies.

The climate of the state always has and always will play a very important part in the profits and losses of livestock. Figure 3 shows the enormous death losses that take place during the drouth years. The state is subject to extremes in precipitation. In 1910 the total precipitation was about 10 inches, whereas in 1905 it was over 22 inches. It is not uncommon to have a fifty per cent increase or decrease in the precipitation. Such wide variations means even a greater variation in the amount of available feed for the winter months, and under the system of management practiced in the '80s and the early '90s the losses on many of the herds varied from 2 to 50 per cent, depending on the amount of rainfall of the spring and summer months, and on the snow and low temperature conditions during the winter.

The winter of 1879-80 was a very severe one and losses were heavy. No official records on losses are available for those dates, but it was reported at the time to be over 50 per cent. Another very severe winter was '86-'87, at which time the very severe losses, previously mentioned, took place. Other severe winters
Figure 3. Annual Precipitation and Death Losses Per Thousand of Cattle, 1883-1925.

when losses were high occurred in '89-'90, '02-'03, '11-'12, '16-'17 and in '19-'20. In the last 46 years we have had seven periods when losses due to exposure have been very great, ranging from 5 to 10 per cent of the total herds. This means that on many of the ranches the losses are very much greater than the figures given because some of the ranchers save a little feed from the good years to carry them through the lean years that they know are sure to come. This means that although the average loss is 10 per cent, the loss on some of the ranches reaches a very much higher num-
ber. It will be noted in the figure that the years of severe losses follow the years of light rainfall. The heaviest loss takes place the latter part of the winter following the severe drought.

The actual loss is very much greater than the figures shown by the chart. The loss takes place in three ways. The loss due to actual death, the loss due to forced sales and low prices, and the loss due to the weakened condition of the animals that results in loss of flesh and a poor calf crop.

The years of heavy losses were in all cases preceded by one to two dry years. When there are several good years in succession the number of livestock increases until a dry year, when the above mentioned losses take place. In the winter of 1919-20 the loss due to exposure was 115 out of every thousand for the entire state. The number of cattle on the range had been increased, due to the war-time prices, until there was not sufficient feed under the present system of management. The summer rainfall was very light, which meant a limited food supply. The losses of 1919-20 show very clearly that if we wish to increase our livestock we must increase our reserve feed supply along with it. The points of high losses shown in Figure 3 are the years when many of our former stockmen have been forced out of the business. An 11 per cent exposure loss along with the other losses that accompany it is sufficient to break many of our operators, which it did.

Climate has been the most important single factor in controlling profits in livestock in this area, and it will long continue to be a very important one. If ranchers have their range fully stocked during the good grass years it means overstocking during the lean years. The ranchers who carry over a surplus of feed during the good years and do not have to buy high-priced feed during the years of drought are the ones who are producing cattle at the lowest cost. Cottonseed cake is being used on some of the ranches as a supplementary feed to carry the herd through the dry, adverse seasons.

Figure 4 shows the number of cattle and price per head, and the annual precipitation. There were more cattle in Wyoming in 1886 than we have ever had at any date since. We have more animal units at the present time than we had in 1886, but the in-
crease is due to the increase in sheep, not in cattle. The best grass ranges were taken up first by the stockmen and used almost exclusively for cattle. The desert and mountain ranges were not made use of to any great extent by the cattlemen. Sheep were better adapted to the sagebrush and timbered range, and it was on those two ranges that the sheep industry flourished. During the last few years the sheep have been crowding the cattle off of the grass ranges in many sections of the state. An explanation of this movement is found in Figure 12. The purchasing power of sheep on January 1st, 1926, was the highest it has ever been
at any time since 1880, whereas the purchasing power of cattle on January 1st, 1925, was the lowest it has ever been since 1880. The cattle curve shows a rise in 1926.

The annual precipitation and its influence on the number and price of cattle in the state is shown in Figure 4. The years of 1900, '01, '02 and '03 were years of light rainfall. These four dry years in succession had the effect of stopping the marked increase in livestock that was taking place and caused a marked drop in the number of cattle by 1906. The following six years, 1904-09, were ones of heavy rainfall compared to the average. This meant good range conditions and abundant feed, with a corresponding increase in the number of cattle, which had reached a high peak by the end of 1909. The rainfall during these six years was about 25 per cent above the average. Under such favorable feed conditions the total number of cattle and sheep in the state increased from 3,101,100 in 1904 to 5,373,230 in 1910, or an increase of 70 per cent. The two following years, 1910 and 1911, were dry years, followed by severe winters. Due to the overstocked conditions of the range at that time the results were disastrous. The price of sheep dropped 40 per cent and the total number of cattle and sheep dropped back to 3,320,108, or a decrease of about 40 per cent from the 1909 high-point mark. A study of Figures 3 and 4 will show the same extreme losses when a drouth year or two follows a period of favorable rainfall.

In most cases the extreme losses shown on the chart are the year following the drouth. An exception to that is 1910, when the losses took place the same year as the drouth. This was due to the fact that there was such an overstocking up to 1910, that when the dry year came there was not feed enough to carry the livestock through to the first of the following year, which is usually the case. The heavy losses took place before the end of December. The so-called free range has played no small part in these losses. The rancher may know that his range is overstocked should a dry year occur, but during the years when there is abundant grass he must keep it fully stocked, for if he does not some one else will run stock on his range. He must keep it fully
stocked during the good years in order to hold it, which means it will be overstocked in the dry years that are sure to follow. Some method of control of the public domain would seem to be desirable in order to correct the above evil.

**TOPOGRAPHY**

The topography of the region studied in the following cattle survey varies from almost level plains gradually sloping to the north and northeast to rolling, broken mountainous lands of the Black Hills. The greater part of the area is sufficiently level for farming. Moisture is the most important factor in controlling crop production. The Powder, Little Missouri and Belle Fourche rivers drain the area and supply water for livestock and irrigation of the meadow lands. The breaks and timber along the streams afford excellent protection to livestock. The streams, as a rule, do not head back in the snow-covered mountains and, as a result, they do not have the continual flow of summer water that mountain streams have.

**SOIL**

The soil upon the uplands is dark brown with carbonate accumulation at from one to three feet. The alluvial soil along the rivers and creeks is silt loam and is deeper than the upland soils. The fine texture of the soils makes them especially adapted to the grasses found thereon. The fertility of the soil is sufficient for luxuriant plant growth. The limiting factor in the production of vegetation is moisture. Where water is available for irrigation excellent crops of winter feed, consisting of alfalfa and grasses, can be grown.

**VEGETATION**

The vegetation of this area is especially well adapted to cattle. The principal grasses are blue grama (*Bouteloua oligostachya*), blue stem (*Agropyron occidentale*), needle grass (*stipa comata*), June grass (*Koeleria cristata*), the rush grasses and sand grasses. The grama grass furnishes excellent summer, fall and winter grazing upon the uplands. The blue stem furnishes early spring grazing on the bottom lands. The blue stem and the rush grasses
are found in the irrigated meadows, and are used for hay and winter grazing. Some seeding of the cultivated grasses has been done in the meadows. Reseeding with alsike clover, red top and the wheat grasses has proven beneficial on some meadows.

