A study of the comparative advantages of raising beef cattle in the corn belt and on the Montana ranges
by Arthur H Roth

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the
Degree of Master of Science in Agricultural Economics
Montana State University
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Abstract:
no abstract found in this volume
A STUDY OF THE COMPARATIVE ADVANTAGES OF RAISING BEEF CATTLE
IN THE CORN BELT AND ON MONTANA RANGES

by

Arthur H. Roth, Jr.

A THESIS

Submitted to the Graduate Committee in partial fulfillment of the requirements for the Degree of Master of Science in Agricultural Economics at Montana State College

Approved:

In Charge of Major Work

Chairman Examining Committee

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INTRODUCTION

The problem to be studied in this thesis is a comparison of beef production costs and practices in Montana and in the Corn Belt. The latter part of the paper will consist of suggestions as to adjustments in ranch organization, costs, type and quality of product that Montana range cattle producers must make so as to: (1) increase the net income to the ranch family, and (2) put the industry in the strongest economic position possible from the standpoint of permanency and stability of ranch organization and the proper utilization of Montana's natural resources.

The sources of material used in this work were obtained from the State Agricultural Experiment Stations and the U. S. Department of Agriculture. The type of material used was ranch and farm management studies also marketing and price studies. Much of the material was in the form of technical bulletins and a considerable amount of unpublished data obtained by the Montana State Agricultural Experiment Station and the Division of Farm Management and Costs, Bureau of Agricultural Economics, U. S. D. A. on cattle ranch costs of production. From this material investments, costs and ranch organization were secured. Marketing data for Montana was secured from material obtained on livestock marketing by P. L. Slagsvold of Montana State College, Department of Agricultural Economics. The adjustment alternatives are based on the interpretation of the comparisons of the two regions.

A cattle ranch may be defined as that unit of land and equipment devoted to beef cattle production by grazing. A stock farm is a combi-
nation of grazing and farming. While there may be a number of cattle ranches in Montana that have less than 75 head of cattle, this study will be devoted largely to the consideration of ranches running between 90 - 1,000 head the year round. This decision is made in the light of the fact that from 150 - 600 head of cattle is considered the most desirable size of family ranch in Montana. There are many types of beef production in Montana. The ones considered here will be: production of feeder calves; yearlings - feeders, and grass fat; two- and three-year-old grass fat steers; and combinations of these.

Numerous cattle ranches in the state which derive the major portion of their income from the sale of cattle also obtain some income from various other sources such as the sale of grain, alfalfa seed, hay or sheep. In this study supplementary income will be disregarded with due respect for its cost and value factors. One thing more should be made clear before we come to the main body of the thesis, that is, an animal unit. Most all ranch management surveys are based on the "animal unit". This unit is considered as a mature range cow weighing on the average 1,000 pounds. With this as 1.00 the relative value of the other classes of cattle would be .85 animal units for a two-year-old steer, .65 for a yearling steer, and 1.3 for bulls. The survey on which the ranch costs and returns are based was made during 1929-1933, a five-year period. This period, it is felt, is fairly representative and while prices may vary in the next five years the basis for the costs will remain fairly constant and with different price levels used should yield similar results.
Production Areas in Montana

Beef cattle ranches in Montana may be divided by geographical and climatic factors into three areas: (1) mountain valley (2) foothill and low mountain (3) plains or prairie ranches.

The mountain valley ranches are distinctive in that they generally have a longer winter feeding period, are relatively more dependent on the National Forests for summer range and tend more to produce and market two- and three-year-old steers. This area lies in the western part of Montana. Generally speaking, the ranges are more rugged, produce green feed later in the year and have more stock water than the plains.

The low mountain and foothill area is characterized by such ranges of mountains as are relatively low and not as rugged as the western area. Some of the so-called mountains are in reality nothing much more than foothills. The ranches are scattered along the water courses where irrigation is practiced for the production of winter feed reserves as in the western area. However, there is more dry farming practiced. Some of the smaller National Forests afford summer grazing for the cattle and there is more Public Domain than in the western area. The outfits are about equally divided as to type of production. Some ranches running calves, some yearlings, and others two-, three-, and four-year-old steers. The winter feeding period averaged around 100 days. The snowfall is not as heavy as in the western area nor does it lay as long on the ground.

The plains or prairie ranch area is characterized by a topography
ranging from fairly level plains and rolling prairie to the rougher districts, such as the "Bad Lands" and the "Breaks" of the Missouri river. The altitude varies from 3,000 up to 5,000 feet. "Normal" rainfall in this area is only 15.79 inches and is very unreliable; in fact in 1934, the year of the drought, there was only 5.51 inches - just 40 per cent of normal. When such a drought as this occurs, it causes a heavy liquidation of livestock. Not only is rainfall scarce, but also the supply of water for livestock is very limited. Wells and reservoirs are built to increase the water available for livestock so they will not have to travel such great distances to water. The rate of evaporation is also higher in this area. Snowfall is light and seldom is the ground ever completely covered with snow. This allows for a much shorter winter feeding period. Most of Montana's Public Domain lies in this section of the state. The ranches of this area are tending more towards a cow and calf basis due to forced liquidation of the past decade or so. Similar to all regions of the western United States that are deficient in rainfall the ranches are scattered along the water courses or near some other supply of water for livestock.

A brief discussion of ranch organization, management, cost of production, and marketing will be given by areas. Since the main objective of this study is a comparison of Montana and the Corn Belt this material will be summarized later to assist in the analysis of data.

Ranch Organization

The major portion of the total investment per animal unit is in land. The highest investment in land is in the foothill area where this
item amounted to £81.81 per animal unit. However, this constituted only 44 per cent of the total investment in this area while in the mountain valley area it was 44 per cent of the total investment. In the plains area 40 per cent of the investment per animal unit was in land. The variation among ranches was quite wide due primarily to the amount of land leased. In the mountain valley area this amounted to 23 per cent, not including National Forest grazing. Fifty per cent of the land per unit was leased in the plains area. The land in the prairie country was leased more cheaply but this is offset by the lower carrying capacity of the ranges which caused the acres of grazing land per animal unit to be 25.0, over twice that of the western area and about one-half again that of the foothill area. It would appear that it is not the cheapness per acre of leasing land that should be considered but rather the cost of gains. In other words, the rancher should lease land according to its ability to put gains on his animals.

In the mountain valley and foothill areas many of the outfits secure grazing on the National Forests. In the plains area this advantage is counter balanced to some extent by grazing on the Public Domain, little of which lies in the other two areas.

The investment in buildings (not including dwelling houses) and permanent improvements such as fences, corrals, sheds, etc. was somewhat higher in the mountain valley area. The lowest investment in this item was in the plains area where it amounted to $8.60. In the mountain valley area this same investment was $9.05 per animal unit.

Investment in cattle varies only a small amount between the three
areas. Because of the larger investment in land, the per cent of investment is smallest in the mountain valley area. The variation is between 36 and 41 per cent of the total investment per animal unit. In 1929, a year of relatively high valuations, the investment in cattle amounted to about $60.00 per animal unit.

The range in amount of indebtedness per head was quite wide. Interest expense was somewhat higher in the prairie area due no doubt to a higher indebtedness. The mountain valley operators, those in debt had an interest expense of $2.18 per animal unit; the foothill ranchers $3.06; and the prairie operators $3.52. The indebtedness was about evenly divided between the land and the cattle.

Ranch Management

Of all the charges that go to make up the total operating cost per animal unit, exclusive of land and interest charges, that of labor is the greatest. Labor cost includes the operator at current wages and the cost of board for the men. Labor costs constitute 33 per cent of the total operating expense exclusive of land and interest charges. Labor costs are related to the number of animal units handled per man and the wages paid. The number of animal units handled per man was 135 for the mountain valley area, 120 for the foothill area, and 108 for the great plains. The reason for this wide range is due to the fact that the amount of time spent in farming increases as we go from the western to the eastern part of Montana. This fact counteracts the amount of time spent in winter

1/ The total operating cost mentioned here includes between $3.00 and $3.50 for taxes and leases.
feeding which is greater in the western part of the state. The variation in the number of animal units handled per man was quite large in each area and was not correlated with size of outfit except that outfits of less than 150 head appeared to handle fewer cattle per man. Labor charges amount to approximately $6.00 per animal unit for all the areas.

The calf crop is one of the most important cost factors making for the success or failure of the cattle ranch enterprise where a cow herd is maintained. The per cent of calf crop was highest in the foothill area, 76.25 per cent, due to range that is not as rugged as that of the mountain valley area and yet has more stock water and probably a higher carrying capacity than the prairie ranges. The calf crop was lowest for the plains area because of the above mentioned cause. Since the prairie operators tend to run more on a cow and calf basis this would appear to be in need of improvement. The mountain valley ranches have an average calf crop of 68.5 per cent; 1.5 per cent more than the plains ranches.

The number of cows per bull affects the calf crop to a certain extent. A considerable range exists within each area in the number of cows run per bull. However, the average number of cows per bull was highest for the plains ranches. Here 32 cows were run per bull. This is probably due to the increased territory the cows graze over. The number of cows per bull was 26 for the mountain valley ranches and 27 for the foothill ranches.

Feed costs constitute a major portion of the expense in running cattle in Montana. The remark has often been passed that the ranching areas of the nation have cheap grass. Winter feed costs raise the annual
feed bill to quite a considerable item. Feed costs will be shown by areas starting with the mountain valley ranches. These will be followed by the foothill ranches and then the prairie ranches. We may figure an approximate cost of feed (both grazing and winter feeding) by taking the figures obtained from 5 typical western area ranches on grass costs, number of days on grass, the hay cost per day, and the number of days of winter feeding. The number of days on grass averaged 243 at a cost of 1.46 cents per day giving an annual cost of grazing of $3.54 (this included the cost of cottonseed cake fed on grass by two outfits to prolong the grazing period). The number of days of winter feeding was 122 at an average cost per day of 5.74 cents. This gives a cost of winter feeding of $7.00 which is almost twice the cost of grazing which averaged twice as long as the winter feeding period. It is likely that the cost of hay might be a little high due to some winter fattening in this area. These figures were obtained in 1930. The total cost of feed, including grass, hay, and salt averaged $10.85 a year for these five outfits and ranged from $10.16 to $12.45.

Feeds purchased such as salt, and hay cost approximately $2.00 per head. Most of the ranches in this area run on the National Forests in the summer although some of the operators summer their cattle on irrigated and subirrigated pastures.

In the foothill area the total cost of feed per animal unit was $8.93. The approximate grazing cost was 1.5 cents per head per day.

2/ The five year average for the winter feeding period on all the ranches surveys in this area was 120 days.
The total grazing cost averaged $4.33, 25 cents of which was for cottonseed cake fed on grass to prolong the grazing period. The cost of hay fed was 6.4 cents a day. The total annual feed cost including grass, hay, salt, and cottonseed cake was $8.93. 3/ Feed purchased including salt was the lowest for the three areas, amounting to $1.62 per head. This is due to the small amount of hay purchased. Leased land in this area cost 21 1/2 cents per acre, 1,660 pounds of hay were fed during the winter. 4/ Very few of the outfits received the use of the open range. Out of approximately 24 outfits only 2 used the Public Domain while around one-half of them had the privilege of grazing on the National Forests.

In the prairie area the cost of feeds purchased, including salt, averaged $1.77 for the 5 years. The records of four typical ranches in this eastern area taken from the source previously used for feed cost figures show the cost per acre of leased land to be 11 1/2 cents. The average grazing cost per head per day is 1.65 cents. The total grazing cost per head amounted to $4.34 and included about $1.27 for two outfits which fed some cottonseed cake as a grass supplement. The average hay cost per head per day was 4.7 cents; 3 cents a day more on hay than when on grass.

The total feed cost per head including salt averaged $8.20. The number of days on winter feeding was 93 for the average of the 5 years. The feed

3/ The above material is for 1929 and 1930 and included only two ranches, however they are typical of the area and hence were used as an example of the areas feed costs. The average number of days of winter feeding for the 5 years, 1929-1933, was 101 for this foothill area. The above calculations were on the basis of 305 days of grazing and only 60 days winter feeding. A table in the text shows a somewhat higher feed cost because of a longer winter feeding period.

4/ Figures for two years 1929 and 1933 only.
costs in this area are lower than the others due primarily to the lower winter feed costs. This advantage, however, is offset by the gains on the animals since the gains made in the foothill and mountain valley areas are appreciably greater.

Death loss amounts to 2.25 per cent for the mountain valley and foothill ranches and 2.50 per cent in the plains area. Besides the losses resulting in the death of the animal there are losses in weight and a reduction in quality which are caused by disease, parasites, poisonous plants, and minor causes.

Gains in weight made by the various classes of stock were obtained for 1929. (13) The foothill ranches produce the heaviest calves and yearling steers of all three areas. The two- and three-year-old steers of the mountain valley ranches are the heaviest but this is probably due to the practice of some operators of fattening these age classes on hay during the winter. The gains made in the prairie area are the smallest of all except for the gain of 281 pounds on the calves which is somewhat higher than similar gains in the mountain valley area. The gains and weights made for the three areas are shown in table VI, page 25. The weights and gains reflect the grade of range and amount of winter feeding in each area.

Some of the ranches had a small amount of income other than that derived from the sale of cattle of which the plains area was largest, namely $2.58. While this item amounted to only 50 cents in the Mountain valley area and 88 cents in the foothill area. 5/ Other income figures were obtained for 1929 only.
Cost of Production

In figuring the cost of production the item of land charges will be left out until a later page. The cost of production is computed by areas. The method used was the same for all three areas.

The cost of producing a feeder calf in the mountain valley area was figured as follows: The total operating expense per animal unit was obtained for all outfits selling feeder calves. This was $14.57, exclusive of land and interest charges. The cost per calf amounted to $22.14. 6/

The cost of production for a yearling steer of 675 pounds average weight was $31.00. 7/ The cost of producing a two-year-old steer weighing 1050 pounds and a three-year-old steer weighing 1300 pounds was $45.68 and $60.07 respectively; exclusive of land and interest charges but including taxes on both real estate and livestock. 8/

6/ The total operating cost was $14.57 per animal unit plus 60 cents for depreciation on the cow herd plus $1.50 death loss cost totaled $16.67. This figure was divided by the calf crop .753 (75.3%) and thus the above figure was obtained.

7/ This was figured as follows: The cost of producing the calf was figured as on the preceding page, to this was added the total operating cost of $8.42 for those outfits selling yearling steers, to this was added the death loss cost of one per cent on the number of steers or 44 cents a head figured by multiplying 675 by 6 2/3 cents a pound (the ranch value).

