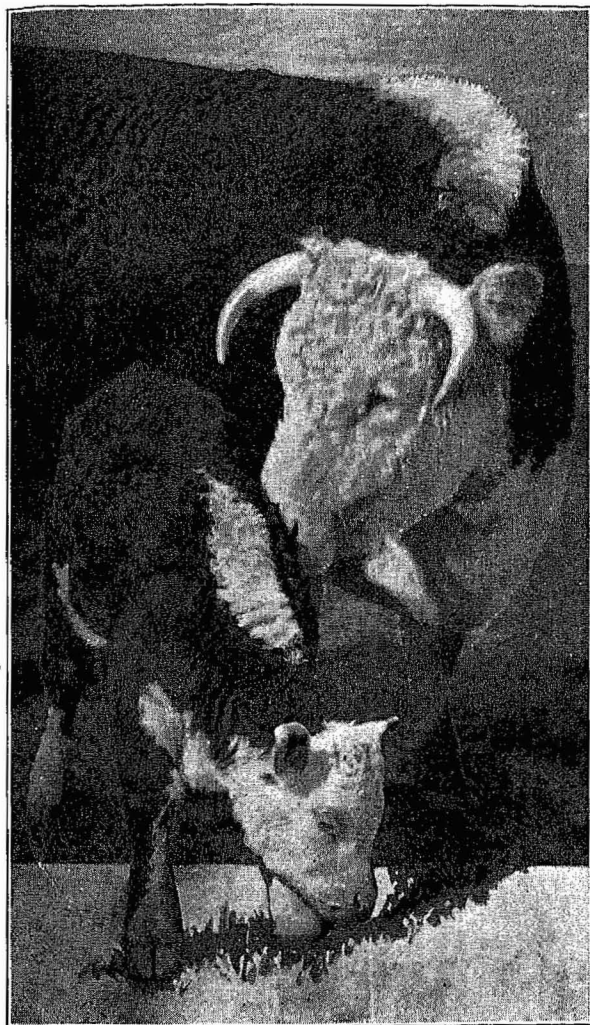


Beef Cattle

Information on:

Grazing
Feeds
Wintering
Fattening
Management
Diseases
Dehorning
Branding
Marketing
Prices
Taxes



As Presented at the Forty-Ninth Annual Convention
MONTANA STOCKGROWERS ASSOCIATION

— at —

MONTANA STATE COLLEGE

MONTANA STATE COLLEGE EXTENSION SERVICE
BOZEMAN

Montana State College, Extension Service, J. C. Taylor, Director,
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The College and the Livestock Industry

By Dr. Alfred Atkinson*

Montana State College through its Experiment Station and Extension Service is doing those things which are of practical interest and value to stockmen. The efforts to get the most beef from Montana feeds, the cooperative work with the Livestock Sanitary Board in the investigation for the control of diseases, the program to restore range land to the use of stockmen and many other lines of work being carried on here are of vital and immediate importance. At the same time the institution recognizes the need for a certain amount of fundamental research which has a direct bearing upon the welfare of the livestock industry, even though results may not be immediately apparent. It is not in a position financially to do much of such work since the resources are being employed largely on the pressing problems of the present but it is hoped that such essential work may be continued.

You who have followed the work of the institution have noticed that there has been a decided swing to activities which involve economics, management, and marketing. This is not an accident. Through the passage of the Purnell Bill in 1925 and other legislation the use of federal funds has required the study in these fields, and they have been extended because your problems have shifted to economics. The old time cowman gave thought primarily to production, today he still is concerned with production but to a greater degree than ever he must know how to manage and how to market. Is this a proper field for educational and research institutions? I should say that their field is wherever the problems are. Stockmen and others must operate under changing conditions and they must be prepared to meet those changes. This institution and others like it must change their operations that they may best perform the functions for which they exist.

Financially, Montana State College and its divisions have had to make retrenchments as you have. There have been serious reductions in income and there have been readjustments in the work here as a result. The greater part of the reductions have been met by salary cuts and the people here have met this situation with the same spirit as reductions in income have been met by you stockmen and the other people of Montana. Basing my statement on the progress of the past I can say with assurance that this institution will go forward with its work confident that with your cooperation and support and with the fine contacts such as this meeting assures many of the problems which now loom so large can be solved and many of the mistakes which have proved so disastrous in the past can be avoided in the future.