**TRANSPORTATION**

The area is served by the Burlington railroad system, giving the cattlemen of the area direct connection with the Portland and Seattle markets on the west, Denver to the south, Omaha, Kansas City and the Mississippi valley markets to the east. Most of the cattle go to the Omaha market. The average distance to the loading point is 20 miles. The long distance to market makes it desirable to use livestock for the marketing of the farm crops.

**LAND TENURE AND USE OF LAND**

The land area per ranch was 7,115 acres. Of this amount 45.6 per cent was owned, and the remainder leased. Of the leased land, the greater per cent of it was privately owned. Thirty-three per cent of the owned land and fourteen per cent of the leased land was tillable. The bottoms and better lands were owned and the poorer lands, which represented, in many cases, the more recent homesteads, were leased. The grazing land was valued at $7.86 per acre, and the crop land at $11.00 per acre. Seventy per cent of the leased land was privately owned, and the remainder was school land.

The value of the owned land, without buildings and improvements, was $8.13 per acre. If the owner were allowed 6 per cent interest on his investment, and taxes, this land should have a leasing rate of over $0.50 per acre. With the leasing rate of $0.11 per acre the owner received enough to pay the taxes and less than 1 per cent interest on his investment. The Texas survey showed a leasing rate of $0.34 under a tax rate of $0.139 per acre. This left a return of $0.201 per acre on land valued at $12.64, or a return of 1.6 per cent interest on the land investment, which is slightly more than the percentage received by the Wyoming owners who leased their land to stockmen.
The above situation indicated one and probably both of the following conditions:

1. A too high rate of land valuation for taxation.
2. A too high rate of taxation.

A reduction in the former would be more beneficial to the stockmen, in so much as it would more evenly distribute the burden of taxation between the ranch and city businesses. Land is worth only as much as it will return capitalized on a fair rate of interest on the investment.

Taxes were 12.7 per cent of the ranch income of $3,822, or $485. The neighboring states ranged somewhat higher. Taxes were 11.1 per cent of the total operating expenses, which was lower than in any of the surrounding states. In one of the adjoining states it was 17.1 per cent of the expenses.

The tax on deeded land in Wyoming was 10 cents per acre and the leasing rate 12 cents per acre. In one of the adjoining states the tax rate was 17 cents and the leasing rate 12.5 cents per acre.

A relatively high percentage of the homesteads that have been taken up since 1910 have been abandoned. In many cases loans that were in excess of the actual value of the land were obtained on the homesteads from individuals and mortgage companies. In many cases the title has reverted to the holder of the mortgage since the abandonment. Instances are not uncommon where cattlemen have made loans to homesteaders and now have title to the lands which are separated from their main holding, and are now of little value, due to isolation. The sale of mortgages in some instances has raised the cost of the mortgages above the actual value of the land, resulting in loss to holder of mortgage.

The methods of obtaining use of land are ownership and leases. The leasing rate was very little more than the taxes, and in many cases the homestead was leased to the stockmen for just enough to pay the taxes.

The land owned by the cattlemen varied in nature, but in almost all cases some of it lies along rivers or creeks which supply water for livestock, and irrigation waters for the meadows.
The use of the open range is not generally satisfactory to the cattleman because of competition, which prevents the grass from ever getting a fair start; lack of breeding control; loss of cattle; and lack of a guarantee of further operations. The cattlemen of this area, as a rule, consider leasing a distinct advantage over free range, because they have better control of their operations, and greater ease in obtaining loans on their cattle that are under control at all times rather than scattered over a large open range.

**RANCH INVESTMENT**

**TABLE III. SHOWING RANCH INVESTMENT**

<table>
<thead>
<tr>
<th>Item</th>
<th>Per cent of total</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>49.0</td>
<td>$26,356.00</td>
</tr>
<tr>
<td>Buildings and improvements</td>
<td>11.4</td>
<td>6,113.00</td>
</tr>
<tr>
<td>Range cattle</td>
<td>31.3</td>
<td>16,848.00</td>
</tr>
<tr>
<td>Work stock</td>
<td>1.5</td>
<td>837.00</td>
</tr>
<tr>
<td>Other livestock</td>
<td>1.7</td>
<td>897.00</td>
</tr>
<tr>
<td>Equipment and machinery</td>
<td>3.8</td>
<td>2,027.00</td>
</tr>
<tr>
<td>Feed and supplies</td>
<td>1.3</td>
<td>699.00</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>$53,777.00</td>
</tr>
</tbody>
</table>

The percentage of the total investment in cattle was 31.3 and ranged from 5 to 79 per cent. Although Wyoming had the highest per cent of total investment in productive cattle, of the four states studied, the percentage was still too low for the best returns under present conditions. With present rate of taxation and land valuation, the land investments were too high.

Figure 5 shows the correlation of the return on investment to the per cent of the total investment represented by cattle. The correlation is \( +0.619 \pm 0.053 \), which is very good. There were twenty-one ranches that had only 20 per cent of their total capital invested in cattle. Of those 21 there was but one ranch that showed a return on investment and that return was less than 2 per cent. The remaining 20 ranches that had less than 20 per cent of their capital in cattle showed a loss of 2 to 14 per cent on
their investment. Of the 12 ranches that had 40 per cent or more of their capital in cattle, 9 showed a return on their investment from 1 to 8 per cent. The remaining 3 showed a loss on investment, but their loss was not so great as it was on those ranches where the percentage of investment in cattle was less.

Those ranches that had a large percentage of their capital in cattle were, in most cases, leasing considerable land. This shows that the leasing of land is more conducive to profitable ranching than ownership. This also indicates that land taxes and land values are too high to give satisfactory returns on ranching. It does not mean, however, that ranchers should not own their land, but it does show that under present conditions there should be a readjustment of land valuation and land taxation in order that the owner of land might be able to show a return on his investment.

**FINANCING ON THE RANCHES**

The average value of all property per ranch was $53,777. The total indebtedness per ranch was $10,205, which was less than 20 per cent of the value. The real estate loans represented $4,789,
with an interest rate of 6.6 per cent, and the chattel loans amounted to $5,416, with an interest rate of 7 per cent. There was a decrease in total indebtedness during the year of $486. The chattel debt per cow unit was $9.18 and per acre of land the debt was $1.48.

The ratio of interest payment to income was 18.4 per cent. Of the ranches reporting, 13.5 per cent of the total loans was held by local state banks, 6.3 by national banks, 20.4 by private individuals, 19 per cent by loan companies, and 29.1 per cent was in federal farm loans. Interest rate on loans secured from the banks and private individuals ranged from 8 to 8.5 per cent. The federal loans averaged 5.7 per cent.