8/ To the cost of producing a yearling was added the operating cost of those outfits producing two- and three-year-old steers $12.99, plus the one per cent death loss cost which gave the cost of a two-year-old steer. To this cost was added the cost of running the two-year-old for an additional year which gave the cost of producing a three-year-old steer. In this survey were included 5 outfits producing hay fattened two- and three-year-old steers and cows. These outfits had an operating cost per animal unit of $11.74, exclusive of land and interest charges. By basing the cost on these five outfits, which may or may not be representative, gives us a cost of $43.39 for a two-year-old steer weighing 1000 pounds.
The cost of production for the foothill area was lower than in the mountain valley area when land charges were not included. The total operating expense was $11.76 per animal unit for those outfits selling feeder calves. This figure is almost $3.00 less than the similar cost for the mountain valley operators. The average per cent calf crop for these outfits was 79.33 also higher by 4 per cent than the western area. From these figures and those for the death loss and depreciation costs of $1.50 and .60 respectively, we obtain the cost of producing a feeder calf of 405 pounds $16.92. To produce a yearling steer weighing somewhat close to 700 pounds, it cost $28.88, the total operating expense for those outfits selling yearling steers being $11.50. This is $3.08 more per unit than the mountain valley average, but a cost of $2.12 less for the total cost of producing a yearling steer.

The outfits in this foothill area selling two- and three-year-old steers had a total operating expense averaging $11.44. From this we arrive at the cost of producing a two-year-old steer weighing 1000 pounds as $40.99, the yearling cost $28.88, plus the death loss cost of 70 cents and the running expense per unit of $11.44. The three-year-old steer weighing 1250 pounds cost $52.43 to produce.

The cost of production in the plains area is practically the same as in the foothill area when land charges are not included. The total operating cost for those prairie outfits that sell feeder calves was $11.77 and the calf crop 72.8 per cent. Figuring 60 cents depreciation per cow and $1.50 for the death loss cost brings the cost of producing a 385 pound calf to $16.17. In considering this cost and the others to
follow one should bear in mind that we have not included land charges or interest costs in the figures reached. The cost of producing a yearling steer weighing 650 pounds is $28.24, the average total operating expense for outfits in this area selling yearlings is $11.67 plus the death loss cost of 40 cents per head. The total operating expense for these outfits selling two- and three-year-old steers varied quite widely and gave an average of $10.33 per animal unit. The death loss cost of 61 cents per head and the operating cost gives us the sum of $29.18 for the cost of producing a 935 pound two-year-old steer. The death loss cost on the three-year-old steers amounts to 75 cents and the cost of production for the three-year-old steer weighing 1150 pounds is $50.26.

Land Charges

A detailed analysis of land charges will be given in the summary for Montana but some of the differences between the three ranch areas will be given here. The foothill area has the highest land charge. This amounts to $7.13 per head for an average of all age classes whereas the mountain valley area has a charge of $6.07 and the prairie ranches $6.68. The higher cost in the foothill area is probably due to the increased cost of land because of a natural advantage in beef cattle production. It will be remembered that the calf crop was highest for this area and the gains on the calves and yearlings were also greater. The privilege of grazing on the Forest Reserves may be one cause for the lower land charge in the mountain valley area.
Marketing

Montana lies about midway between the livestock markets of the Pacific coast and the market and packing centers of the middle west. Numerous factors influence the producer in choosing a market for his cattle. The most important are economy of transportation and price forces operating in the market. Others are convenience of transportation facilities, custom, activity of railroad agents, and friendliness towards a commission firm.

The mountain valley area is served by four railroads. Fifteen counties by the Northern Pacific, five by the Great Northern, eight by the Milwaukee, and four by the Oregon Shortline (Union Pacific). The markets available to this area are Chicago, South St. Paul, Sioux City, and Omaha in the east; and Spokane, Seattle, Portland, Salt Lake City, Ogden, Los Angeles, and San Francisco in the west. Some cattle are marketed locally as in Butte and some are slaughtered on the farm. Using the average annual number marketed for 1929-1931 we find that 51.7 per cent of the cattle of the mountain valley ranches go to the western markets and 48.3 per cent to the eastern markets. 9/

It would seem that the foothill area has the largest disadvantage in the marketing of its cattle. The mountain valley area is closer to the west coast markets and the prairie area is closer to the eastern

9/ 24,298 head to the eastern markets and 26,060 head to the western markets. 11,573 steers, 11,431 cows, 461 bulls, and 2,495 calves to western markets; 13,122 steers, 9,098 cows, 274 bulls, and 1,784 calves to eastern markets. The majority of cattle marketed from this are the older age classes of steers.
markets. This foothill ranching area is served by the Northern Pacific, Great Northern, Milwaukee, and Burlington railroads. Almost 98 per cent of the cattle shipped to the terminal markets go to the eastern ones; 2.03 per cent going to the western markets. What cattle do go to the western market centers are shipped to Portland, Seattle, Spokane, and one year a few head were shipped to Los Angeles. 10/

Marketing facilities for the prairie area are as favorable as anywhere in the state. The area is served by four railroads. Three counties have access to the Burlington railroad, five counties to the Milwaukee, and eleven counties each can ship over the Northern Pacific, and Great Northern lines. Practically all of the cattle, 98.4 per cent are marketed in the east. For the three-year average, 1929-1931, we find that only 1956 head are annually shipped to western markets. Only three western markets receive cattle from this area: Seattle, Spokane, and Portland.

Summary for Montana

In this summary we will endeavor to present a general picture of ranch costs and cost factors in Montana as a unit so that the reader may have this as a basis of comparison with corn belt practices and costs.

Ranch Organization

The per cent of investment in the various items will be given for each area and then averaged for the state. These averages we are going

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10/ Average yearly marketings for these 3 years was 70,715 steers, 34,211 cows, 1,064 bulls, and 10,793 calves to eastern markets; 1,018 steers, 289 cows, 48 bulls, and 373 calves to the western markets.

This area does not specialize in one age class of cattle but markets about equal amounts of all classes.
to compare with those obtained by a study of Wyoming mountain valley ranches which appear to be the best available for the purposes of a comparison. (20)

Table I shows the per cent of the total capital invested in each item such as land, buildings, cattle, etc. These average per cents are compared with those for Wyoming. However, the comparison is not exactly fair for we have included the great plains ranches as well as those of the mountainous area in the Montana figures. The first contrast to come to our eyes is that of land. The table shows over 6 per cent more of the total capital invested in land in Wyoming than in Montana. The investment in buildings and improvements is also much greater in Wyoming. On the other hand, we find that Montana cattle ranches have about 7 1/2 per cent greater investment in cattle. This means that the Montana ranches have a greater amount invested in a factor which will produce income.

It might be said, however, that the horses and other livestock percentage is larger for Wyoming because this figure includes 1.88 per cent invested in sheep. Just how much of the Montana figure of 2.3 per cent is in livestock other than horses is not obtainable. Feed and supplies on hand also form a larger item in the Montana cattle ranch investment which appears desirable. The Wyoming ranches have a lower per cent of investment in machinery and equipment.

Ranch Management

Labor cost per animal unit per year averaged approximately $5.70 for the state. From table II one will notice how much greater the cost per day is when hay is fed than when on grass. In the cost of grazing is
TABLE I

INVESTMENT OF CAPITAL BY MONTANA BEEF CATTLE RANCHES,
IN PERCENTAGES OF TOTAL INVESTMENT PER ANIMAL UNIT.*

<table>
<thead>
<tr>
<th>Investment Items</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Montana Average</th>
<th>Wyoming Mountain Valley Ranches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>43.9</td>
<td>43.9</td>
<td>39.7</td>
<td>42.5</td>
<td>48.9</td>
</tr>
<tr>
<td>Buildings and Permanent Improvements</td>
<td>5.4</td>
<td>6.0</td>
<td>6.3</td>
<td>5.9</td>
<td>7.63</td>
</tr>
<tr>
<td>Machinery and Equipment</td>
<td>4.2</td>
<td>3.6</td>
<td>3.8</td>
<td>3.85</td>
<td>2.67</td>
</tr>
<tr>
<td>Cattle</td>
<td>36.0</td>
<td>39.4</td>
<td>41.9</td>
<td>39.1</td>
<td>31.55</td>
</tr>
<tr>
<td>Horses and Other Livestock</td>
<td>1.9</td>
<td>1.7</td>
<td>3.2</td>
<td>2.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Feed and Supplies On Hand</td>
<td>8.6</td>
<td>5.4</td>
<td>5.1</td>
<td>6.35</td>
<td>5.55</td>
</tr>
</tbody>
</table>

* Source of data - (13) and (20)
included the cost of cottonseed cake which was fed on grass by several outfits to prolong the grazing period. At the top of the columns will be found the total feed cost for the year.

Table III shows the number of cows per bull, the per cent of calf crop and the death loss in per cent. The general ranch expense which includes such things as automobile charges, veterinary charges, etc. is shown in Table IV along with the items of supplies, depreciation on equipment, taxes, leases, and the total operating cost. The item supplies refers to such articles as repairs to machinery and similar expenses. The item taxes includes not only the tax on real estate but also on livestock. This varies with the amount of land owned as does the cost of leases. The percentage of range land leased in 1929 was 25 per cent for the mountain valley operators, 40 per cent for the foothill ranches, and 50 per cent for the prairie outfits. The total operating cost figures are the average for all types of outfits in each area.

While the cost of bulls was included in the total operating expense due to the fact that some of the outfits raised their own bulls, representative bull service charges will be given at this time. Bull service amounts to $2.60 per cow when a $150.00 bull is purchased. This cost includes: interest at 6 per cent, $8.00; depreciation, $25.00; death loss at 6 per cent, $4.75; feed and labor, $35.00. When this is prorated over 28 cows it gives the above figure of $2.60.

Cost of Production

Table V gives the total operating costs for the different types of production by the ranches. The weights and gains made by the various
<table>
<thead>
<tr>
<th>Feed and Related Costs</th>
<th>Mountain Valley</th>
<th>Foothill</th>
<th>Great Plains</th>
<th>Montana Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total feed cost for year</td>
<td>$10.47</td>
<td>$10.42</td>
<td>$8.86</td>
<td>$9.91</td>
</tr>
<tr>
<td>Days of grazing</td>
<td>245</td>
<td>264</td>
<td>272</td>
<td>260</td>
</tr>
<tr>
<td>Cost per day of grazing</td>
<td>$1.46</td>
<td>$1.53</td>
<td>$1.65</td>
<td>$1.54</td>
</tr>
<tr>
<td>Total cost of grazing</td>
<td>$3.58</td>
<td>$3.96</td>
<td>$4.49</td>
<td>$4.01</td>
</tr>
<tr>
<td>Cost per acre of leased land</td>
<td>$20.50</td>
<td>$21.25</td>
<td>$11.25</td>
<td>$18.00</td>
</tr>
<tr>
<td>Number acres grazing per unit $</td>
<td>10.75</td>
<td>17.25</td>
<td>25.0</td>
<td>17.75</td>
</tr>
<tr>
<td>Cost of producing ton of hay Minus land charges</td>
<td>$2.99</td>
<td>$5.80</td>
<td>$4.71</td>
<td>$4.50</td>
</tr>
<tr>
<td>Cost of producing ton of hay plus land charges</td>
<td>$5.51</td>
<td>$8.20</td>
<td>$6.94</td>
<td>$6.68</td>
</tr>
<tr>
<td>Number days winter feeding</td>
<td>120</td>
<td>101</td>
<td>93</td>
<td>106</td>
</tr>
<tr>
<td>Cost per day of hay fed</td>
<td>$5.74</td>
<td>$6.46</td>
<td>$4.74</td>
<td>$5.61</td>
</tr>
<tr>
<td>Cost of winter feeding</td>
<td>$6.89</td>
<td>$6.46</td>
<td>$4.37</td>
<td>$5.90</td>
</tr>
<tr>
<td>Cost of feed &amp; salt purchased</td>
<td>$2.75</td>
<td>$1.67</td>
<td>$1.77</td>
<td>$2.06</td>
</tr>
<tr>
<td>Hay fed per unit</td>
<td>2307</td>
<td>1640</td>
<td>1137</td>
<td>1694</td>
</tr>
</tbody>
</table>

* Source - (22)

/ Number of acres of grazing per unit does not include use of open range lands.
TABLE III

PERCENTAGE OF CALF CROP AND DEATH LOSS FOR MONTANA BEEF CATTLE RANCHES. ALSO THE NUMBER OF COWS RUN PER BULL.

<table>
<thead>
<tr>
<th></th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Great Plains Ranches</th>
<th>Average for Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows per bull</td>
<td>26</td>
<td>27</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Per cent calf crop</td>
<td>68.5</td>
<td>76.25</td>
<td>67</td>
<td>70.25</td>
</tr>
<tr>
<td>Per cent death loss</td>
<td>2.25</td>
<td>2.25</td>
<td>2.50</td>
<td>2.33</td>
</tr>
</tbody>
</table>

TABLE IV - MISCELLANEOUS COST FACTORS INVOLVED IN THE TOTAL OPERATING COST AND THE TOTAL OPERATING COST PER ANIMAL UNIT FOR MONTANA BEEF CATTLE RANCHES.*

<table>
<thead>
<tr>
<th></th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Great Plains Ranches</th>
<th>Average for all Montana Ranches</th>
</tr>
</thead>
<tbody>
<tr>
<td>General ranch expense</td>
<td>$ 2.45</td>
<td>$ 2.03</td>
<td>$ 2.32</td>
<td>$ 2.27</td>
</tr>
<tr>
<td>Cost of supplies</td>
<td>1.83</td>
<td>2.26</td>
<td>1.89</td>
<td>1.99</td>
</tr>
<tr>
<td>Depreciation on Equipment</td>
<td>1.11</td>
<td>1.22</td>
<td>1.29</td>
<td>1.21</td>
</tr>
<tr>
<td>Taxes</td>
<td>1.97</td>
<td>2.22</td>
<td>2.45</td>
<td>2.21</td>
</tr>
<tr>
<td>Leases</td>
<td>1.02</td>
<td>1.85</td>
<td>1.79</td>
<td>1.55</td>
</tr>
<tr>
<td>Total operating cost*</td>
<td>12.24</td>
<td>11.54</td>
<td>11.03</td>
<td>11.60</td>
</tr>
</tbody>
</table>

* Does not include taxes and leases.
ages of cattle are shown in table VI. From this we can see that the smallest gains and, therefore, the lightest weights are those for area III, the plains ranches. The heavier weights of the two- and three-year-old steers in the mountain valley area are no doubt due to the practice of feeding a larger amount of hay during the winter feeding period which while longer is offset by the heavier feeding making the gains for the year greater than when the stock have to rustle during the winter months.