*President, Montana State College.

The Little International Livestock Show

By Ross Miller*

An annual activity of the Montana State College "Ag Club" is the staging of the "Little International Livestock Show." The animals fitted and shown by agricultural students are representative of the herds and flocks maintained by the College for instructional purposes.

In planning this activity a number of Agricultural seniors who are not eligible to participate in the show, interest the underclassmen in fitting stock for the "Little International." The upperclassmen then assist members of the Animal Husbandry Department in the selection of the animals for each class. Insofar as possible animals are selected that are similar in size, type and condition. The students draw lots for their animals, thus giving all an equal chance.

The judges are selected by members of the Animal Husbandry Department. Each judge looks over all of the animals that will be shown in the classes he is to judge before any of the students start working on their animals. Each student then starts to fit and train his animal in a manner similar to the methods used in fitting and training animals for the large livestock shows.

In this show the individuality of the animals is not considered. The judges, having seen the animals before they have been fitted and trained, make the final awards on the basis of the amount of improvement the student has made on his respective animal. The judges pick the winners for each class on the basis of 60 per cent for fitting and 40 per cent for the manner in which the animal is shown.

The divisions of livestock represented in this show are beef cattle, sheep, dairy cattle, horses and hogs. Wherever there is more than one class in a division the judge selects a division champion and reserve champion from the first and second prize winners of all the classes represented in that division. The Grand and Reserve Champion Showmen are selected from the champion and reserve champions of the five respective divisions.

Upperclassmen from the Animal Husbandry and Agricultural Education Departments play a major part in the "Little International" by assisting the members of the Animal Husbandry Department in the supervision and training of the animals. A senior in Animal Husbandry is selected each year for student manager of the show. The objects sought and attained are love of livestock, appreciation of type and true sportsmanship.

Forty-two students took part in the 1933 "Little International." Classes of Shorthorn, Hereford and Angus cattle, Rambouillet and Hampshire sheep, Percheron horses, Holstein dairy cows and Duroc hogs were shown. The students that trained and fitted these animals utilized their spare time since the middle of April preparing their respective animals for the show. The animals, were fed by college herdsmen, otherwise the students did all of the

*Of the Livestock Department, Montana State College.

work in getting their animals in the most presentable condition for the show.

The steers that will be shown by the Animal Husbandry Department at the Pacific International held in Portland the fall of 1933 will be selected from the steers that were shown in the 1933 "Little International."

The prizes, including cash awards to first and second place winners and a gold watch for the grand championship, were made possible through contributions of \$100 given by John Clay, and \$50 by the Montana Stockgrowers Association.

Special prizes included a silver cup donated by the Sime Sheep Company to the boy winning the Rambouillet class, the cup to remain in the trophy case in the Ag Building and the name of the winner of this class to be engraved on it each year. The first boy to have his name engraved on the cup twice, will become the permanent owner of the cup. An award of \$15 in gold contributed by the Montana Stockgrowers Association was given to the champion beef showman. An award of \$5 in gold was given to the student winning the Hereford championship by Lester Thompson, Hereford breeder of Bozeman, Montana.

Land Settlement Mistakes and New Land Laws

By R. B. Tootell*

Looking back upon the period from 1900 to the present, the conclusion seems justified that Montana had a rather unfortunate homestead era. The decade from 1907 to 1916, during which the greatest number of our original homestead entries were made, was clearly above normal as far as moisture conditions and, hence, crop production are concerned. This is evident from the following table:

CROPS DURING HOMESTEAD PERIOD COMPARED WITH NORMAL

	Normal 10-yr. period has:	10 yr. Homestead period had:
Bumper crop	1	3
Very good crop	1	2
Good crop	3	2
Medium crop	2	2
Poor crop	2	1
Failure	1	0

During the 1907-16 period there wasn't a single failure and there were twice as many good and bumper crops as under normal conditions.

Not only were the moisture conditions good, but the price situation was also favorable. This period is looked upon as more or less of a "golden age" of agriculture in the United States. While actual farm prices were not as high as they have been during other periods, the purchasing power of farm products was relatively very high.

The problems which we have at present that are traceable to the mistakes of this early period are many, but I shall confine my remarks to those problems which seem to have some possibilities of solution through the use of land legislation enacted by the last Montana session.