The cause of the present indebtedness may be accounted for as follows: (1) The abnormally high prices in 1918-19 stimulated the cattle industry and caused an increase in the number of cattle per ranch. The profits made in the above years were invested in more cattle along with heavy loans from the banks. (2) Drouth conditions had prevailed in the southwest during 1917 and 1918, so that there was a considerable movement of cattle from the drouth area to the northwest, which materially increased the stocking of the ranges and the loans of the stockmen. (3) The season of 1919-20 was dry, with a scarcity of feed. Hay was selling at $30 to $60 and cottonseed cake at $70 to $100 per ton before the winter was over. Severe snowstorms in the early spring months, combined with a shortage of feed, resulted in very heavy death losses.

By Figure 3 we see that the rainfall in 1919 was but 11 inches, and the death loss the following winter 100 per thousand. As is almost always the case, a drop in the price of cattle occurred at this time. Due to the winter death losses, high price of feed, and the drop in the price of cattle, the owner's equity in his cattle was, in many cases, completely lost. Some ranchers tried to save their cattle by putting their land up as additional collateral. It is the payment of these loans made when cattle prices were higher and money cheap that makes it so difficult for the rancher. The money they have to pay back is about double the amount borrowed when measured in terms of cattle, the thing they have to pay it with.
The high prices during the World War encouraged many to engage in the cattle business, and caused others to increase their herds. Solicitors for the banks and livestock loan companies were busy urging people to borrow money and invest in cattle. The results of this was especially noticeable where stockmen were running on the public domain or were able to lease more land.

Mr. Klemmedson reports:

“In a number of the towns the bankers were in the cattle business to the extent that they bought cattle and turned them over to the cattlemen at an advance of $2.00 to $3.00 per head and loaned the money to the stockmen to run the cattle. In some cases ranchmen were simply notified by wire that such and such a loan company had billed him six or eight cars of steers, and had charged his account. Many ranchers refused to accept these steers, as they were afraid of the crash. They were urged to accept by their banker friends, who pictured vast profits. Some of these ranchmen were fortunate enough to make money, but the majority of them lost heavily. Many of the ranchers wintered the steers for two years and then sold them for less than the original cost. Other ranchmen were wise enough to foresee a crash and refused to buy high-priced steers or cows on borrowed capital, and in a number of instances these very cattlemen either cut down their herds or sold everything down to the cows. These men are, as a rule, in good financial condition today, and some of them are now buying land and cattle. Other men who planned to sell out their ranches and cattle because of excellent offers were advised by their bankers to keep their ranches and expand their business, as the future outlook for cattle was excellent. This advice proved to be rather disastrous.”

History has never repeated itself more clearly than in the last few years in the cattle and sheep business. When a rancher does not need more credit for the expansion of his business, that is the time when the banks and loan companies are anxious to loan him money. When he really needs it, it is then difficult to get. Sheep at the present time are in somewhat the same position that cattle were in in 1919. In studying the prices of cattle and sheep over a long period of years we find that one cow is equivalent in value to seven sheep. A $10 loan on a sheep would, under average conditions be equivalent to a $60 to $70 loan on a cow. The above rate of loaning on cattle was rather disastrous to our banks and cattlemen in 1920-21.

Many stockmen who were out of debt and had money in the bank in 1919 found themselves out of cash and with mortgages on
their cattle by the end of 1920, as the result of economic conditions over which the operator had no control. The same condition existed with almost all other agricultural products the world over.

Figure 12 shows the changes that may take place in the values of cattle and sheep. In 1900 cattle had a purchasing power of 126 and sheep a purchasing power of 86. In 1915 cattle had a value of 135 and sheep 113. In 1921 the purchasing power of both sheep and cattle was about 85; and in 1925 the purchasing power of cattle had dropped to 64 and the purchasing power of sheep had risen to 150. The next few years will very likely show a shift that will bring cattle up to somewhere near where they should be and will bring relief to the financial situation as it now exists on many cattle ranches.

TABLE IV. PERCENTAGE OF RECEIPTS AND EXPENSES

<table>
<thead>
<tr>
<th>Ranch Receipts:</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash crops ..................................</td>
<td>$ 220.00</td>
</tr>
<tr>
<td>Range cattle ..................................</td>
<td>5,702.00</td>
</tr>
<tr>
<td>Other livestock ..................................</td>
<td>529.00</td>
</tr>
<tr>
<td>Increase in inventory of range cattle.</td>
<td>1,658.00</td>
</tr>
<tr>
<td>Livestock products ..........................</td>
<td>90.00</td>
</tr>
<tr>
<td>Other sources ..................................</td>
<td>18.00</td>
</tr>
<tr>
<td><strong>Total</strong> ..................................</td>
<td>$ 8,217.00</td>
</tr>
</tbody>
</table>

Ranch Expenses:

| Current expenses ..................................................| $ 2,895.00 | 66.6 |
| Building and fences depreciation ..................| 285.00 | 6.6 |
| Machinery depreciation ..................| 232.00 | 5.3 |
| Other expenses ..................................| 4.00 | .1 |
| Cattle purchases ..................................| 931.00 | 21.4 |
| **Total** .................................. | $ 4,347.00 | 100 |

Total Receipts ..................................$ 8,217.00
Total Expenses ..................................$ 4,347.00

Ranch Income ..................................$ 3,870.00
Unpaid labor ..................................$ 826.00

Ranch return on investment ..................................$ 3,044.00
Ranch investment ..................................$ 53,777.00

Rate of interest return on investment, 5.66 per cent.
The total ranch receipts, which include the increase in inventory of cattle, was $8,217 per ranch. The sale of range cattle represented $5,702, or 69.4 per cent of the total. Less than 3 per cent came from the sale of crops and about 1 per cent from the sale of livestock products. The receipts from the sale of livestock other than beef cattle was very small.

The increase in the inventory of range cattle was $1,658 per ranch, or 20.2 per cent of the total receipts. This is due to an increase in the price of cattle rather than in an increase in number, and is one of the most encouraging things in the whole survey.

The average total expense per ranch was $4,347, the greater part of which was for current expenses. The current expenses include all money spent for operation, but does not include interest paid on borrowed capital nor animals purchased. In studying the methods of operation on the ranches it does not seem that the current expenses can be reduced very much. The number of cattle units per ranch averaged 427 and the current expenses $2,895, which shows that the ranchers are running their cattle for a year at an expenditure of $6.78 per animal unit when depreciation, interest on investment and owner's time is not figured in. The total cost per animal unit on the 60 ranches was $18.14 per head. The interest on investment in land and cattle $53,777 at 6 per cent would be $7.56 per head. The depreciation on the cows and bulls is figured at $2.85 per cow, which is probably a little too low. A total of $1.32 went for taxes, and the interest above 6 per cent that was paid on borrowed capital.