Quality is a difficult thing to define. It is a combination of factors which are usually associated with good feed and breeding. Quality is shown in the smoothness of the fleshing and frame of the animal and also in the hide, hair, head, and bone. We found ourselves unable to secure any concrete data on the quality of cattle coming to the markets from Montana. Be that as it may, we feel justified in saying that the quality of cattle from Montana cattle ranches is good. The use of pure-bred sires and the relative freedom from many of the diseases which beset other cattle producing areas along with the comparatively good ranges make Montana cattle, both feeders and grass fat, desirable from the standpoint of quality. As a reminder, we want to state that here we are considering cattle ranches where the source of income is primarily from cattle and the operator devotes the greater part of his time to his cattle and matters relating thereto. This excludes those cattle coming from outfits whose major source of income is not from cattle and whose beef is too often poor in quality.
TABLE V

TOTAL OPERATING COSTS FOR VARIOUS AGE CLASSES OF CATTLE
PRODUCED ON 100 MONTANA BEEF CATTLE RANCHES 1929-1933*

<table>
<thead>
<tr>
<th>Age of Cattle</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Average for Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>$14.57</td>
<td>$11.76</td>
<td>$11.77</td>
<td>$12.70</td>
</tr>
<tr>
<td>Yearlings</td>
<td>8.42</td>
<td>11.50</td>
<td>11.67</td>
<td>10.53</td>
</tr>
<tr>
<td>Two-year-old steers</td>
<td>12.99</td>
<td>11.44</td>
<td>10.53</td>
<td>11.59</td>
</tr>
<tr>
<td>Three-year-old steers</td>
<td>12.99</td>
<td>11.44</td>
<td>10.53</td>
<td>11.59</td>
</tr>
</tbody>
</table>

* Does not include land charges or interest.

† Only an average for 6 ranches.

TABLE VI

WEIGHTS AND GAINS MADE BY THE VARIOUS AGE CLASSES
OF BEEF CATTLE ON MONTANA CATTLE RANCHES*

<table>
<thead>
<tr>
<th>Age Classes</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Average for Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>400</td>
<td>405</td>
<td>385</td>
<td>397</td>
</tr>
<tr>
<td>Yearlings</td>
<td>675</td>
<td>275</td>
<td>640</td>
<td>678</td>
</tr>
<tr>
<td>Two-year-old steers</td>
<td>1050</td>
<td>375</td>
<td>955</td>
<td>995</td>
</tr>
<tr>
<td>Three-year-old steers</td>
<td>1300</td>
<td>250</td>
<td>1150</td>
<td>1233</td>
</tr>
</tbody>
</table>

* Source – (15)
Table VII shows the cost of production by areas for the different age classes of cattle and the average from Montana. These costs do not have either the land charges or the cost of interest included in them.

Table VIII was obtained by dividing the cost of production by the weight of the animal produced. From this we see that the cost of producing 100 pounds of beef is greatest for those outfits selling calves and decreases for the outfits producing yearling and two-year-old steers but rises for three-year-old steers.

Land Charges

We now arrive at the problem of land charges. This we will divide into two parts: (1) the present land charges; (2) the charges the land can actually sustain under the historical level of prices. Our land charge estimates will be based on the animal unit defined before and on the average ranch price for beef of 6.5 cents per pound. Land charges may take several forms, interest on land investment, land taxes, land leases, or some combination of the above. Real estate taxes are included in the land charge because a tax on land cannot easily be shifted and it directly affects the lease and capital value of agricultural land.

The average ranch price for beef cattle in Montana was 6.5 cents per pound over a forty year period. Seven cents per pound for calves, yearlings, and two-year-old steers, five cents for dry cows, and 3.5 cents for old and cull cows.

This reference will be used for all the discussion on land charges since it is the most accurate of the known methods of formulating the cost and valuation of range lands in Montana. This method has recently been approved by the Federal Land Banks for the use of its appraisers.
### TABLE VIII

**COST OF PRODUCING 100 POUNDS OF BEEF ON MONTANA BEEF CATTLE RANCHES, 1929-1933**

<table>
<thead>
<tr>
<th>Age of Cattle</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Average for Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>$5.54</td>
<td>$4.18</td>
<td>$4.20</td>
<td>$4.64</td>
</tr>
<tr>
<td>Yearlings</td>
<td>4.59</td>
<td>4.13</td>
<td>4.26</td>
<td>4.53</td>
</tr>
<tr>
<td>Two-year-old steers</td>
<td>4.35</td>
<td>4.10</td>
<td>4.19</td>
<td>4.21</td>
</tr>
<tr>
<td>Three-year-old steers</td>
<td>4.62</td>
<td>4.19</td>
<td>4.57</td>
<td>4.39</td>
</tr>
<tr>
<td>Average cost for all classes</td>
<td>4.78</td>
<td>4.15</td>
<td>4.26</td>
<td>4.37</td>
</tr>
</tbody>
</table>

* Does not include land or interest charges.

### TABLE IX

**ANNUAL LAND CHARGE ON MONTANA RANCHES FOR THE VARIOUS AGE CLASSES OF BEEF CATTLE, 1929-1933**

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Cost Items</th>
<th>Mountain Valley Area</th>
<th>Foothill Area</th>
<th>Prairie Area</th>
<th>Average for Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeder calves</td>
<td>Leases</td>
<td>$1.10</td>
<td>$1.11</td>
<td>$1.32</td>
<td>$1.18</td>
</tr>
<tr>
<td>(per cow)</td>
<td>Land taxes</td>
<td>1.01</td>
<td>2.11</td>
<td>2.25</td>
<td>1.78</td>
</tr>
<tr>
<td></td>
<td>Interest (5%)</td>
<td>3.95</td>
<td>4.09</td>
<td>5.44</td>
<td>5.85</td>
</tr>
<tr>
<td></td>
<td>Land charge</td>
<td>6.06</td>
<td>7.51</td>
<td>6.99</td>
<td>6.79</td>
</tr>
<tr>
<td>Yearlings</td>
<td>Leases</td>
<td>0.97</td>
<td>1.71</td>
<td>1.64</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Land taxes</td>
<td>0.51</td>
<td>1.33</td>
<td>1.55</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>Interest (5%)</td>
<td>3.95</td>
<td>4.09</td>
<td>5.44</td>
<td>5.85</td>
</tr>
<tr>
<td></td>
<td>Land Charges</td>
<td>5.45</td>
<td>7.15</td>
<td>6.66</td>
<td>6.41</td>
</tr>
<tr>
<td>Two- and Three-year-old steers</td>
<td>Leases</td>
<td>1.47</td>
<td>1.62</td>
<td>1.88</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td>Land taxes</td>
<td>1.31</td>
<td>1.25</td>
<td>1.07</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>Interest (5%)</td>
<td>3.95</td>
<td>4.09</td>
<td>5.44</td>
<td>3.85</td>
</tr>
<tr>
<td></td>
<td>Land charges</td>
<td>6.75</td>
<td>6.36</td>
<td>6.39</td>
<td>6.70</td>
</tr>
<tr>
<td>Average for all ages</td>
<td></td>
<td>6.07</td>
<td>7.13</td>
<td>6.68</td>
<td>6.65</td>
</tr>
</tbody>
</table>

* Land values used are for the average investment per head.
Present Land Charges

Land charges per animal unit have been worked out for the 1929-1933 period. The method used is contained in the following sentences.

The leases paid on leased lands for each age class of cattle marketed was found for each area. To this sum was added the real estate tax found by subtracting the average tax per animal unit from the total taxes per unit. (15) To this was added the cost of 5 per cent interest on the average amount invested in land and buildings for that ranching area. 13/ This total gives us the land charge per animal unit. This is shown in table IX.

The average tax per animal unit was 60.2 cents for the five year period. This tax has decreased from 72.4 cents on an average value of cattle of $37.20 in 1929 to a tax of 39.4 cents on cattle valued at $18.31 in 1934. The tax on farms and grazing lands in the state was 14.6 cents per acre on land valued at $8.97 in 1929 to a tax of 11.5 cents on land valued at $6.35 per acre in 1934. These figures show the trend in taxation until June 30, 1934.

Table IX shows the annual land charges for the different ages of cattle sold for each of Montana's ranching areas. The reason the land charges are so high in the foothill area is a natural advantage in cattle raising which has caused the land values to rise. Land charges are high in the prairie area because of the competition for lands between the grain farmer and the livestock grower. The land charge per calf is higher because of the smaller calf crop which increases the burden on

13/ The figure for investment in land and buildings were obtained for 1929 only.
each calf. Due to the cheap summer grazing afforded by the National Forests in the western area, the mountain valley ranches have the lowest land charges of any of the three areas.

By multiplying the average lease cost per acre of grazing land times the number of acres of grazing per animal unit we find the cost to be considerably less than when the land is owned or partly so. This is shown in table X.

When it comes to applying the land charge per animal unit to find the cost for the various age groups, we run into a different problem—that of how much should be charged to the calves and how much to the dry cows which are fat but have produced no calf. Just how much of the land charge should be put upon the calves and how much can be charged to the dry fat cows can possibly be estimated by the following method. Assuming that a dry cow will gain approximately 250 pounds during the grazing season and that the weaned calf will weigh 400 pounds, we find that the cows which produce a calf produce 150 pounds more beef than the dry cows which put on fat. However, the dry cows that are sold constitute 12-15 per cent and the cows with calves 70 per cent of the total number of breeding cows. If the dry cows produce 250 pounds of beef which will sell at 5 cents per pound this means that she is worth $12.50 more because of carrying her through the year. Since the land charge constitutes about one-third of the cost of running a cow per year we can use one-third of the $12.50 for paying the land charge for those cows that do not produce a calf.
Since the cows are run for the purpose of producing calves we may be allowed to reason in this manner and allow this $4.00 (about one-third of $12.50) to offset the land charges which are made against the calf. This means that after we prorate the total land charge per unit over the cows which produce calves we can subtract this amount, $4.00, when multiplied by the per cent of the fat cows culled and sold from the herd, over the cows which do produce calves. That is, this $4.00 is multiplied by the number of fat cows that are sold and this sum is divided among the cows having calves. Thus, the land charge per calf is reduced by approximately 69 cents.

Using this method of computation we arrive at a land charge of $8.09 per calf in the mountain valley area, $8.93 for the land charge per calf in the foothill area, and $9.59 for the prairie ranches. The land charges for calves, yearlings, two-year-old, and three-year-old steers are shown in table XI.

Using this material in tables VII and XI we can find the total cost of production by adding the land charge to the total operating cost charge. This is shown in table XII. By dividing the pounds of beef produced into the total cost of producing the beef we arrive at the cost of production for 100 pounds of beef for the different classes of stock in each ranch area. This is shown in table XIII.

Desirable Land Charges

Figured on the basis of 63 cents a pound, ranch price, for beef which is the long-time average for Montana range beef cattle we find that
the annual gross income per animal unit is $20.00. Thirteen dollars of this $20.00 income comprises the ranch expenses, taxes, feed, etc. Three dollars of the income goes to pay for interest on the investment in cattle and equipment. This figure of $3.00 is arrived at by using an interest rate of 6 per cent on an investment of $45.00 per cattle unit and a $5.00 investment in equipment per cattle unit. The reason for deducting the other charges before that of the land charge is taken out is because the other capital can be used for other purposes while the land has practically no alternative use. Long-time trends show that real estate taxes constitute somewhere near 30 to 35 per cent of the lease value of the land. This item means that one-third of the income from the land must be used to pay the real estate tax. In 1934 the average real estate tax on privately owned ranch lands was around $2.00 per animal unit.

Just as the animal unit has been used as a basis for computing livestock production costs so has the forage acre been founded as a measurement of forage production and range land carrying capacity. The forage acre is a surface acre of land having the maximum density of grass cover and maximum palatability of forage under range conditions. This is an ideal and is not approached to any great degree by Montana range lands. The forage requirement for an animal unit is between 0.8 and 1 forage acre per month. This means that it takes 0.8 x 12 months or approximately 10 forage acres per animal unit per year. From this we find that a

14/ During this discussion we shall use the average prices and other valuations. There is considerable range above and below these figures but they probably represent the average for all ranches considered and, therefore, are a basis for comparison for ranches whose costs and incomes are either above or below these averages.
capital value of $5.50 per forage acre can be sustained to arrive at the $55.00 figure of total investment in land on a 5 per cent interest rate. This figure of $5.50 includes the value of fences, water development, and buildings.

This value of $5.50 per forage acre was derived from ranch records of 100 cattle ranches obtained from over the entire state for calf crops, weight and quality of livestock, death losses, labor, length of range and winter feed periods, etc. Due to climatic differences causing green feed to be produced for a longer period and better water facilities for range utilization result in a forage acre worth about $6.00 in the mountain valley and foothill areas and $5.00 for the prairie area.

Figuring on the basis of $4.00 per unit to sustain the land charge annually and a requirement of 10 forage acres the average annual lease value of a forage acre would be somewhere near 40 cents. This would mean a monthly grazing fee of 33 cents per head for the 12 months. By relating the figures to those for the different grades of grazing land we get the results in table XIV which gives us the lease value of the grades of Montana range lands.

Using the value of $5.00 for the forage acre in eastern Montana and $6.00 for western Montana we arrive at the following results shown in table XV which gives us the capital values of range lands.

Hay lands may be evaluated on the forage acre basis of the above. Figuring the animal unit to require 500 pounds of hay per month this would be equal to .8 of a forage acre. Therefore, an acre of land able to produce one ton of hay would be equivalent to 3.2 forage acres and
### TABLE X

**AVERAGE LAND CHARGES PER ANIMAL UNIT FOR THE RANCHING AREAS OF MONTANA AT THE 1929-1933 LEASE RATES IF ALL RANGE LANDS WERE LEASED**

<table>
<thead>
<tr>
<th>Class of Cattle</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Montana Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>$2.80</td>
<td>$3.08</td>
<td>$3.32</td>
<td>$3.07</td>
</tr>
<tr>
<td>Yearlings</td>
<td>2.15</td>
<td>3.22</td>
<td>2.62</td>
<td>2.66</td>
</tr>
<tr>
<td>Two- and Three-Year-Old Steers</td>
<td>2.93</td>
<td>2.67</td>
<td>2.71</td>
<td>2.77</td>
</tr>
<tr>
<td>Average</td>
<td>2.63</td>
<td>2.99</td>
<td>2.88</td>
<td>2.83</td>
</tr>
</tbody>
</table>

* Does not include crop land.

### TABLE XI

**AVERAGE LAND CHARGE PER ANIMAL UNIT FOR CALVES, YEARLINGS, TWO-YEAR- AND THREE-YEAR-OLDS ON MONTANA CATTLE RANCHES, 1929-1933**

<table>
<thead>
<tr>
<th>Age Classes</th>
<th>Mountain Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Montana Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>$8.09</td>
<td>$8.93</td>
<td>$9.59</td>
<td>$8.67</td>
</tr>
<tr>
<td>Yearlings</td>
<td>13.52</td>
<td>16.06</td>
<td>16.25</td>
<td>15.28</td>
</tr>
<tr>
<td>Two-Year-Olds</td>
<td>21.25</td>
<td>23.02</td>
<td>22.64</td>
<td>21.98</td>
</tr>
<tr>
<td>Three-Year-Olds</td>
<td>26.98</td>
<td>29.98</td>
<td>29.03</td>
<td>28.68</td>
</tr>
</tbody>
</table>
TABLE XII

TOTAL COST OF PRODUCTION FOR THE VARIOUS AGE CLASSES OF CATTLE
IN THE RANCHING AREAS OF MONTANA, 1929 - 1933*

<table>
<thead>
<tr>
<th>Age</th>
<th>Cost and Weight</th>
<th>Mt. Valley Area</th>
<th>Foothill Area</th>
<th>Prairie Area</th>
<th>Montana Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td>$30.23</td>
<td>$25.85</td>
<td>$25.76</td>
<td>$27.28</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>400#</td>
<td>405#</td>
<td>385#</td>
<td>397#</td>
</tr>
<tr>
<td>Yearlings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td>44.52</td>
<td>44.94</td>
<td>44.49</td>
<td>44.65</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>675#</td>
<td>700#</td>
<td>660#</td>
<td>678#</td>
</tr>
<tr>
<td>Two-Year-Olds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td>66.93</td>
<td>64.01</td>
<td>61.82</td>
<td>64.25</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>1050#</td>
<td>1000#</td>
<td>935#</td>
<td>995#</td>
</tr>
<tr>
<td>Three-Year-Olds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cost</td>
<td>87.05</td>
<td>82.41</td>
<td>79.29</td>
<td>82.93</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>1500#</td>
<td>1250#</td>
<td>1150#</td>
<td>1233#</td>
</tr>
</tbody>
</table>

* No interest on cattle charged. Includes operators wages at going rate.
TABLE XIII
COST OF PRODUCTION FOR 100 POUNDS OF BEEF IN MONTANA
BY ALL CLASSES AND AREAS, 1929- 1933

<table>
<thead>
<tr>
<th>Age Class</th>
<th>Mt. Valley Ranches</th>
<th>Foothill Ranches</th>
<th>Prairie Ranches</th>
<th>Montana Ranches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves</td>
<td>$7.56</td>
<td>$6.38</td>
<td>$6.69</td>
<td>$6.88</td>
</tr>
<tr>
<td>Yearlings</td>
<td>6.60</td>
<td>6.42</td>
<td>6.74</td>
<td>6.59</td>
</tr>
<tr>
<td>Two-Year-Olds</td>
<td>6.37</td>
<td>6.40</td>
<td>6.61</td>
<td>6.46</td>
</tr>
<tr>
<td>Three-Year-Olds</td>
<td>6.70</td>
<td>6.59</td>
<td>6.89</td>
<td>6.73</td>
</tr>
<tr>
<td>Average</td>
<td>6.81</td>
<td>6.45</td>
<td>6.73</td>
<td>6.67</td>
</tr>
</tbody>
</table>

TABLE XIV
LEASE VALUES OF GRADES OF MONTANA RANGE LANDS BASED ON
A NORMAL LEASE VALUE OF 40 CENTS FOR THE FORAGE ACRE

<table>
<thead>
<tr>
<th>Grade</th>
<th>Lease Value of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40¢ x 0.45 = 18¢</td>
</tr>
<tr>
<td>2</td>
<td>40¢ x 0.30 = 12¢</td>
</tr>
<tr>
<td>3</td>
<td>40¢ x 0.23 = 9¢</td>
</tr>
<tr>
<td>4</td>
<td>40¢ x 0.17 = 7¢</td>
</tr>
<tr>
<td>5</td>
<td>40¢ x 0.10 = 4¢</td>
</tr>
</tbody>
</table>
### TABLE XV

**CAPITAL VALUES FOR DIFFERENT GRADES OF MONTANA RANGE LANDS AS DERIVED FROM FORAGE ACRE VALUES**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Western Montana</th>
<th>Eastern Montana</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2.75</td>
<td>$2.25</td>
</tr>
<tr>
<td>2</td>
<td>1.85</td>
<td>1.50</td>
</tr>
<tr>
<td>3</td>
<td>1.35</td>
<td>1.15</td>
</tr>
<tr>
<td>4</td>
<td>1.00</td>
<td>.85</td>
</tr>
<tr>
<td>5</td>
<td>.50</td>
<td>.60</td>
</tr>
</tbody>
</table>

* Source (14)
this figure times $5.50 (the value of a forage acre) would result in a value of $17.00 per acre for hay land capable of producing one ton of hay.

The present level of real estate taxes on the different grades of range lands based on the 1934 average Montana range land tax of 6 cents an acre and on the assumption that the average of the privately owned range lands of Montana are between second and third grade range land gives the following figures: grade 1, a tax of 10 cents an acre; grade 2, 7 cents an acre; grade 3, 5 cents; grade 4, 3.5 cents; grade 5, 2 cents per acre. This means a forage acre tax of 22 cents.

Adjusted tax rates on range lands figuring one-third of the normal annual lease value as consumed by taxes would give a tax rate of the following: grade 1, 6 cents per acre; grade 2, 4 cents; grade 3, 3 cents; grade 4, 2 cents; grade 5, 1 cent. If we consider the range lands of Montana as falling on an average between second and third grade then the average value per acre should be about $1.50.

The indebtedness of Montana cattle ranches varies widely. At the time this survey was conducted some of the ranches had no indebtedness while others had a great deal. From our previous figures we saw that $3.00 was needed from the gross income of $20.00 per animal unit to pay interest charges of 6 per cent on a capital valuation of $45.00 per animal unit and $5.00 invested in equipment. This $3.00 interest on cost constitutes 15 per cent of the gross income. In the total cost of production per 100 pounds of beef no charge was made for interest on capital invested in livestock. There appears to be no basis for assuming
any appreciable difference in livestock valuations or interest charges between Montana and the corn belt.

The disposition of Montana cattle and calves for the years 1926-1931 was as follows: farm slaughter, 6.7 per cent; local slaughter, 14.3 per cent; shipped to central markets, 79.0 per cent. In 1932 there were 30,000 cattle and calves slaughtered on Montana farms. Forty per cent of all cattle shipped out of Montana each year go to Chicago. The other markets, South St. Paul, Omaha, Sioux City, Spokane, Salt Lake City, Seattle, Ogden, Tacoma, and Portland rank in favor to Montana cattle ranchers in the order given. Sixty-two per cent of the cattle go to Chicago and South St. Paul. Of the total cattle marketed from Montana 89 per cent go to the eastern markets and 11 per cent to the western. The most important factors influencing the cattleman in his choice of markets are economy of transportation and price differentials.

Some idea of the difference in freight rates can be obtained from the following data for charges on fat cattle, not rates for feeder cattle which are 85 per cent of the ordinary livestock rate when shipped to points at which no public market exists. The rate from Dillon to Ogden, Utah, is 38.5 cents per 100 pounds; from Dillon to San Francisco is 73\(\frac{1}{2}\) cents; and to Omaha, Nebraska, 72 cents. The freight rate from Great Falls to Chicago, is 81.5 cents, South St. Paul 66\(\frac{1}{2}\) cents, and to Spokane 44 cents. It is hoped that these rates will give the reader some idea of the difference in cost of marketing cattle from Montana. There are other costs incident such as yardage, commission charges, etc., but the major
cost is freight. The advantages of the different markets will be decided by the price differentials and the freight rates to the markets.

Shrinkage is a considerable factor in marketing Montana cattle for most all of the markets are a considerable distance from the state.

"Cattle in transit less than 24 hours shrank from 2.05 to 3.91 per cent.
Those in transit from 24 to 36 hours shrank from 3.4 to 6.37 per cent.
Those in transit from 36 to 72 hours shrank from 3.88 to 5.40 per cent.
Those in transit over 72 hours shrank from 3.96 to 7.00 per cent."[21]

FATTENING CATTLE IN MONTANA

While it was not originally intended to include any discussion of cattle fattening in Montana, after a perusal of the adjustments possible to Montana beef cattle producers, it was deemed advisable to present a brief picture of the cattle fattening enterprise in the state. In this short discussion, we will confine ourselves to an analysis of ranches and farms where small grains and hay are the feeds used or could be used.

The reason for excluding those farms fattening cattle on sugar beet by-products is because the expansion of finishing in this direction is dependent on an increase in the sugar beets produced and processed. A summary of practices and costs of ranchers or farmers finishing cattle on small grains, hay and possibly the addition of a commercial feed as cottonseed cake will aid in an understanding of our future discussion.[15]

[15] The following pages are based on material taken from bulletins of experiments conducted by the Animal Husbandry Department of Montana State College and an unpublished study of feed lot costs carried on jointly between the department of Animal Husbandry and Agricultural Economics of Montana State College and the Division of Farm Management and Animal Husbandry of the U. S. Department of Agriculture. The price of feeds used is for the period from 1929-1933.
The various classes of cattle which may be fattened in Montana are varied. The most common ages to feed are weaned calves, yearlings, and two-year-old steers, although, cows, heifers, and even bulls are occasionally fattened. Some operators feed their cattle until they are fully finished while others may only feed them long enough to use up the extra feeds they have on hand. However, the use of feeds for fattening cattle is limited to those areas which have a surplus of feed over and above the necessary amount needed to maintain the numbers of cattle run from year to year.

Our main interest here lies with the cattle producer who finishes his own livestock, although there is also to be considered the man who raises feed and buys or contracts to feed other cattle.

There has been developed the Montana baby beef production plan where calves are fed around 3 pounds of grain per day with 8-10 pounds of hay per day from weaning time until May and then are given a full feed of grain or pasture from May to September at which time they are full fed grain and 5-6 pounds of alfalfa hay.

When marketed in November, they should weigh around 1,000 pounds. The average amount of feed required for this operation is 2,500 pounds of wheat or barley, 2,500 pounds of alfalfa, and 4 months native pasture. These feeds would cost approximately $40.00 with the 1929-1933 average farm price level for the products. This means a feed cost of around $6.66 per pounds gain.

Yearling steers of beef type can be finished for the eastern market in 150 days when on a full feed of grain and calves can be
finished from 180-200 days. Feeds used in finishing cattle by farm or ranch operators are barley, oats, wheat, cull peas and cull beans where available, and alfalfa or other hay; cottonseed cake may also be purchased and fed.

One trouble which is of much consequence in Montana when feeding barley and alfalfa hay to cattle for fattening is bloat. Montana cattle feeders have this factor to contend with which is much more serious than in the middle west and eastern parts of the United States.

By taking a typical ration used for fattening yearling steers and also one for calves we can work out a reasonably accurate cost per 100 pounds of gain for the period 1929-1933. Starting yearling steers on a feed of oats and then finishing on a ration of 11.04 pounds of wheat and 9.66 pounds of alfalfa hay per day gives an average daily gain of 2.35 pounds or a total gain of 35.21 pounds for 150 days. The final weight was around 1,228 pounds. Average feed costs for the five year period mentioned above gives a feed cost of about $8.00 per 100 pound gain. To get the true cost per 100 pound gain, however, one would have to add the cost of labor, equipment, interest on investment, and death loss cost. Some computations of the above have been made. The cost of these items for feeding 50 head of steers would be as follows: labor cost (including board) $100.00; equipment cost (10 per cent depreciation) $60.00; interest on investment varies between $60.00 and

16/ The rations used and the results obtained are from the cattle feeding experiments of the Animal Husbandry Department of Montana State College. Numerous bulletins on cattle fattening were used in computing the results. The costs for labor, equipment, etc., are estimates based on feeding records and observations of competent men.
An example of a ration using barley would be: barley 12.07 pounds and alfalfa hay 8.5 pounds per day and conditioned on oats. This ration gave a daily gain of 2.15 pounds, a total gain of 323.3 for 150 days feeding and a final weight of 1,193 pounds.

Weaned calves weighing 400 pounds or over may be fed a ration of about 10 pounds barley, 0.75 pounds cottonseed cake, and 5 pounds of alfalfa hay to make a daily gain of 2.15 pounds or 421 pounds during a feeding period of 196 days. These calves are started on oats and then changed over to the other grain such as wheat or barley. Cottonseed cake may or may not be added to the ration. Using the ration of barley, cottonseed cake and alfalfa hay as above for the 1929-1933 farm price level of feeds, we find the cost per 100 pounds gain to be approximately $6.40 exclusive of other charges than that of feed. The other costs connected with feeding 60 calves were estimated as follows: labor $131.00; equipment $60.00 (10 per cent depreciation); interest on investment of feeders at $7.50 per 100 pounds, $77.00; death loss cost (2 per cent death loss) $66.50. These costs, it may be remembered, are averages and will vary quite widely depending on conditions and the price level.

It is hoped that the foregoing statements will be of use to the reader in a comparison of corn belt feeding. All too often, it is thought

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17 This death loss cost may seem high but it includes the cost of one-half the feed for a one per cent death loss, also, the cost of the cattle that died which are all true costs to be borne by the other animals marketed.
that corn is the only feed for fattening cattle. What does the future hold in store for Montana cattle growers? Will there be an increase in feeding in the state? If so, how will it compare in cost and product with the corn belt? We now approach the question of practices of management and of costs that are in some cases the direct opposite of those encountered in Montana.

**STUDY OF THE BEEF CATTLE INDUSTRY AS CONDUCTED IN THE CORN BELT**

We now come to the study of the corn belt, so-called because of the preponderance of corn over other crops raised. It has been in a dynamic state in the past gradually creeping north and west until at the present time it extends from the central part of Ohio on west into South Dakota, Nebraska, and Kansas. From southern Minnesota, it runs south into Missouri. Beef cattle production, both baby beef calves and the fattening of calves and older cattle, is of more importance in the western part of the area. This area is farther away from the markets for grain, there is more land devoted to pasturage, and, in general, the crops are more often marketed in the form of livestock. This region may be designated as humid since the rainfall varies from 20 to 30 inches annually. Generally speaking, the summer nights are warm in sharp contrast to those of Montana. The growing season is also considerably longer than that of Montana. All the above go to make the optimum conditions for its chief crop, corn.