The receipts from cash crops, other livestock, livestock products, and other sources was less than 10 per cent of the total receipts, which shows very little diversification. The crops that were grown were used chiefly for feed. Due to the long haul of 20 miles to market, cash farm crops do not lend themselves well to the type of farming fitted to the region.
RATE OF TURNOVER OF CAPITAL

A popular recommendation made to the stockmen by writers and speakers who seek to advise him, is to sell cattle at an early age in order to secure a greater rate of turnover on their investment in livestock. Many ranchers reported that they were selling their cattle at a younger age than they preferred, because the banker who held the mortgage insisted on them selling young stock, but that they intended to get back to the three-year-old steer as soon as they were in a financial condition to do so.

Just why the sale of young stuff would result in a greater turnover has not been clearly explained. In fact, a study of the actual results being secured on our ranches does not indicate a greater turnover on the capital invested in cattle, when calves are sold as compared to the selling of older stock.

In the Texas investigations on breeding ranches, where calves were sold, a study of the receipts from the sale of livestock showed a 26 per cent turnover. Thirty-eight per cent more pounds of beef, however, were being sold than was actually being produced, due to liquidation. The value of the actual amount of meat being produced was only 16 per cent of the capital invested in cattle.

On the Colorado prairie ranches, where both calves and older stock were sold, a 21 per cent turnover was secured. On the mountain ranches in Colorado, where the practice was to sell three-year-olds, the per cent of turnover was 28 per cent.

On the Wyoming ranches the rate of turnover on the money invested in cattle was 28.3 per cent. An average of $5,702.30 per ranch was received from the sale of cattle, and $930.50 was expended for the purchase of animals. The difference between the sales and purchases was $4,774.30, which represented 28 per cent of the total investment in cattle.

The following table shows the rate of turnover of the investment in cattle when calves are sold, and where two- and three-year-olds are sold. The values of the livestock are in all cases the same as that given by the ranches and represents the average inventory and sale value of the livestock on the 60 ranches studied.
### TABLE V. INFLUENCE OF AGE OF SELLING ON RATE OF TURNOVER

#### A. WHEN CALVES ARE SOLD

<table>
<thead>
<tr>
<th>Class</th>
<th>No.</th>
<th>Investment Value</th>
<th>Total No.</th>
<th>Sales Value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>173</td>
<td>$39.31</td>
<td>$6,800.63</td>
<td>30</td>
<td>$35.04</td>
</tr>
<tr>
<td>Bulls</td>
<td>8</td>
<td>104.62</td>
<td>836.16</td>
<td>2</td>
<td>56.23</td>
</tr>
<tr>
<td>Calves</td>
<td>100</td>
<td>21.09</td>
<td>2,109.00</td>
<td>67</td>
<td>21.09</td>
</tr>
<tr>
<td>Heifers, 1's</td>
<td>32</td>
<td>29.46</td>
<td>942.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifers, 2's</td>
<td>31</td>
<td>36.83</td>
<td>1,141.73</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: $11,830.24

$2,576.69 = 21.8 per cent turnover.

#### B. WHEN THREE-YEAR-OLD STEERS AND TWO-YEAR-OLD HEIFERS ARE SOLD

<table>
<thead>
<tr>
<th>Class</th>
<th>No.</th>
<th>Investment Value</th>
<th>Total No.</th>
<th>Sales Value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>86.5</td>
<td>$39.31</td>
<td>$3,400.32</td>
<td>15</td>
<td>$35.04</td>
</tr>
<tr>
<td>Bulls</td>
<td>4</td>
<td>104.52</td>
<td>418.08</td>
<td>1</td>
<td>56.23</td>
</tr>
<tr>
<td>Calves</td>
<td>50</td>
<td>21.09</td>
<td>1,054.50</td>
<td>8</td>
<td>36.83</td>
</tr>
<tr>
<td>Heifers, 1's</td>
<td>24</td>
<td>29.46</td>
<td>707.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifers, 2's</td>
<td>23</td>
<td>36.83</td>
<td>847.09</td>
<td>8</td>
<td>36.83</td>
</tr>
<tr>
<td>Steers, 1's</td>
<td>24</td>
<td>34.27</td>
<td>822.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steers, 2's</td>
<td>23</td>
<td>44.06</td>
<td>1,013.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steers, 3's</td>
<td>22</td>
<td>58.66</td>
<td>1,290.52</td>
<td>22</td>
<td>58.68</td>
</tr>
</tbody>
</table>

Total: $9,553.41

$2,167.43 = 22.7 per cent turnover.

In Table V the actual values of cattle on hand and cattle sold as given by the ranchers are used. The calf crop and the death losses found on the ranches are the ones used in the table.

In the first case where calves are sold it would require a breeding herd of 173 cows in order to secure a calf crop of 100 calves. A calf crop of 60, if sold at a later age, would give the same sales value as the 100 calves.

When calves were sold at the prices given for calves the turnover was 21.8, and where the steers were sold at three years and the heifers at two years of age the turnover was 22.7.

The selling of young stuff does not seem to show a greater turnover than the selling of two- and three-year-olds. Why rate
of turnover should be used as an argument to sell calves, even if the turnover were greater is not clear to the writer. It is the increase of sales over purchases and expenses that interests the rancher and not sales alone. It is for profit and not for the sake of doing a large business that the ranch is operated. Profit and not turnover measures the success of a business. The proper age to sell the animal is when it will show the greatest profit and not when it will mean the most business. Cows and calves require more labor than do steers and heifers, and the death loss is greater. The depreciation is also much more on the breeding herd.

As shown in Table V, it requires 68 per cent more cows in order to receive the same amount from sales where calves were sold, compared to the number necessary when twos and threes are sold. A greater depreciation, greater death loss, and greater labor costs takes places on the breeding herds.

CLASSIFICATION OF ANIMALS

TABLE VI.

Number of cattle per ranch on hand at beginning and end of the year and the calf crop for 1924.