The economic study of beef production and fattening in the corn belt is complex in contrast to production of the same product on Montana
ranches. Whereas in Montana the main source of income, and often the only source, is from beef cattle and the energies of the operator are directed almost solely towards that end, in the corn belt its production is complicated by the diversity of crops raised, and the different kinds of livestock produced and marketed all from the same farm. All this makes for a very involved problem when it comes to deciding between what costs are created by the beef cattle and what costs by the dairy cows, hogs, sheep, or divers crops marketed. 18/

The problem confronting us will be attacked from two angles: (1) the production of calves for baby beef, and (2) the fattening of calves, yearlings, and two-year-old steers. Compared with the problem of finding the costs involved in the production of 100 pounds of beef, the question of costs contained in the production of feeder calves and baby beef on the same farm is very complicated and in all probability can result in only very careful estimates rather than in exact figures. However, none of our figures can be considered exact in the strictest sense of the word. Let us now turn our minds to a type of beef production very different in its form from that with which we have previously concerned ourselves.

Farms Producing Calves for Baby Beef

Farm Organization

Our first concern lies with those men who produce baby beef calves by running a beef or milk and beef breeding herd. We are limiting the

18/ An excellent discussion of joint costs, etc. involved in the allocation of expenses by different methods with their advantages and disadvantages is made by John A. Hopkins and Paul Taylor in Iowa Research bulletin, No. 183, "Cost of Production in Agriculture".
discussion to the production of baby beef calves since very few corn belt farmers raise feeder cattle other than calves due to high carrying charges which make the cost of production for older cattle uneconomic at the present time.

Baby beef production is the most intensive form of beef production. The average acreage in pasture land per farm varied from 93 acres on the farm in southwestern Minnesota \(^{(11)}\) to 318 acres in Kansas.

There are a number of types of management on farms producing baby beef calves which are as follows: beef, baby beef, dual purpose, mixed, partially milked, and double nursing. These may be described by saying that the beef and baby beef farms are those outfits that do not milk the cows; the sole source of income from the cows being the calves. Dual purpose farms are those where the cows are all milked and the dairy products sold, the calves weaned at birth and raised on skim milk and other feeds. The "mixed" layouts are those where some of the cows are milked and others are not. Partially milked are those farms where some of the cow's milk is taken but the remainder is left for the calf, some keep the calves separate from the cows except at milking time and others run the calves with the cows twelve out of twenty-four hours. Double nursing is where some of the cows are milked and the other cows raise their calves, two calves per cow.

The amount of capital invested in beef cattle and the percentage of the total capital invested varies considerably. The farms in the

\(^{(11)}\) The size of beef cattle farms in Minnesota in 1914-16 was 335 acres and in 1929-31 was 340 acres. There was, however, an increase in corn acreage in the latter period along with an increase in small grain acreage and a corresponding decrease in pasturage, to 65 acres.
beef and baby beef groups are generally larger than the others. The average number of beef cattle on the strictly beef farms is around 35 head. The number of cows on the milk and beef farms runs as low as 12 head and on up to a little over 22 head on the "mixed" farms. Most of the strictly beef farms have their own bulls but some of the milk and beef farms borrow bulls or hire the services of one. Sometimes a group of farms will own a bull together. The common practice on these farms is to raise hogs in addition to the cattle enterprise. The percentage of the farm income derived from pork production, grain crops, dairy products, and beef varies from farm to farm. In southwestern Minnesota the acreage in corn and pasture is closely related to the production of cattle. The percentage of investment is greater in cattle and less in hogs on the beef farms.

In 1929-1932 average investment for a baby beef cattle unit was 33 beef cows $2,508.00, 4 yearling heifers $229.00, 4 heifer calves $81.00, 1 beef bull $126.00, buildings and equipment $1,202.00 plus 25 baby beefs gives a total of $4,146.00.

The milk and beef cattle unit had a total investment of $3,259.00 consisting of the following: 20 milk and beef cows $1,280.00, 15 beef calves $575.00, 3 yearling heifers $138.00, 3 heifer calves $60.00, 1 beef bull $114.00, buildings and equipment $1,072.00, and 15 feeder calves and yearlings credited to the breeding cows. The milk and beef breeding herd is generally smaller in size and the average investment per breeding cow was $12.00 less.
The average investment in buildings was $457.00 per farm or $19.00 per head for the beef farms and $493.00 or $33.00 per head on the milk and beef farms. Machinery on farms in the corn belt constitute 2 per cent of the total investment. The larger farms have a smaller per cent invested in machinery and the smaller farms a larger percentage per head. What per cent of this is used for the beef cattle enterprise cannot be ascertained. The machinery would be used in crop production and the crops would in turn be fed to livestock or sold.

The amount invested in machinery in 1921 ranged from $1,438.00 on farms of 200 acres to $2,564.00 on farms of 340 acres and over.

The investment in buildings and equipment is greater for the milk and beef herds because a reasonably good barn is necessary for housing the cows that produce milk. Beef cattle can be wintered in a straw shed or some other modest shelter. The young calves from the milk cows will need to be kept warm during the winter and stanchions are needed in which to milk the cows. Equipment such as milk pails, cream separator, etc. will also be needed for the milk and beef herd although the farm with the strictly beef herd will also have a cream separator but no doubt a smaller one.

Farm Management

Labor costs vary according to the kind of management program followed and the equipment used. The average number of hours of man labor per cow was 20 and that for a bull 50, with an average for the breeding herd of 44 hours. The above figures are for the beef system of production. Under the milk and beef system the number of hours of man labor
was 30 per bull and 110 per cow with an average for the herd of 118 hours. This great increase is due to the labor used in milking and feeding the calves. The distribution of labor used is much more equal throughout the entire year under the milk and beef system while under the beef system the amount of labor used is very little in the spring, summer, and fall when compared with the winter months. Thus, while the strictly beef system of calf production does not interfere with crop production to any great extent, the use of labor by the milk and beef system competes with crop production for the use of labor. Horse labor amounted to 5 hours per animal unit under the beef system and 7 hours for the milk and beef system.

The labor cost per cow was $4.00 and $4.62 per bull under the beef system or a cost of $4.77 per baby beef calf raised to weaning age. The annual labor cost per cow in the milk and beef system averaged $12.32 per cow, $8.09 per bull, and $1.00 per calf. This gives a labor charge per calf of $13.65. It must be remembered, however, that this high cost is due to the labor involved in milking which is offset by the sale of milk or milk products in most cases. The $1.00 charge per calf is for costs incurred by hand raising or mixed and double nursing of the calves under the milk and beef system. The beef system utilizes labor which, while busy during the crop growing season, would otherwise be idle during the winter months. Thus, the labor item under the beef system is not so much greater than if only crops were grown and marketed.

Keeping a herd of beef cows in the corn belt seems to fit quite well into the feed situation in that area. The cows are a means of
utilizing the roughages such as hay, straw, stalk fields, and other unmarketable feeds and the baby beef calves constitute the medium for marketing the grains. Then too, most farms have some land unfit for tillage and this can be used as pasture for the herd of cows and calves. The milk and beef system of management use relatively less pasture than does the beef system. The feed cost constitutes approximately 75 per cent of the expense involved in running a cow for one year. As feed prices decrease this percentage would be less and vice versa. Feed costs will be higher under a system of milk and beef production due to the necessity of heavier feeding of cows producing milk to be sold.

The pasturage required for the grazing season would be around one acre of permanent grass pasture for the spring and fall use for the cow and calf with one-half acre of sweet clover pasture for midsummer use. Two to three acres of permanent pasture would otherwise be needed for the entire grazing season for the cow and her calf. The pasture season in Iowa runs about seven months in length with a charge of $1.50 to $2.00 per animal unit per month. The winter period requires from one-half to one ton of alfalfa or sweet clover hay plus one to one and one-half tons of roughage such as corn fodder or low grade hay as millet. The low grade roughage can be replaced by two or three tons of corn silage. Grain should be fed to cows being milked according to their production.

Calves under a system of milk and beef production must generally

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20 Information to the author from John Hopkins, Iowa State College.
be fed grain to replace the whole milk deprived of them. Many strictly beef production farms creep feed their baby beef calves to increase their weight. According to most writers on the subject it appears to be profitable to creep feed baby beef calves. This practice may be stated as follows: "Creep feeding grain to calves while running with their dams on pasture is a profitable practice. An increase of 100 or more pounds in the weight of the calf can be obtained this way by weaning time on a feed consumption of about 300 pounds of grain." This practice is followed by successful baby beef producers in Minnesota. The winter feeding period varies widely throughout the corn belt since there is considerable distance from the southern part to the northern part. In Minnesota the winter feeding period is from December 1 to May 1 according to the season and the feeds available. For about one month or so the cows can be run in the corn fields after husking. After the pasture season has run out the cows are run in the stubble fields and meadows. The length of the grazing period in Indiana averages 238 days beginning between April 15 to May 1 and running to November or December 1. In the 1926-1931 period the cost of grazing per day per cow was 3.3 cents and for the entire season $7.83 per cow. The cost of winter feed for this same period in Indiana was 6.3 cents per cow per day with a cost for the winter feeding season of $8.00. This gives a yearly feed cost per cow of $15.83. The grass pasture cost $1.00 per cow per month while the corn stalk pasture amounted to .03 cents per day. The stalk pasture would probably not last over a month. The costs show that, like the Montana rancher, the corn belt
beef producer's wintering costs per day are about twice that on pasture. On the other hand, some corn belt farmers have wintered their cows as cheaply in the winter as on grass because many of the roughages fed are of little or no value for any other use except for feeding to beef cows.

Some pasture costs obtained from Missouri records for 1928 are as follows: winter pasture from December 1 to April 1 was valued at 75 cents per month; pasture from April 1 to December 1 at $1.50 per month. This gives a pasture cost of $12.00 per cow. The feed cost per cow was around $17.00 for the 1929-1932 period. The feed cost per cow per calf raised was $20.32. Since most or an appreciable percentage of corn belt farmers creep feed their baby beef calves because they are fattened on the same farm we will give some feed costs for calves. These costs are those for feeds fed up to the time they are sold. Two typical records of feed consumption may be given to indicate the feeds used. Corn, 13-14 bushels; oats, 2-3 bushels; linseed oil meal, 13 pounds; molasses feed, 40 pounds; hay, 85 pounds. A somewhat similar consumption is: corn, 12 bushels; oats, 3 bushels; oil meal, 25 pounds; and hay 23 pounds. The value of feed per calf amounted to $13.68 ranging from $18.40 in 1929 to $9.50 in 1932. A cost of $9.42 was charged to each calf for grain consumed per calf in Indiana.

These feed costs include a charge for land. Just how much of the feed cost is taken up by land charges is not certain. We may estimate the land charge on feeds by the various charges included in

21/ Unpublished material obtained from the Animal Husbandry Dept. of the University of Missouri. Records obtained on beef demonstration herds in Missouri from 1926-1932.
the cost of producing a bushel of corn. The 1927 cost of corn pro-
duction in Iowa was $6.69 land charge, a total cost of $22.36 per
acre or a cost per bushel of about 55 cents. The land charge consti-
tutes approximately 30 per cent of the total cost of corn. Whether
this land charge would be similar to that of other crops is not
certain since labor is a very large factor in cost of production of
corn.

Farm management studies show that the kind of crops produced on
the corn belt farm are an indication of the kind of livestock pro-
duction best fitted to the farm. The relation of crops to livestock
should provide an interesting side light to our study of competitive
costs of production. As mentioned before, the amount of corn and
pasture on the farm is closely related to the beef cattle industry.

A representative beef cattle farm with a herd of breeding cows
had 80 per cent of the crop area in grains which is greater than on
the dairy farms. The proportion of land in corn should also be larger
on the beef farm. Forty-one per cent of the roughages used by a beef
cattle herd were of low grade such as wild hay, corn fodder or stover
whereas only 14 per cent of the dairy herd ration consisted of such
low grade roughages. Hogs will compete with beef cattle for the use
of fattening grains. The breeding cows in a beef herd require very
little grain, but is used for finishing the baby beef calves. Just
as the supply of range and winter feed reserves determines to a con-
siderable extent the size of the beef herd in Montana so does the
the supply of corn and roughages determine the size and kind of beef
operation in the corn belt.

The average calf crop obtained by the corn belt baby beef producers is approximately 86 per cent. Contrary to records obtained in 1914-1916 in the corn belt, the average calf crop on strictly beef farms was 87 per cent and on the milk and beef farms 85 per cent. Calf crops of 90 per cent and upwards to 100 per cent are not unusual, and on the other hand, they may be considerably less. The high calf crop means that each calf has to pay for less of the expense of carrying the breeding herd through the year which in turn means a decreased cost of production for the calves. These high calf crops are due to the relatively small pastures wherein the breeding herd is run and also the close observation of the operator and smallness of the herd. The number of cows run per bull is less on the milk and beef farms than on the beef farms. Most farms have only enough cows for one bull. Too small a herd of cows will mean a higher bull charge per calf. Calves on the beef system farms generally come from March to June while the cows on a milk and beef system farm may come throughout the entire year or in the spring and fall months. The latter means calves of varying age will be on the farm.

Death losses average somewhat below 5 per cent. Careful supervision and prompt attention to diseases and parasites offset the effects of close confinement in lots and pastures. 22/

Under the beef system it is assumed that one heifer will be needed for replacement each year for every eight breeding cows. Under the milk

22/ Information to the author.
and beef system it takes one heifer for every seven cows. These replacements are most generally cattle raised by the operator himself.

Gains made by baby beef calves depend upon the manner in which they are handled and fed. Creep feeding calves while they are suckling will result in a gain in weight of 100 pounds or more. Calves from the beef herds are weaned at from 6 to 8 months of age. The average weight of the calves at weaning time was 404 pounds and ranged from 300 to 475 pounds. It is extremely difficult to obtain many weights for calves at weaning time due to the fact that a majority of the men producing baby beef calves fatten them before selling them. A goodly number of the calves are creep fed and, therefore, the weights would be much different from calves not creep fed. 23/

Missouri creep fed calves weighed 581 pounds at 7½ months of age while the calves not fed grain weighed only 487 pounds. In an Indiana trial calves creep fed two months and then hand fed weighed 715 pounds at 10½ months. In Missouri beef herds the calves come early in the year in the records cited below. The average weight per calf when started on grain, June 20, was 250 pounds; the weaning weight per calf, September 24, was 502 pounds. The average weight per calf on November 12 was 626 pounds; an average gain per calf for the 144 days on grain of 376 pounds and a daily gain of 2.61 pounds. It must be remembered that these gains are for calves born early in the year.

23/ Creep feeding is a system where the calves are allowed to eat grain at will while on pasture with their dams. The creep allows only the calves access to the grain.
Land Charges

Land charges vary widely between different farms in the same locality and also according to the tenure of the land. Just how much of the land operated by corn belt baby beef calf producers is leased is not known. Like many other areas of the United States, the increase in farm tenancy has been considerable. We shall assume that the person who leases a farm or owns one should derive 5 per cent interest from his investment of capital in real estate. The cost per head of buildings and equipment was 95 cents per year for the beef system and $1.65 per cow under the milk and beef system.

The costs used in this section are averages and will not be applicable to every district in the corn belt. However, the object of this study is to analyze two different beef producing regions. We suggest that the reader consider these figures or costs with the understanding that they are averages for a large region.

The investment in buildings and equipment was $19.00 per head for beef herds when figuring 5 per cent interest on the investment giving a cost of 95 cents. Since the feed prices charged against the animals were in most cases market values, the land charge is included in the cost of feed. This is exclusive of feed lots, barnyards, and buildings. There are no doubt several ways of estimating land charges per animal unit. The method to be used here is not without flaws but in lieu of a more accurate method this will be used. The method followed involves the use of average values for land, and taxes, average yields per acre,
average costs of production per acre, and average feed consumption for the cattle.

Land valuations for the 1929-1933 period in the corn belt show wide fluctuations from year to year and state to state. Illinois' values were taken because it was felt that they came midway between the high values of Iowa and the low values of Kansas and Nebraska. The value of pasture land was $66.00 and that of plow land $102.00. The tax per acre is from 1.0 - 2.0 per cent of the total value which gives us a tax charge of approximately $1.50 for plow land and $1.00 for pasture land. The pasture season of 226 days is obtained from approximately 1/2 acres of bluegrass pasture. This is for strictly beef herds and includes some cornstalk pasture in the fall. At 5 per cent interest this means a land charge of interest and taxes of $6.28 for this period. Improvements such as fences, and creep feeders would bring this up somewhat. In addition to the pasture land charge there is a winter feed cost part of which is composed of land charges. If calves are dropped in the spring the cows can be wintered cheaply on roughage which is the usual practice on well-managed beef farms. Assuming a standard of 2700 pounds of legume hay, probably alfalfa, for wintering a beef cow, we can find the land charge by finding: the cost of production per ton of alfalfa and the land charge per ton.

In 1932-1934, it cost $17.21 per acre to produce alfalfa yielding 2.29 tons to the acre. This is a cost per ton of $7.52. Interest and taxes compose 48.45 per cent of this. Since it takes 2700 pounds of alfalfa this would mean a cost of $10.14 for the winter feed cost.
Since 48.45 per cent of this is land cost, the land charge would be $4.88 for the winter months. This land charge would, of course, vary widely. If grains were fed it would no doubt be higher and if a cheaper roughage were fed it could be lower. Adding the winter and summer land charges we get a cost of $11.15. Including the interest on buildings, which is part of the real estate, we arrive at a total land charge per cow of $12.11.

The land charge per calf would be $15.81 for a 400 pound calf not creep fed or $3.45 per 100 pounds. The land charge per creep fed calf would be higher as would the charge for milk and beef herd calves since there is a greater amount of feed and especially higher priced feed fed to the cows. Then too, the calves must be fed grain to compensate for the butterfat taken from their milk. Depreciation on buildings and equipment was not included because it is felt that this is not properly a land charge.

Undoubtedly, the tax burden seems very heavy to the cattle producer in any area of the United States. This is true of the corn belt beef producer. Tax delinquency had been increasing up to 1930 in Missouri and this is true of other corn belt states. The 1928 and 1929 tax per cow was 50 cents a head. This tax has no doubt decreased up to 1933. The real estate tax averaged a little above $1.00 per acre. The high average for any one state was about $1.50 in 1929 and dropped to considerably less than $1.00 in 1933 on the poorer grades of farm land. On the basis of productivity per acre, how does this tax compare with grazing land taxes in Montana?
Interest expense per cow amounted to around $4.50. The range was from around $2.00 up to over $8.00 for all livestock farms in Iowa county, Iowa. Interest charges were higher in the beef herds than in the milk and beef herds due to the fact that the cows in the beef herds were valued somewhat higher than the others.

Cost of Production

The cost of production for baby beef calves show a wide range. This range is caused by numerous factors such as feed costs, management factors but undoubtedly the most important one is the system under which the calf is produced. The corn belt beef calf producer has two by-products, manure and butterfat, which must be deducted from the cost of calf production. Indeed, on some farms the calf is no doubt considered the by-product and the butterfat or milk the major source of income.

Numerous costs of production for baby beef calves will be given and following this a comparison of costs of production under the beef and milk and beef system of calf production. The cost of feed per cow per calf raised was $20.32 and the value of the feed consumed per calf was $13.88, a total feed cost per 625 pound calf of $34.20. To this is added the cost of bull service, interest, taxes, etc. of $6.04. The bull service charge per calf constitutes around 20 per cent of the $6.04, interest approximately 75 per cent, and tax about 5 per cent. This gives a total cost per calf of $40.24. Since no interest was charged to the cost of production of calves in Montana this charge must be subtracted for purposes of comparison. The interest cost is $4.53. This gives us a cost of $35.71.
However, this does not include the charges for labor and probably not for equipment and buildings either. The labor cost would be approximately $4.62 per animal unit and $2.38 for buildings and equipment. This increases the cost per cow by $7.00 and the cost per calf will then total $42.71 for a 626 pound calf and $29.81 for the 400 pound calf not creep fed. Thus, we get the cost of $6.82 per 100 pound for creep fed calves and $7.45 for the calves not creep fed. This disparity between the two is not exactly true for there would be additional labor costs involved in creep feeding the calves which are not included here. Perhaps these charges for labor are too high since the basic costs for feed are from Missouri, where the land is more in pasture and thus the charge for labor would be less than the figures used, which were from Minnesota. Then too, manure credits would be in the neighborhood of from $4.00 to $5.00. Therefore, the average cost of production per 100 pounds of baby beef feeder calves would approximate $6.25 per 100 pounds.

The following costs are those obtained from most all the states in the corn belt. In the beef group, that is, herds where a strictly beef system is followed, the carrying cost made up of feed, labor, equipment, interest, and other charges, was $39.85 per cow and subtracting the credit for manure and extra calves raised gives a cost per cow of $34.78. However, from table XVI we find the carrying cost per cow to be only $3.70 in the dual purpose group due to credits of $60.67 for milk and manure to offset the gross cost of $64.37.

It would seem that the labor cost of $17.80 was quite low when one considers the large amount of labor involved in the milking of cows and
the feeding of the calves. The credit for milk is very high and to get this high credit should involve a very heavy labor and feed cost.

The other annual carrying charges per cow are found in table XVI and it will be seen that the carrying cost per cow is much lower under the milk and beef system.

Table XVII shows the cost of production per calf raised in each of the six groups. Here again the beef and baby beef groups are the highest and the milk and beef group lowest. Of course, the feed and labor charge per calf is much higher in the milk and beef group and especially so in the dual purpose group. However, this is not high enough to offset the low net carrying cost per cow. No doubt the calves from the milk and beef herds are considerably lighter in weight and lacking in quality, natural fleshing, and other requisites of beef type as compared with the beef system herd. This will mean a lower selling price and more costly gains when fattened.

"Pail fed calves are usually unsatisfactory to feeders because they are frequently thin in flesh, owing to insufficient and improper feed and carelessness in feeding, and the development of intestinal ailments." 

Are the factors of weight, quality, and beef type great enough to overcome the reduced production cost of the milk and beef calves? A goodly number of corn belt farmers consider the value of manure from their beef herd to be of considerable import. We would like to insert here a statement from a bulletin entitled, "Beef Cattle Production in Minnesota". Speaking of milk and beef herds we quote, "However, they
## TABLE XVI

**COST PER YEAR OF KEEPING A COW ON CORN BELT FARMS**

<table>
<thead>
<tr>
<th>Type of Management</th>
<th>Feed</th>
<th>Labor</th>
<th>Equipment</th>
<th>Interest</th>
<th>Other Charges</th>
<th>Total Charges</th>
<th>Milk Manure</th>
<th>Total Net Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef herd</td>
<td>27.52</td>
<td>4.41</td>
<td>2.18</td>
<td>4.55</td>
<td>1.19</td>
<td>39.85</td>
<td>.04</td>
<td>5.53</td>
</tr>
<tr>
<td>Baby beef</td>
<td>28.61</td>
<td>3.67</td>
<td>2.50</td>
<td>4.95</td>
<td>1.19</td>
<td>40.92</td>
<td>.08</td>
<td>6.06</td>
</tr>
<tr>
<td>Dual Purpose</td>
<td>37.21</td>
<td>17.80</td>
<td>4.00</td>
<td>4.23</td>
<td>1.15</td>
<td>64.37</td>
<td>53.87</td>
<td>6.80</td>
</tr>
<tr>
<td>Mixed herd Partially Milked</td>
<td>31.48</td>
<td>10.60</td>
<td>2.78</td>
<td>4.54</td>
<td>1.14</td>
<td>50.54</td>
<td>24.66</td>
<td>5.22</td>
</tr>
<tr>
<td>Mixed herd Double Nursing</td>
<td>31.68</td>
<td>9.96</td>
<td>3.55</td>
<td>4.46</td>
<td>1.21</td>
<td>50.66</td>
<td>31.36</td>
<td>5.83</td>
</tr>
<tr>
<td>Average</td>
<td>31.02</td>
<td>9.55</td>
<td>2.91</td>
<td>4.50</td>
<td>1.17</td>
<td>49.16</td>
<td>21.76</td>
<td>5.78</td>
</tr>
</tbody>
</table>

* Source - (13)

\(\star\) (Figures reduced to the 1929-1933 level by reducing the costs by 16.4 per cent.)
### TABLE XVII

**COST OF PRODUCTION FOR CALVES AT WEANING AGE ON CORN BELT FARMS**

<table>
<thead>
<tr>
<th>Type of Management</th>
<th>Cows per Calf</th>
<th>Cow Charge per Calf</th>
<th>Calves per Calf</th>
<th>Bull Charge per Calf</th>
<th>Feed, Labor and Incidental Charges</th>
<th>Total Charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>1.179</td>
<td>40.12</td>
<td>21.6</td>
<td>2.59</td>
<td>.01</td>
<td>42.72</td>
</tr>
<tr>
<td>Baby Beef</td>
<td>1.163</td>
<td>40.12</td>
<td>25.1</td>
<td>2.61</td>
<td>--</td>
<td>42.73</td>
</tr>
<tr>
<td>Dual Purpose</td>
<td>1.185</td>
<td>4.68</td>
<td>10.7</td>
<td>4.60</td>
<td>14.07</td>
<td>18.75</td>
</tr>
<tr>
<td>Mixed</td>
<td>1.143</td>
<td>24.13</td>
<td>18.5</td>
<td>3.28</td>
<td>6.73</td>
<td>34.14</td>
</tr>
<tr>
<td>Partially Milked</td>
<td>1.143</td>
<td>25.88</td>
<td>13.9</td>
<td>3.70</td>
<td>.06</td>
<td>29.64</td>
</tr>
<tr>
<td>Double Nursing</td>
<td>1.154</td>
<td>16.01</td>
<td>15.5</td>
<td>3.48</td>
<td>.38</td>
<td>19.87</td>
</tr>
<tr>
<td>Average</td>
<td>1.16</td>
<td>25.16</td>
<td>17.6</td>
<td>3.38</td>
<td>3.54</td>
<td>31.31</td>
</tr>
</tbody>
</table>

* Source - (3)
do not offer possibilities of as large profits as may be obtained with either a beef or a dairy herd. The milk and beef cows generally are not capable of producing large quantities of dairy products economically, nor of raising the highest quality of beef calves". If people buy beef according to price, and we believe they do, how much of a premium will quality baby beef receive over inferior grades? Will it be great enough to offset the lower cost of production for the cheaper grades?

Fattening of Feeder Calves and Older Cattle in the Corn Belt

Fattening of cattle occupies a prominent place on many corn belt farms as a means of marketing grain and on some farms more as a source of fertilizer than as a means of income. Not only does fattening cattle in the corn belt provide a market for grain crops but it also affords a means of utilizing labor during the slack season of the year. A considerable amount of the corn raised in the corn belt states is marketed through beef cattle. The corn belt is located between the feeder producing area of the western states and the beef consuming centers of the U. S. This geographical situation coupled with land ideally fitted for the production of fattening grains makes this area one especially well suited for finishing cattle. To this area each year come many cattle from the ranges of the west to be finished. Montana ranches and farms furnished approximately 23,000 calves annually for the eastern cattle markets in 1930-1932 most of these no doubt being feeder calves.

Organization of Feeding Operation

All age and sex classes of cattle are finished in the corn belt:
steers, yearlings, and two-year-olds, calves, cows and bulls. Two methods of fattening are followed: (1) fattening in dry lot, and (2) fattening on grass. Since space and time are limited we will deal only with the first method because it is by far the most prevalent at the present time. The discussion will also be confined to the fattening of calves, yearlings, and two-year-old steers. These age classes constitute the great majority of cattle finished in this area.

Corn belt cattle feeders purchase their feeders in numerous ways; by going to the range area and buying them directly from the producer, purchasing from commission men who operate in the range area, buying from local farmers, or purchasing them on the central livestock markets. Most feeders buy them on the open market. What kind of cattle the feeder decides on finishing vary with the operator, the feeds available, and the price of fat cattle. It takes longer to fatten young cattle than older cattle which make a larger daily gain, can utilize more roughage and require a larger amount of digestible nutrients per 100 pounds of gain due to the fact that the larger an animal is the more nutrients required for maintenance. A few operators fatten cattle through the summer and early fall although most feeders prefer to finish their cattle during the fall, winter and spring months due to more favorable conditions existing.

The investment in feeder cattle represents the largest item of any in the cost of fattening cattle. Some farms finish purchased feeders along with those produced on the farm. Others purchase all their feeders. Feeders generally fatten one or two carloads except the larger commercial
feeders who finish cattle in much larger numbers.

Quite a number of feeders fatten hogs along with the cattle and this operation will be discussed later on to show its effect on the cost of production per 100 pounds gain per steer. The amount of capital invested in cattle varies according to the number fed, the quality or grade, and the prices prevailing.