<table>
<thead>
<tr>
<th></th>
<th>Beginning</th>
<th>Bought</th>
<th>Sold</th>
<th>Died</th>
<th>End.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>200</td>
<td>4</td>
<td>27</td>
<td>5</td>
<td>194</td>
</tr>
<tr>
<td>Bulls</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Heifers, 3's (spayed)</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Heifers, 2's (unbred)</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Heifers, 2's (spayed)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Heifers, 1's</td>
<td>48</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>59</td>
</tr>
<tr>
<td>Calves</td>
<td>116</td>
<td>11</td>
<td>6</td>
<td>2</td>
<td>112</td>
</tr>
<tr>
<td>Steers, 1's</td>
<td>69</td>
<td>14</td>
<td></td>
<td>0</td>
<td>58</td>
</tr>
<tr>
<td>Steers, 2's</td>
<td>65</td>
<td>1</td>
<td>20</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td>Steers, 3's</td>
<td>25</td>
<td>6</td>
<td>35</td>
<td>0</td>
<td>39</td>
</tr>
<tr>
<td>Steers, 4's</td>
<td>8</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total per ranch</td>
<td>544</td>
<td>25</td>
<td>124</td>
<td>9</td>
<td>546</td>
</tr>
</tbody>
</table>

Percentage of calf crop, 57.15.
The number of cattle was approximately the same at the beginning and end of the year. Twenty-five head were purchased, of which the greater number were calves; 124 head were sold, of which 35 were three-year-old steers; 27 cows, 20 two-year-old steers, and 14 one-year-old steers. Six calves were sold and eleven purchased. The tendency was to buy young stuff rather than sell it. This practice is in keeping with the conditions of the state and the markets. Wyoming has never been and probably never will be a breeding ground like we find in Texas and the other southern ranges. In the days of the Old Texas Trail the south was the breeding range and the north the finishing range. With the passing of the open range and the grazing of cattle from one section of the country to the other, the bringing in of young stuff from the south to finish in the north is almost a thing of the past. There are a few large operators in the state who still follow the above practice. Most of the cattlemen are now raising their own calves, which practice will become more common in the future.

COST OF RUNNING CATTLE IN THE NORTHERN GREAT PLAINS AREA OF WYOMING

In figuring the cost of running cattle for one year on the Northern Great Plains area of Wyoming the cattle were grouped into two classes. The first group of "all cattle", including all of the cattle except calves. The second group included cows only and took into consideration all changes and depreciation in the breeding herd.
TABLE VII. ANNUAL COST OF CATTLE PER HEAD ON WYOMING RANCHES

<table>
<thead>
<tr>
<th>Item</th>
<th>All Cattle</th>
<th>Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on owner's investment in land, improvements and equipment</td>
<td>$32,140 @ 6.0</td>
<td>$ 4.49</td>
</tr>
<tr>
<td>Interest on borrowed capital in land, interest and equipment</td>
<td>4,789 @ 6.6</td>
<td>.73</td>
</tr>
<tr>
<td>Interest on owner's capital in cattle</td>
<td>11,432 @ 6.0</td>
<td>1.60</td>
</tr>
<tr>
<td>Interest on borrowed capital in cattle</td>
<td>5,416 @ 7.0</td>
<td>.88</td>
</tr>
<tr>
<td>Taxes on land, improvements and cattle</td>
<td>1.13</td>
<td>1.15</td>
</tr>
<tr>
<td>Labor charges</td>
<td>4.32</td>
<td>4.36</td>
</tr>
<tr>
<td>Depreciation on buildings</td>
<td>.66</td>
<td>.67</td>
</tr>
<tr>
<td>Depreciation on equipment</td>
<td>.54</td>
<td>.55</td>
</tr>
<tr>
<td>Salt</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>Depreciation on breeding herd</td>
<td>2.85</td>
<td></td>
</tr>
<tr>
<td>Leases and other expenses</td>
<td>3.54</td>
<td>3.57</td>
</tr>
</tbody>
</table>

Total cost, including interest on owner’s investment... $18.14  $21.18
Net cost not including interest on owners investment... 12.05   15.03
Cash cost amount actually paid out... 8.69  8.78

Table VII shows the individual items of cost per head in running the entire herd and in running the breeding herd. The interest on the owner’s investment in land, improvements, equipment and cattle was figured at 6 per cent, and the interest on the borrowed capital was figured at the rate paid by the owner.

The interest charges on owned and borrowed capital was $7.70 and the taxes $1.13, or a total of interest and taxes of $8.83 per head. These items, which are almost one-half of the cost of operation, are left out by many writers in figuring the cost of running an animal for a year.

The depreciation charges on buildings and equipment was $1.20 and salt 25 cents per head. The labor item was $4.32 and this, along with leases and other expenses, was $7.86. This latter figure, which is less than one-half of the total cost, is the one often used by operators and others when asked the cost of operation. The average total cost of running the cattle was $18.14 per head. The cost of the different ranches ranged from $10 to $50 per head.

The cost of cows per head was slightly higher on all items, due to a slightly greater investment per head on the breeding herd, and had an additional item of $2.85 for depreciation and bull
charges. The cows were used six years and the bulls four. The total cost, including 6% interest on investment, of running a cow was $21.18 per head. When we figure that the calf crop was only 57 calves per hundred cows it makes the cost per calf $37.06. The average weight per calf was around 360 pounds, which made the cost per pound 10.2 cents. The price received for the few calves that were sold was very much below this figure.

There are not many of the items of cost that lend themselves to reduction under present conditions. Land values and taxes are, no doubt, too high, as are the interest rates, especially loans on chattel mortgages.

The single item that lends itself most readily to a reduction is cost per calf, which can be greatly decreased by increasing the percentage calf crop. Better methods of handling the breeding herd should bring the calf crop up to 75 per cent, which is obtained on 25 per cent of the ranches. This would reduce the cost per calf to $28.19. This can be done without a great increase in the cost of operation per cow.

The annual cost per head for the entire herd, excluding calves, was $18.14. The annual cost per head for carrying the breeding herd was $21.18. The annual cost for maintenance of the one, two and three year old animals was $15.42 per head. The average annual gain in weight for the young animals was 198.7 pounds, which would give a cost per pound of 7.76 cents.

The above spread of 2.46 cents between 10.2 and 7.76 explains in part why the rancher prefers to distribute the first cost on his calves over a period of two or three years. The cost per pound at six months of age is 10.2 cents, whereas increased weight can be put on at a cost of 7.76 cents. Better calf crops will reduce this first cost per pound.

FACTORS INFLUENCING THE CALF CROP

The seriousness of our small calf crop is being more fully realized by the cattlemen. In previous years when young stuff was shipped in from the south, and when the native steers were kept until they were three and four years old, it was but natural
to emphasize the beef rather than the calf productive end of the business. Wyoming stockmen are now raising their own steers. They are also in some cases selling their steers at an earlier age. The younger the animals are sold the more important the percentage calf crop.

The number of calves per 100 cows, or what is commonly called the percentage calf crop, was 57.15. For each 100 cows kept for breeding purposes there were 57 calves produced. The calf crop on the different ranches ranged from 28 to 95 per cent.

Figure 6. A Good Calf Crop on a Wyoming Ranch.

One of the outstanding factors that has resulted in heavy losses on so many of our ranches and broken several of the large land and cattle companies, has been the very small percentage calf crop. It costs almost as much to run a cow without a calf as with a calf, as it only takes a little additional labor to care for the calves. The loss in carrying a cow for a year with no return in the form of a calf is very great. The annual interest and depreciation on breeding cows is about 15 per cent of the total value. Add to this the cost of feed and labor and we find a breeding cow costs the Wyoming rancher from $16.00 to $24.00 a year, including interest on investment, whether she raises a calf or not. The average cost
per year for running a cow on the Wyoming ranches studied was $21.18. Figure 6 shows a well-managed herd of cows, in which the calf crop was 85 per cent.