Buildings and equipment used in fattening cattle vary considerably in the amount of capital invested. Some operators have very well equipped feed lots consisting of well constructed barns or sheds, paved lots, and good feed bunks and racks. Others are more modest. The investment in buildings and equipment depends a good deal on the number of cattle to be finished. In southwestern Minnesota the investment per 100 pound gain in weight averaged $3.40 for buildings. Equipment consisting of feed bunks, and racks varied from $5.00 to $25.00 and on one farm ran up to $116.00. In some instances the feed bunks, etc. may be considered as part of the buildings. Building and equipment expense cost 19 cents per 100 pound gain and general livestock equipment cost 6 cents per 100 pound gain in Ohio in 1933.

Management of Cattle

Labor charges constitute approximately 6 per cent of the total cost of producing 100 pounds of beef. This, of course, varies according to the prices for feed, etc. which will change the relative position somewhat. Labor in feeding cattle while it has a distinct cost can be considered from a slightly different angle than feed, buildings, and
other costs for the finishing of cattle in a good many cases is a means of utilizing labor that would be otherwise not too profitably employed. This will be true of only the outfits feeding in the fall, winter, and early spring months. Farmers who fatten in the summer months would probably have a higher labor charge even though fattening on grass. The hours of labor per 100 pound gain in weight ranged from 2.3 to 4.5 and averaged 3.5. Labor costs will vary according to the rate of gain, method of feeding, and convenience of the feeding lots and equipment used. Horse labor costs about one-third to one-fourth as much as the man labor. In 1933, in Ohio, the labor cost amounted to 44 cents per 100 pound gain; 36 cents for man labor and 8 cents for horse labor. Cattle making the most rapid gains would have a lower charge per 100 pound gain produced.

Feed costs constitute by far the largest item in the cost of producing 100 pounds of gain on feeder cattle. The charge for feed is somewhere between 75-90 per cent of the total cost depending on the prices for feeds and other items of expense. The kinds of feeds grown on the farm and the prices of the various feed determine to a great extent the rations fed. Corn, barley, and oats are the principal grains used in fattening cattle in the corn belt. Oats are used principally to get the animals accustomed to eating grain. Corn is the basis for most fattening rations being fed in a number of forms: shelled corn, cracked corn, corn cob meal, or corn silage. No doubt shelled corn composes the principle grain fed in the ration and the undigested corn passing through the cattle.
**TABLE XVIII**

STANDARD RATIONS FOR FATTENING CATTLE IN MINNESOTA

PER 100 POUND GAIN IN WEIGHT

<table>
<thead>
<tr>
<th>Feeds</th>
<th>Calves</th>
<th>Yearlings</th>
<th>Two-Year-Olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain - pounds</td>
<td>525</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>Protein supplement - pounds</td>
<td>60</td>
<td>75</td>
<td>90</td>
</tr>
<tr>
<td>Legume hay - pounds</td>
<td>200</td>
<td>250</td>
<td>325</td>
</tr>
</tbody>
</table>

* Source - (11)

Calves fed 200 - 225 days.
Yearlings fed 140 - 180 days.
Two-year-olds fed 100 - 125 days.

**TABLE XIX**

RATIONS FOR FATTENING CATTLE IN NEBRASKA

PER 100 POUND GAIN IN WEIGHT*

<table>
<thead>
<tr>
<th>Feeds</th>
<th>Calves</th>
<th>Yearlings</th>
<th>2-year-olds</th>
<th>3-year-olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelled corn - lbs.</td>
<td>529</td>
<td>702</td>
<td>798</td>
<td>835</td>
</tr>
<tr>
<td>Alfalfa hay - lbs.</td>
<td>186</td>
<td>266</td>
<td>314</td>
<td>350</td>
</tr>
</tbody>
</table>

* Source - (7)
causes a goodly number of feeders to follow the practice of fattening hogs along with the cattle.

The amount of feed required to make 100 pound gain varies being affected by many factors such as length of feeding period, class of cattle, and individual differences in the cattle. To go into a thorough discussion of the feeds consumed and gains is beyond the scope of this study.

To acquaint the reader with a few standard rations several will be given. Tables XVIII and XIX show standard rations for Minnesota and Nebraska. In the Nebraska experiment the cost of feed per 100 pound gain was $10.81 for the three-year-old steers, $10.19 for the two-year-olds, $8.90 for yearlings, and $6.62 for the calves. 24/ Feed costs per 100 pound gain were considerably higher than this for the entire corn belt. Perhaps the reason for this wide range is due to the fact that the Nebraska costs were obtained under fairly good conditions and under a competent feeder whereas the costs for the entire corn belt would include both good and poorer types of management. The feed costs per 100 pound gain for the corn belt were $12.84 for cattle weighing 1000 pounds and up when purchased; $12.99 for cattle having an initial weight of 750-1000 pounds, yearlings weighing between 500 and 750 pounds, $10.91 and calves up to 500 pounds, $9.87. 25/

In 1933, a year considerably below the 1929-1933 level of feed

24/ Prices reduced to 1929-1933 price level by index numbers of U.S. D.A., Bureau of Agricultural Economics.
25/ Prices reduced by 32.28 per cent to 1929-1933 price level by U.S. D.A., Bureau of Agricultural Economics index numbers.
prices, the feed cost in one part of Ohio was $6.44 per 100 pound gain.
The feed cost per 100 pound gain for experiments conducted from 1929-1933 at Purdue gives an average for all rations fed of $9.25, ranging from $3.67 in 1933 to a high of $15.15 in 1929. These results were obtained by applying feed prices prevailing at that time to the feeds fed.

Corn was valued at 41.2 cents per bushel for 1930-1935. From the figures given above one can see that there exists a wide range in feed costs. Therefore, an average would be hardly representative for such a large region as the corn belt. In fact, this same Ohio study showed a range from $3.33 to $14.83 for the feed cost per 100 pound gain in 1934. These are actual farm records. In conclusion, we may say that not only do prices or cost of production per bushel or ton of feed affect the feed cost but also management and class of cattle. Perhaps management is more of a factor than it is often conceded to be when we see extreme deviations from within one or two counties.

The gains made vary considerably depending on the ration used, age and class of cattle, the ability of the particular group of cattle to utilize feed, and the length of feeding period as well as management. The rate of gain varied from around 0.5 pounds to 3.5 pounds for calves and from 0.4 pounds to 4.4 pounds a day for heavy steers. The average daily gain seems to be somewhat less than 2 pounds per day for calves, light and medium weight steers; and a little over 2 pounds for heavy steers. This is contrary to experimental results at the state agricultural experiment stations where the gains made were approximately 2.25 pounds for calves, up to 2.6 pounds for two- and three-year-old steers.
Baby beef calves when ready for market weigh anywhere from 750 to 900 pounds depending on the length of feeding period and management practices such as feeding. Yearlings weigh from 950-1150, two-year-olds 1150-1350, and three-year-old steers, of which there are very few, 1400 and up. The quality of cattle fattened in the corn belt varies. Generally speaking, the cattle from the western states and those feeders coming from the strictly beef herds when finished are of good quality. No accurate data can be found on this subject and so it will of necessity be passed by knowing full well that it is a very potent question.

Death loss in finishing cattle in the corn belt is of minor importance. By careful management it can almost be eliminated. In most cases it is less than 1 per cent, probably running around one-half of 1 per cent. Shipping fever, a disease of which little is known, is often a source of trouble to the feeder. This disease may cause or aid in the catching of pneumonia. The disease is caused by shipping cattle and their standing around in places of questionable sanitation. Bloat incurred when feeding on leguminous hays may also be a source of trouble although less so than in Montana feeding areas.

Land Costs

Land charges are included in the cost of feeds except for the amount included in buildings and feed lots. This charge will vary according to the amount of feed fed, the cost of production of the feed, the ration that is fed, and the value of the land. By using an average ration, length of feeding period, value for land and buildings, taxes and cost of production for feeds we can arrive at an average land
TABLE XX
COST OF PRODUCTION OF FAT CATTLE ON CORN BELT FARMS
WITH WEIGHTS AND GAINS MADE.*

<table>
<thead>
<tr>
<th>Items</th>
<th>Heavy Cattle</th>
<th>Medium Weight Cattle</th>
<th>Yearlings</th>
<th>Calves 500# &amp; Less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight</td>
<td>1,059 lbs.</td>
<td>870 lbs.</td>
<td>649 lbs.</td>
<td>419 lbs.</td>
</tr>
<tr>
<td>Final weight</td>
<td>1,315 &quot;</td>
<td>1,166 &quot;</td>
<td>984 &quot;</td>
<td>751 &quot;</td>
</tr>
<tr>
<td>Daily gain</td>
<td>1.92 &quot;</td>
<td>1.60 &quot;</td>
<td>1.56 &quot;</td>
<td>1.54 &quot;</td>
</tr>
<tr>
<td>Cost of feeder</td>
<td>$63.43</td>
<td>$48.39</td>
<td>$33.72</td>
<td>$25.23</td>
</tr>
<tr>
<td>Feed cost</td>
<td>$32.73</td>
<td>$37.53</td>
<td>$33.98</td>
<td>$31.60</td>
</tr>
<tr>
<td>Interest on and cattle equipment</td>
<td>$2.39</td>
<td>$2.67</td>
<td>$2.34</td>
<td>$2.06</td>
</tr>
<tr>
<td>Depreciation and repairs on equipment</td>
<td>$.72</td>
<td>$.89</td>
<td>$.94</td>
<td>$.97</td>
</tr>
<tr>
<td>Man and horse labor</td>
<td>$2.40</td>
<td>$3.06</td>
<td>$2.93</td>
<td>$2.55</td>
</tr>
<tr>
<td>Other costs</td>
<td>$.81</td>
<td>$.96</td>
<td>$.91</td>
<td>$.99</td>
</tr>
<tr>
<td>Total gross cost</td>
<td>$102.48</td>
<td>$93.50</td>
<td>$74.82</td>
<td>$61.40</td>
</tr>
<tr>
<td>Credit for pork</td>
<td>$5.57</td>
<td>$5.44</td>
<td>$4.51</td>
<td>$4.17</td>
</tr>
<tr>
<td>Credit for manure</td>
<td>$2.10</td>
<td>$2.72</td>
<td>$2.32</td>
<td>$2.26</td>
</tr>
<tr>
<td>Total of credits</td>
<td>$7.67</td>
<td>$8.16</td>
<td>$6.83</td>
<td>$6.43</td>
</tr>
<tr>
<td>Total cost</td>
<td>$94.61</td>
<td>$85.34</td>
<td>$67.99</td>
<td>$54.97</td>
</tr>
<tr>
<td>Gain in weight</td>
<td>256 lbs.</td>
<td>296 lbs.</td>
<td>315 lbs.</td>
<td>332 lbs.</td>
</tr>
</tbody>
</table>

* Source - (23) Prices reduced to the 1929-1933 price level by reducing originals by 32.28 per cent.
TABLE XXI
COST PER HUNDRED POUNDS GAIN IN FATTENING CATTLE ON CORN BELT FARMS. *

<table>
<thead>
<tr>
<th>Items</th>
<th>Heavy</th>
<th>Medium Weight</th>
<th>Yearlings</th>
<th>Calves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed</td>
<td>$12.84</td>
<td>$12.99</td>
<td>$10.91</td>
<td>$9.57</td>
</tr>
<tr>
<td>Labor</td>
<td>.93</td>
<td>1.04</td>
<td>.93</td>
<td>.76</td>
</tr>
<tr>
<td>Interest</td>
<td>.93</td>
<td>.90</td>
<td>.74</td>
<td>.61</td>
</tr>
<tr>
<td>Other costs</td>
<td>.59</td>
<td>.63</td>
<td>.59</td>
<td>.58</td>
</tr>
<tr>
<td>Total cost</td>
<td>15.29</td>
<td>15.57</td>
<td>13.19</td>
<td>11.52</td>
</tr>
<tr>
<td>Credits</td>
<td>3.00</td>
<td>2.76</td>
<td>2.17</td>
<td>1.94</td>
</tr>
<tr>
<td>Net Cost</td>
<td>12.29</td>
<td>12.80</td>
<td>11.02</td>
<td>9.58</td>
</tr>
</tbody>
</table>

* Source - (23) (Prices reduced to 1929-1933 price level).
charge for each age class. This, of course, will be the cost only for the feeding period. Another factor that will cause the land charge to vary is the amount of purchased feed. Thus, the farms feeding only home-grown feeds would generally have a greater land cost per head than those purchasing commercial feeds but the ultimate cost of producing 100 pounds gain would tend to be the same. The cost per bushel of corn is composed of 29.8 per cent land charge. Forty-eight and forty-five hundredths per cent of the cost of alfalfa per ton is land charges, interest, and taxes. By using the ratios in Table XIX on page 67 and an average price per bushel of corn of 56 cents and $12.00 per ton for alfalfa we get the following land charges per 100 pound gain; three-year-old steers $3.53; two-year-old steers $3.30; yearling steers $2.88; and calves $2.13. To these costs must be added 17 cents for 5 per cent interest on an investment in buildings and equipment.

Interest on cattle and equipment is shown in Table XX for each age class. The amount of interest on the cattle will depend somewhat on the length of feeding period since calves require about twice as long to finish as two-year-old steers and, therefore, the interest not only on cattle but also on the feed, this cost is considered by some workers, is that much greater. Taxes on land have been included in the land charge.

Cost of Production

Table XX shows the cost of finishing the different age classes of cattle. The initial cost of the feeder cattle is included. Table XXI shows the cost per 100 pound gain in weight. The feed costs shown seem to be quite high. Perhaps this is due to the fact that these are actual
farm records and would include some operators who were rather inefficient. This would cause the average to be higher. Nebraska feed costs obtained appear to be more in line with our opinion on the subject. These feed costs per 100 pound gain are as follows: three-year-old steers $10.81; (7) two-year-old steers $10.19; yearlings $8.90; and calves $6.62. 24/ These costs are from $2.00 to $3.00 lower than those obtained on the farms. This can be accounted for by the fact that the Nebraska costs were for a high grade of cattle which would cause them to be more efficient, according to most cattle feeders. Another cause might be that the Nebraska cattle were fed under better conditions, had a more desirable ration on the average, or that the person who did the feeding was a highly capable cattle feeder.