Insomuch as our ranchers must in the future rely chiefly on their own calf crop for their future steers, the calf crop becomes a vital factor in our cattle industry. The cost of the two- and three-year-old steer is influenced directly by the cost of the calf. The cost of the calf, in turn, depends very largely on the calf crop.

In order to see just how close a correlation there was between the calf crop and the return on investment, or what the rancher was making, the ranches were grouped into divisions based on their percentage of calf crop, and the profits of those groups were studied. Figure 7 shows the correlation of rate of return on investment to the percentage of calf crop. The correlation of these two factors was $+0.684 \pm 0.046$. In other words, as the calf crop increased there was an increase in the return on investment. Of the 21 ranches showing less than 60 per cent of calf crop, 15 of the 21 showed a loss of from 2 to 8 per cent on their investment. The remaining six showed a slight gain. As the calf crop in-
creased the per cent of the ranches that were making a profit increased.

With only a 57 per cent calf crop, which was the average for the area, and the cows costing $21.18 per head to maintain the cost per calf was $37.06. The ranchers in Crook and Campbell counties showed a greater return on their investment when they had a high percentage calf crop, which is due to the distribution of the cost of maintaining the breeding herd among more calves. A rancher with an 80 per cent calf crop could produce a calf to six months of age at a cost of $26.48, whereas the cost to a rancher with a 50 per cent calf crop would be $42.32 per head. The percentage of calf crop is the most important factor in determining the cost of the calf. It ranged from as high as 95 to as low as 28 per cent on the Wyoming ranches studied.

There are several factors that count most heavily toward producing a high percentage calf crop. Some of them are within the control of the rancher, and lend themselves to improvements that are practical. The number of cows per bull is a very important factor on the percentage of calf crop.

**NUMBER OF COWS PER BULL**

The number of cows per bull ranged from 14 to 88, with an average of 32.2. With small herds under fenced conditions a large number of cows per bull can be run successfully, but under the conditions that prevail on our large cattle ranches the above number of 32.2 is too high. In order to insure a good calf crop it is necessary to have sufficient bulls. On the better breeding ranches of Texas the practice is to have one bull for twenty cows. That the number of the cows per bull is too great on our Wyoming ranches is shown by the correlation table in Figure No. 8. The correlation between the percentage of calf crop and number of cows per bull was \(-0.560 \pm 0.059\). As the number of cows per bull decreased the percentage of calf crop increased. On those ranches where there was at least one bull for twenty cows the calf crop was 76 per cent, and on the ranches using one bull for twenty-three cows the calf crop was 70 per cent.
There were 15 of the 60 ranches studied, or 25 per cent, on which the number of cows per bull was greater than 40. One-fourth of the ranches were using about one-half the number of bulls that they should use in order to insure a paying calf crop. There were nine of the sixty ranches on which the calf crop was less than 50 per cent, and the above ranches, in all cases except two, were running, on an average, 40 cows per bull. Poorly managed herds are giving a calf crop under 40 per cent, while the best managed herds are giving a 75 per cent crop.

Thrifty, well-conditioned bulls are as important as sufficient numbers. Due to the poor return on cattle the last few years, many of the ranchers do not feel that they can afford to buy good young bulls, and in many cases they are attempting to use animals that have passed their period of usefulness. They are low in vitality and, as a result, they do not cover the range. Young, thrifty bulls must be used if we wish to greatly increase our calf crop.
METHODS OF MANAGEMENT

The type of farming in the area was strictly one of livestock production. Less than 4 per cent of the land was in crops. There were 92 acres of alfalfa, 94 acres of wild hay and 59 acres of grain hay and feed crops, per ranch. Where there was sufficient water for irrigation or seepage, alfalfa and wild hay were grown. The small grains were the chief dry-land crops.

There were 15.3 acres of pasture, .42 acres of hay and .11 acres of other feed crops per animal unit. The annual production of beef per acre was 17 pounds, and the sales per acre, 15.9 pounds. The annual production of beef per animal unit was 259.4 pounds.

One-half of the ranchers reported that their heifers calved under 25 months of age, and the other half reported a higher minimum age. Bulls are used in the herds three to four years. Cows are used in the herd six to eight years. Barren, as well as aged cows, are culled. The bulls are placed in the breeding herd July 1st, and left there until near the end of the year, when they are taken out and are conditioned the next spring. The calves are weaned at from 6 to 7 months of age.

The method of management of the breeding herd depends, to some extent, on the conditions under which the cattle are run, and the type of range. Where the cattle are under fence and in direct control of the operator, a smaller percentage of bulls may be used than where the cattle are on the open range. In the exceedingly rough and broken country, and on the National Forests, it is necessary to use more bulls than on the more open level type of range. One bull to twenty cows should be used on the forest and broken ranges, while one bull to twenty-five cows will usually give good results on the open, rolling ranges. Some of the smaller operators were using one bull to thirty cows with very successful results. In such cases the cattle were under fence and the direct supervision of the operator. The more riders used in the distribution of the bulls and the mixing of the herds, the better the results. The summer roundups that were formerly held on the range resulted in the mixing of the cattle, the distribution of the bulls, and a better calf crop.
A common condition that we found on many of the ranches was not only a deficient number of bulls but the use of old bulls, low in vitality and in poor physical condition. The older bulls will not cover the range and give the satisfactory service that the young bull gives.

The ranches that were conditioning the breeding herd by the use of supplementary feeds, were securing a better calf crop. This was very noticeable in the case of the bulls. While the methods of handling the cattle varied upon the individual ranches, the general practice was to turn out on the range early in April. On one-third of the ranches the cows were pasture bred. On the remaining ranches the cows and heifers to be bred were turned out on the open range with the bulls and steers.

Figure 9 shows a breeding herd grazing under fence, on the foothills of the mountain range. The calf crop is usually low on those herds run on the National Forests, as it is more difficult to secure good distribution of the bulls in the rough timbered country, and in some cases the required number of bulls are not turned on the forest ranges.
AGE OF CATTLE AT MARKETING

There seems to be a difference of opinion regarding the proper age at which to market cattle. We hear a great deal about "young stuff," "baby beef," "small handy cuts," "market demands" and similar subjects. Many of the advisers to the stockmen are, as a rule, advising early marketing, and in some cases the operator is forced to the practice of selling calves and yearlings, due to the fact that some loan company has more to say about the business than the operator himself.

Regardless of the advice given him, the rancher still continues to sell his steers as long two-year-olds or threes. Table VIII gives the number, weight, value per head, per cent of total number and per cent of total receipts for each of the different classes of cattle sold during the year.