Table XX shows the credit per animal for pork produced. Where corn is used as the grain for fattening cattle the cost of fattening per steer can be reduced by having growing pigs with the cattle. If shelled corn, broken ear corn, or whole ear corn is fed the pigs will make considerable gain and even so where ground corn is fed although not as much. When small grains are fed hogs will not make any gains when following steers. The Minnesota Experiment Station recommends one pig to each two-year-old steer, 2 pigs to each 3 yearling cattle, and one pig for 2 calves when the steers are fed whole corn. In addition, the pigs are generally fed some additional feed to finish them or even while they are growing. These pigs when fed additional grain and a protein supplement (11) will gain from 40-50 pounds from the feed obtained per steer. Pork

24/ Prices reduced to 1929-1933 price level.
credit per calf for a 217 day feeding period when fed shelled corn ranged
from $3.20 to $5.22 but was much lower for steers fed corn and cob meal.

The pork credit will also be affected by the price of hogs as well as the price of feeds. The credit for manure is also of considerable import. Some farms in the corn belt as well as in Montana's irrigated areas fatten cattle for the main purpose of obtaining manure for the land. Often times the value of the manure is considered to offset the cost of overhead expense such as interest, depreciation, salt, labor, and other incidental expenses. Whether or not the value of manure does cover these costs depends on the management practices followed but in many cases the fertilizer value is greater than the expenses mentioned above.

One of the most important factors affecting the profits or losses in cattle fattening is margin. Margin is the difference between the purchase price per pound and the selling price of the original weight of the animal. That is, if a feeder were purchased for 6 cents per pound and weighed 450 pounds, a cost of $27.00, and then the finished animal sold at 9 cents per pound there would be a margin of 3 cents per pound, 9 cents minus 3 cents, or a profit on the original weight purchased of $13.50. If the market had dropped and the feeder had been forced to sell at a lower price, say 5 cents, then the margin would have been a negative quantity. Margin can hardly be considered speculative profit for not infrequently it costs as much to produce the gain

27/ Prices reduced by 20.9 per cent to 1929-1933 price level.
on an animal as is received when the animal is sold. Therefore, to make a profit from finishing cattle one must in most cases have some margin to operate on. This, of course, depends on the trend of livestock prices.

Fattening of beef cattle may in many cases not contribute any direct income to the farm but by utilizing labor that would be otherwise unemployed, by turning feeds that would not be marketed into a salable product, and carrying part of the overhead expense of the farm that would otherwise have to be carried by some other enterprise, the fattening operation rounds out the farm organization to a more stable and profitable business.

The fertilizing value of the manure should cause an increase in the yields of the crops raised. All this trends to make the farm more efficient even though it might not be shown as a direct profit on the farm accounts. Perhaps this is why so many corn belt farmers finish beef cattle even though they do not derive any direct income from it every year.

Marketing

The corn belt beef producer is relatively close to markets. This means that he has certain distinct advantages and these may often be turned into considerable more profit than would have been true if the distance to market was greater. No district in the corn belt is very far distant from one of the leading livestock markets. Chicago, South St. Paul, Sioux City, Omaha, Kansas City, and East St. Louis are all situated within the corn belt. Besides these large centers there
are numerous interior packers located at certain points through the corn belt and especially in Iowa. Much livestock is now trucked to the markets when the haul is not too long. In 1929, the per cent of cattle trucked to market was 18.9 per cent; in 1930, 26.2 per cent; and in 1931, 35.1 per cent.

Where the cattle feeder is not too distant to use the truck for marketing his cattle he can load them quickly and take advantage of desirable price situations. Trucks can often be obtained quicker than railroad cars.

Being close to the central markets the corn belt beef producer has less shrink than the cattleman of Montana. If the roads traveled are smooth and the truck handled carefully, the shrinkage is often reduced by trucking for the animals are loaded at the farm and hauled direct to the market. This saves the time and shrink of moving them to the railroad. However, the radius within which livestock may be trucked has rather narrow limits. Most shipments by this means come from within 50 miles of the market. Cattle in transit less than 24 hours shrunk from 2.05 to 3.91 per cent while those in transit from 24 to 36 hours (21) shrunk from 3.46 to 6.37 per cent.

Most of the cattle sold from the corn belt will come under the first shrinkage class of 2 to 4 per cent. Some authorities are of the opinion that grain fat cattle shrink less than feeder cattle or grass fat cattle. It would seem logical that this statement would depend a great deal on the conditions at shipping time and also the kind of grass the cattle were held on prior to shipping time. Compared with
an average cost of marketing cattle from Montana to Chicago of $1.50 per pound (including shrink at average beef prices) the corn belt probably pays somewhere in the neighborhood of 45 cents. This figure is obtained by assuming a 2 per cent shrink at a value of 8 cents per pound; a cost of 16 cents. Montana cattle will probably shrink an average of 5 per cent and at 7 cents this would be 35 cents; over twice as much as the corn belt shrink.

Compared with this cost of 41 cents total marketing charges per 100 pounds of beef, the following figures for marketing from Ames to Chicago from 1925 to 1928 are given: calves, $1.26 per cwt.; yearlings, $1.12, two-year-old steers, $1.00. These charges appear to be considerably above the average. One reason for this might be the high price used for the beef value and the large shrink which in one case was 4.58 per cent. From these costs and the previous ones cited it appears that a charge of about 50 cents per cwt. is a reasonable average cost for the corn belt.

Besides the reduction in shrinkage, corn belt beef producers pay less for freight. Another item that would be less than for Montana cattlemen would be the cost of feed and yardage while enroute to market. Other marketing costs such as commission rates, etc. would be approximately the same.

One disadvantage that the corn belt feeder or producer of beef cattle has is that the number of cattle marketed by each individual is generally smaller than the Montana rangeman's. In some cases the farmer may have less than a carload although most feeders plan on feed-
ing at least one carload. Generally speaking, the corn belt beef pro-
ducer markets a smaller number of cattle each year than the Montana
range cattleman.

In this brief survey of the production and fattening of beef
cattle in the corn belt, we have taken a considerable portion of the
material from the northern tier of corn belt states. This is felt to
be justified since this area of the corn belt produces and finishes
beef cattle which compete more directly with the beef cattle coming
from the ranges and feed lots of Montana.

Other regions, nations, and factors such as dairy cattle, sheep,
hogs, etc. compete with Montana beef cattle for the consumer's dollar.
To make a complete and detailed study of all the factors in competition
with Montana range beef cattle would be a herculean task. It is felt
that there is need for a more complete study of the subject of regional
competition. The field of land charges and utilization has merely been
touched upon. Since land occupies such an important place in the cost
of production in any region much work might well be given to this phase
of the problem.
Land Charges

Compared with the corn belt, Montana has a considerably lower land charge per animal unit. The average land charge for Montana is $6.87 while that for the corn belt is $13.81. These are for feeder calves. Thus, the corn belt beef producer has a land charge of about $5.00 more per feeder calf than the Montana operator. It would seem probable that this higher land charge is partly due to the greater investment in buildings and improvements. Figured on the basis of carrying capacity there is little difference in real estate taxes between the two regions. The difference in cost of marketing between the two areas tends to balance the advantage Montana has in lower land charges. However, Montana has an advantage of approximately 50 cents per hundred pounds.

Even though the Montana range cattle man has a lower land charge he still has a land cost too high in proportion to his average income. The present average annual land charge is $6.63 per cow when the operator can actually afford only $4.00 per animal unit. A number of prominent adjustments would seem to be necessary if he is to operate on a stable basis. These are as follows:

1. Proper utilization of grazing land so as to maintain a permanent forage cover. Poor ranges tend to reduce the weight and quality of the cattle.
2. Leasing of lands where it is possible to obtain satisfactory long-time leases. A long period of control over range land will enable the rancher to stabilize his operations and have a tendency to reduce exploitation of the range land leased under short-time leases. A comparison of table X showing the land charge where all the grazing land is leased and table IX showing the cost is approximately one-half where all the land is leased. Securing long-time leases can be furthered by the formation of cooperative grazing associations.

3. By a reduction in the taxes on grazing lands. A strictly ranching area cannot sustain many roads or public services. The ranchman must be content with a minimum of services if he is to have a low tax burden on his land.

4. A small investment in buildings and improvements. In most instances a large investment in the above items is unwarranted. Where there is a heavy investment in fences, a large calf crop should be secured and reduced labor charges incurred in order to offset this added expense.

Quality

From an analysis of the costs of production in Montana and the corn belt it is readily apparent that the corn belt can produce cheaper baby beef calves. This is especially true from dual purpose herds. The calves from these cows are practically a by-product. Then too, experimental work has been conducted at the Wisconsin Experiment Station on the crossing of beef bulls on dairy cows. The calf from this cross yields a desirable beef carcass when finished. This feeder animal is essentially a by-product.

An interpretation of these data would seem to lead to one conclusion, namely, the Montana cattleman must produce high quality cattle
to more ably compete with this type of product. No concrete evidence is available as to the relative efficiency of range bred calves in comparison with corn belt raised calves in the feed lot. Montana calves have always found a ready market among corn belt cattle finishers. This is due to their uniformity, quality, weight, type, and comparative freedom from disease. It is possible that corn belt calves of equal quality, type, and weight would be more desirable to the feeder since they are easier to get on feed. It is very doubtful if the range cattleman can creep feed his calves so as to increase their weight. Range conditions and scarcity of feed grains are factors discouraging this practice. Range with ample forage and water would seem to be the most desirable solution to the operator whose calves are lacking in weight. More winter feeding in the plains area will help to increase the weight of the cattle.

Changes in Type of Production

A comparison of cost of production for these two regions studied shows that the corn belt can produce baby beef calves more cheaply than can Montana. Nevertheless, calves from the latter region have certain advantages mentioned before. Are these enough to offset the cheaper cost of production? Table XIII shows that the Montana cattleman can produce 100 pounds of two-year-old beef the cheapest of any age class. The next cheapest is the yearling, and then the three-year-old steer.

There is a tendency for range cattlemen in the eastern part of the state to run on a cow and calf basis. It is believed that this is due more to forced liquidation than any advantage to be gained by selling feeder calves. The majority of producers in the mountain
valley area are selling two-year-old steers which are the cheapest of any age class to produce per 100 pounds of beef. This would seem a desirable practice for them to follow. There are no doubt some ranches in the state where large calf crops can be secured, where there is an ample supply of winter feed, and where a considerable amount of family labor can be utilized, and the investment in buildings and improvements is relatively high when it may be advantageous to market the cattle as weaner calves. However, where winter feed reserves are uncertain and droughts are of frequent occurrence it may be more economical to sell the cattle as yearlings, two's, or three's. This practice will enable the operator to keep his breeding herd intact even though he is forced to sell off a large number of cattle during the year. There is a limited area in the western part of the United States where grass fat two's and three's may be produced. A goodly portion of this type of range is or has been in Montana.

There is the possibility or probability that much of this same range has been depleted and may never again be able to produce this type of product. However, range cattlemen producing this kind of beef have little competition at the present time. What effect the regrassing of other areas in the U. S. may have on this supply is not certain at the present time. It would seem reasonable to predict that there would be a decreased demand for feeder cattle from western range. Also, at one time the western corn belt states raised and fattened grass fat steers.
Fattening Cattle in Montana

There appear to be no appreciable differences in the cost per 100 pounds of fattening cattle in this state and in the corn belt. The cost of producing 100 pounds of beef under a system whereby the calves are creep fed as under the Montana method of baby beef production is somewhat cheaper. However, this type of operation is only open to the small cattleman and can hardly be considered as a means available to the strictly range producer.

The Montana cattle fattener can purchase his feeders cheaper than the corn belt because freight and shrink are not included in the price. However, the Montana feeder has to take a larger shrink on his cattle when he markets them. An increase in cattle fattening in Montana is dependent on an increase in the sugar beet areas of this state. These areas are surplus feed districts. The cattle fattening enterprise on these irrigated farms is analogous to the same operation on corn belt farms. That is, it is a means of utilizing unmarketable feeds, provides work for unused labor in the slack season, and produces fertilizer so essential to sustained crop production.

Marketing

There is a cost of approximately $1.00 per 100 pounds more for marketing cattle from Montana than from the corn belt. This is due to higher freight rates and increased shrink. The increased decentralization of our livestock markets should help the Montana cattleman. The more markets available, the more chance has the rangeman to secure a sale of his cattle. Even though the packing plants are not located
in this territory these markets afford the Montana producer a chance to secure a better disposition of his cattle.

Western markets appear to be gaining in favor with mountain valley operators. Montana cattle not carrying a high finish but still classed as slaughter cattle will probably sell to better advantage at western markets. There is not the competition with the well finished cattle of the corn belt that is encountered at the eastern markets.

SUMMARY

1. The land charge per cow or per feeder calf is appreciably lower in Montana than in the corn belt. However, this advantage is partly balanced by increased marketing costs for Montana cattle which tend to reduce this disparity.

2. The corn belt can produce feeder calves cheaper than in Montana. This is especially true of milk and beef herds. To more ably compete with the corn belt the Montana range cattle producer must produce cattle of high quality.

3. Montana range cattlemen can produce one hundred pounds of beef somewhat cheaper as two-year-old steers than as calves, yearlings, or three-year-olds.

4. No appreciable differences appear to exist in the cost of finishing cattle in Montana and in the corn belt. The cost of marketing cattle from Montana would place Montana fattened cattle on the eastern markets at a cost somewhat above that of the corn belt.
5. It costs an average of approximately $1.00 per hundred pounds more to market Montana cattle on the eastern markets than it does for corn belt cattle. This is due to increased shrink and higher freight rates for the former region.
### TABLE A

PERCENTAGE OF THE SURFACE ACRE TO THE FORAGE ACRE FOR DIFFERENT GRADES OF MONTANA RANGE LANDS.*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage of Forage Acre</th>
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<tr>
<td>1</td>
<td>45</td>
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<tr>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
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<td>4</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
</tr>
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</table>

* Source - (14)

### TABLE B

FORAGE ACRE RELATIONSHIP AND CARRYING CAPACITY OF DIFFERENT GRADES OF MONTANA RANGE LANDS

<table>
<thead>
<tr>
<th>Grade of Range</th>
<th>Forage Acres per section</th>
<th>Cattle - cows or their equivalent per section for</th>
<th>Western Mont.</th>
<th>Eastern Mont.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>288</td>
<td></td>
<td>36</td>
<td>30</td>
</tr>
<tr>
<td>2nd</td>
<td>200</td>
<td></td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>3d</td>
<td>145</td>
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</tr>
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<td>4th</td>
<td>96</td>
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<td>5th</td>
<td>88</td>
<td></td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

* Source - (14)
LITERATURE CITED


15. State Board of Equalization, Sixth Biennial Report, July 1, 1932 to June 30, 1934, State of Montana