<table>
<thead>
<tr>
<th>Class</th>
<th>Number</th>
<th>Weight</th>
<th>Value</th>
<th>Per Cent of Total</th>
<th>Per Cent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows</td>
<td>27</td>
<td>966</td>
<td>$35.04</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>Heifers, 3's</td>
<td>2</td>
<td>850</td>
<td>39.10</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Heifers, 2's</td>
<td>4</td>
<td>813</td>
<td>45.87</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Heifers, 1's</td>
<td>5</td>
<td>617</td>
<td>29.91</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Bulls</td>
<td>1</td>
<td>1342</td>
<td>56.23</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Calves</td>
<td>6</td>
<td>333</td>
<td>21.09</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Steers, 1's</td>
<td>14</td>
<td>663</td>
<td>37.14</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Steers, 2's</td>
<td>20</td>
<td>921</td>
<td>49.11</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Steers, 3's</td>
<td>35</td>
<td>1063</td>
<td>59.20</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>Steers, 4's</td>
<td>10</td>
<td>1037</td>
<td>55.61</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Thirty-five per cent of the total receipts were from three-year-old steers, 20 per cent from cows, 17 per cent from two-year-old steers, and 9 per cent each from the sale of four-year-old and one-year-old steers. Calf sales represented 2 per cent of the total. The two, three and four year old steers and the cows represented 81 per cent of the total sales, which indicates the method of sale preferred by the cattlemen.

The cows were culled rather closely and most of the heifers used for replacement. Twenty-seven cows were sold during the
year and five died. Six calves were sold and eleven purchased per ranch.

Stockmen favor the practice of selling steers and heifers at two to three years of age, and although in some cases they are selling at a younger age, due to the control the loan companies have over the cattle, many of those who are selling very young stuff, plan to go back to selling twos and threes as soon as they are in a position to do so.

The California investigators found that as they extended the period of marketing from nine months to three years of age the cost per pound was reduced. It cost 8.8c per pound to produce a calf, 7.7c per pound for long yearlings, and 7.6c per pound for the long two-year-olds. The same conditions exist on the Wyoming ranges. The cost of carrying a cow for one year on the Wyoming ranches was $21.18, which makes the calf cost $37.06 per head. This high cost is due to the very low per cent calf crop of 57.15 per cent. The cost per pound of the above calves weighing 360 is 10.2 cents. The gains of the next two years can be put on at a cost of 7.76 cents per pound, which means that the first cost of the calf should be distributed over a longer period. This means a saving to the rancher in cost per pound of his animals.

If feeders were willing to pay the extra premium per pound required to produce the calf, it would be advisable to sell the calf; but they are not willing to do this, as shown in Figure 10. The rancher should have 1 to 2 cents per pound more for his calves than for his two-year-old and three-year-old animals.

That calves will put on more pounds of gain in the feed lot per 100 pounds of feed than will older cattle is a well-recognized fact, and if the feeders were willing to pay the extra premium per pound required to produce the calf it would be advisable to sell the calf. That the feeder is not willing to pay this premium is shown by Figure 10, which gives the weekly average price of feeder and slaughter cattle in the Omaha market for the past 120 weeks. This shows us what the feeder is willing to pay for the different classes. The average price paid for feeder calves has ranged from 5 to 7 cents, whereas the price of feeder steers above 750 pounds
ranged from 6 to $8\frac{1}{2}$ cents for the same period. The feeder steers weighing 750 and up have consistently sold above the steers weighing less than 750 pounds.

A study of the above marketing figures does not indicate that the feeder prefers the young stuff, but that he prefers the heavier steers and is willing to pay more for them. The same relation holds true for the animals ready for slaughter. Fat steers weighing 800 to 1100 pounds have consistently sold above the steers weighing 800 and less.

When the feeders and packers are willing to pay the higher price for the young stuff it will then be time to consider the advisability of selling calves and yearlings. Baby beef finished at the Wyoming station this year showed that it required a spread of 4 cents per pound in order to pay for the feeding operation. This means that calves put into the feed lot at 8 cents must bring over 12 cents in order to show a profit to the feeder. One to two cents spread is about all the market will stand.

Another factor that is often lost sight of by those who advocate the selling of young stuff is the fact that we have, every now and then, years of very light rainfall, which results in poor grazing conditions and scant feed. This means a reduction in the herd. On those ranches where the steers are kept until they are threes, it means a cutting back of the older steers to the yearlings. On those ranches where calves and yearlings are sold it means a cutting into the breeding herd, which is much more serious than the cutting back of the older steers. In the latter case it requires years to replace the breeding animals, while in the case where the surplus steers and heifers are sold, it means no cutting into the breeding herd, and the number can be readily replaced.

The practice of running the steers until they are long two-year-olds or threes enables a rancher to make use of his surplus cheap feed during good years, and to reduce his herd and save feed during the dry years, and at the same time to keep his breeding herd, which it has required years to build up, intact. The three-year-old steers may be looked upon as a bank deposit where the operator deposits savings in the form of cheap feed and where they accumulate and draw interest. When it is a matter of buying
high-priced feed to deposit, he sells the steer instead. Too often we have the viewpoint of the production of grass and forage for our livestock rather than the one where we look upon our livestock as a means of marketing our grass and forage. The grass and forage are primary and the livestock secondary. We use livestock to market our crops, and we use the kind and classes that will give us the greatest returns for our crops.

Another reason why the rancher prefers the older steers is that steers will not finish on grass alone until they have acquired their growth. This means keeping the steers until they are three or four years of age so that they can be finished as grass-fat steers. Some of our most successful ranchers in the state hold their threes over until they are fours if they are not in condition to go on the market as grass-fat animals at the end of the third year. Earlier maturing types of animals are being used on some of the ranches which makes it possible to finish them at an earlier age.

A study of the percentage of turnover, as shown in Table V, indicates that there was nothing to be gained by selling calves. A study of the marketing prices showed that the younger stuff was selling for less than the older stuff. A study of the cost of production showed that it cost more per pound to produce calves than it did two- and three-year-olds.

When the four above conditions are taken into consideration we can understand why the Wyoming rancher's practice of selling two- and three-year-olds is a sound economic practice and not a mere habit, and that the shift to the practice of selling calves and yearlings would not be a desirable one under present conditions.

LABOR

Labor on Wyoming ranches was paid for at the rate of $52.59 per month, including board. The average amount of work represented 35.3 months, which would be equivalent to 2.9 men the year around. The owner's time represented a man equivalent of 1.0, hired labor 1.5 and unpaid labor done by other members of the family was .4 man equivalent. (A man equivalent equals one
man working 1 year.) The owner’s manual labor was valued at $600 per year.

Figure No. 11 shows the correlation between the number of cows handled per man and the return on investment. Hay labor is figured as part of the labor on cattle. There was a correlation of +.639±.051, which is very indicative that the chances are better for a favorable return on investment when there are at least 108 cows per man, and that as the number of cows handled per man increases the return on investment increases.

It required about the same amount of labor to take care of the hay and other crops as it did to take care of the cattle. This means that during the slack season of the year when there is no crop or feeding work to be done, one man could handle 200 to 300 head. In order to handle one’s labor efficiently a ranch should run not less than 250 cows. The average of the 60 ranches studied was 200 cows. That half of the ranchers were running too few cows per man was shown by the returns on the investment. Even on livestock ranches labor is a very important item of cost.

The cost of labor was $1,858 per ranch, on which was grown 92 acres of alfalfa, 75 acres of native hay and 52 acres of feed crops.

METHODS OF INCREASING CARRYING CAPACITY

Just how much we should attempt to increase the number of livestock on our ranches depends on the amount of available feed. If we can increase our winter feed by better meadow management it will mean a greater carrying capacity per ranch. It required on the ranches studied, 15.3 acres of pasture, .42 acres of hay, and .11 acres of other feed crops to carry one animal unit a year. With an increase in the yield per acre of hay it means increased carrying capacity of the ranges, and less grazing acres will be required per animal unit.

The average production of native hay in the state is about one-half ton per acre. By better methods of irrigation, and some reseeding with alsike clover, wheat grasses and some of the cultivated grasses, it should be practical to increase the yield to one ton per acre. Grass mixtures on the Wyoming State Experiment
Station yield as high as three and a half tons per acre. They are given better care than a rancher can give his meadows, but it does indicate that the yields of our native meadow can be brought up to one ton per acre, without a great deal of expense.

Controlled grazing bears the same relation to forage production that controlled production does to marketing. If the animals are turned out early in the spring before the plants have had a chance to become established it is detrimental to the plant, and the harm done in early spring will continue through the season. More feed will also be produced if the plants are allowed to make a considerable growth before they are grazed off. It is through the green leaves and stems of the plant that the food from the air and soil are taken into the plant and there manufactured into plant tissue. The less leaves and stems a plant has the less its ability to manufacture more plant tissue. The plants should be allowed to obtain a good start, and occasionally they should be allowed to reseed. By meadow improvement and controlled grazing the carrying capacity of our ranches can be increased, and at a profit to the operator.
RECOMMENDATIONS

A study of the range livestock industry over a long period of years shows that it is subject to periods of prosperity and periods of depression. During one period cattle prices may be good and sheep prices poor. The period following is very likely to see the reverse.

Figure 12 shows the actual value of cattle, sheep and wool during the last half century when measured in terms of what they would buy. The value of cattle during the last few years has been such that even with the best systems of management on the ranch it has been impossible to show a favorable return on investment and labor. The present year has seen the turning point in the
value of cattle, and the present prices for cows, calves and feeders is the best it has been for years.

The calf crop may be increased by the use of more young, thrifty bulls, breeding under fence whenever possible, conditioning of the breeding herd, and the use of more riders on the open range and National Forests. Such expenditures will be more than justified by the increase in the calf crop. The stockmen should build up a feed reserve for the years of drouth, by meadow improvement and grazing control. This will reduce the winter losses that follow dry years and increase the calf crop.

The liquidation of range cattle the last few years is very likely to result in a shortage of good beef, and a corresponding increase in price. The increase may not take place as a direct increase in price, but more as a readjustment of other prices, to the price of cattle. The future of the cattle industry for those who are equipped to handle it on a sound economic basis looks bright.

**SUMMARY**

Livestock has always been, and will long continue to be, the most important means of marketing our crops. Cattle have occupied the grass ranges, and sheep the arid ranges and high timbered ranges.

Campbell and Crook, the two counties studied, are in the Northern Great Plains Area, and have always been primarily cattle ranges, due to the grass type of vegetation.

The average ranch acreage was 7,115, of which 45.6 per cent was owned by the operator. The value of the owned land without buildings and improvements was $8.13 per acre; 70 per cent of the leased land was privately owned and the remainder was very largely school land.

The use of the public domain in Crook and Campbell, as now practiced, was not looked upon with favor by the cattlemen. Most of the operators felt that leasing had many distinct advantages over the free range, in that leasing permitted controlled grazing and increased the carrying capacity.
Taxes were 12.7 per cent of the ranch income. That the assessed land valuation is too high is shown by the fact that operators can lease land for grazing purposes at a rate almost equivalent to the taxes. The tax rate was 10 cents per acre, and the leasing rate 12 cents per acre.

At the present time paying loans, made when money was cheap and cattle high, with cattle that are cheap when money is high is one of the greatest difficulties the rancher has to contend with. The ratio of interest payment to income was 18.4 per cent. Federal loans averaged 5.7 per cent, and private and bank loans 8 to 8.5 per cent interest.

The total receipts were $8,217 and total expenses $4,347. The ranch return on investment was $3,044 on $53,777, or 5.66 per cent. The increase in inventory on cattle of $1,658 was favorable to the above.

The investment in cattle was $16,848 and represented 31.3 per cent of the total investment, which was $53,777 per ranch. The investment per head, excluding calves, was $39.18. The operators whose investment in cattle represented at least a third of their total investment were doing better financially than those operators who had less than one-third of their investment in cattle.

The age of marketing had very little influence on the rate of turnover. The rate of turnover on the Wyoming ranches was 28.3 per cent. Animals purchased and sold again during the year influences the rate of turnover. Profit, and not turnover, is the measure of the success of a business. The selling of long two-year-olds and threes is to be recommended under present conditions.

There were on the average 197 cows, 114 calves, 64 one-year-old steers, 60 two-year-old steers, 37 three- and four-year-old steers, 54 one-year-old heifers, 12 two-year-old heifers and 6 bulls per ranch. Most of the heifers were kept for replacement. The surplus of heifers were sold as two-year-olds and the steers as long two-year-olds or threes.

The annual cost of carrying an animal unit for one year was $18.14, and $21.18 for caring for a cow for a year. The annual cost for the one, two and three year olds was $15.42.
The cost of producing a calf six months of age was $37.06, or 10.2 cents per pound. The cost of production per pound above the six-month period was 7.76 cents.

The labor cost was one of the large items of expense, being $4.32 per animal. In order to handle labor most efficiently a ranch should run at least 250 cows.

The item of cost that lends itself most readily to reduction is the cost per calf. The very low calf crop of 57.15 per cent makes the cost per calf very high.

The number of cows per bull was 32.2, which accounts to some extent for the low calf crop. Use of old bulls was another factor. Breeding under fence and good feed conditions increases the calf crop.

ACKNOWLEDGMENTS

The writer takes pleasure in expressing his indebtedness to the field men, G. S. Klemmedson, Associate Agricultural Economist of the Bureau of Agricultural Economics, Harry Pearson, of the University of Wyoming, V. V. Parr, Associate Animal Husbandryman, Bureau of Animal Industry, and to the ranchers and other men who assisted in the work.

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