Range Control Necessary

The absolute control of range is essential to the permanency and success of the range cattle business. "Free range" is an illusion. There is no such thing. The stockman pays for his range either directly or indirectly. What he may save by not owning or renting his land he usually loses in a number of ways. Because he does not control his range he fails to improve it. Lack of water development, over-grazing and the necessity of excess moving of cattle about the range, result in a loss of weight on livestock, which figured even at low market prices, would pay for the control of a good many acres. Another loss is that which comes during dry years. On open range there is no reserve of grass for an emergency. Dry years cause increasingly keen competition with the result that the operator must contract his cattle numbers, very often on a falling or badly weakened market.

*Extension Land Economist.

Control by Operator Ownership

Private ownership of range by the operator is undeniably the ideal, although one must qualify this statement by saying, "if conditions are favorable for private ownership." If this condition is the ideal, then it is logical to conclude that circumstances in most cases are not favorable, since rarely is it true that a stockman owns all or even the major part of his range.

This situation apparently has a very close tie-up with the mistakes of our homestead era. The basic difficulties appear to be as follows:

1. Too high a valuation placed on range land.—This condition in many areas reflects a competitive market between farmers and stockmen for the use of land. It is surprising how this false sense of value persists in spite of the low return which such land has demonstrated in crop land use.

2. Prohibitive taxes.—This may be a carry-over from the expenditures of an earlier day when dreams of a prosperous farming community pervaded a good range area. In other instances it may be traced to an attempt to retain farming institutions in a grazing community.

3. Small, irregular tracts of land in varied ownership.—If stockmen could purchase this land at a price in keeping with its productive value, and if taxes on it were such as to encourage rather than prohibit ownership, it would soon be consolidated into large ranch holdings.

Control Through Private Leases

In spite of the prevalence of this method of control it still has many disadvantages as practiced in this state. A year-to-year lease is still a very common thing even in our range country. Our competitors in Canada, for instance, very often are able to secure 10- to 12-year leases. The advantages of this long tenure are obvious. Not the least of these is the check on competitive bidding which has ruined many a stockman.

Control Through Cooperative Leases

This system of control is a comparatively new, and likely of rather limited adaptability. It is more commonly known as the grazing district system* or a modification of it. The principle of the grazing district is briefly this: A group of stockmen running the same type of livestock form a grazing association and jointly lease, on a long-time basis, lands over which they wish to have control.

Where conditions are favorable the advantages of this system are many. Small stockmen who have difficulty in obtaining range or who have so few cattle that they cannot afford to give them proper attention on the range should benefit by cooperating with neighbors who run stock on about the same basis. Jointly they can afford to fence large tracts and hire a rider; as small individual operators they might not be able to do either. The large operator indirectly will benefit under this system since he will get away from the nuisance of trespassing on his range by small stockmen.

The larger operators also may benefit by such organization. It frequently happens that large operators attempt to reserve certain tracts of

*For details of this system see Montana Extension Service Bulletin No. 127.

summer or winter range. If part of this land is in public ownership they have considerable difficulty, in fact, they usually find it impossible to reserve this feed. There are conditions where three or four large operators might form an organization and get control of winter range which ordinarily is used up by tramp outfits or small operators long before the season arrives for its best use.

Assistance Through Recent Legislation

One of the measures passed by the last session of the Montana legislature which seems to offer many possibilities is that of land trading. It is now possible for counties which have acquired land through tax deed to trade these lands with other political sub-divisions or with individuals and corporations. It is also possible for the state of Montana to trade its land in the same way. The purpose of this trading is, of course, to block out ownerships and in a measure correct some of the problems of checker-board ownership. Private individuals also could profit by an exchange of land. Since these trades do not have to be on an acre basis but rather on a value for value basis it would seem that they offer possibilities of consolidating ownerships.

Another use which can be made of this trading provision is in connection with very sparsely settled dry land farming areas. In many counties there are families with children of school age living in poor, isolated farming sections where they are enabled to stay and attempt to farm only because of government seed loans, Red Cross aid, county aid, etc. Where schools are being maintained for one, two or three of these isolated families it may be possible through trading to move them to localities where county services can be more cheaply supplied and where the individual will have a better opportunity of making a living.

If isolated farmers are to move, new places must be found for them. If the county already has deeds to farms which are located in more productive areas and near established schools, the problem will be easy. If not, it may be possible for the county to secure suitable farms by trading with mortgage and insurance companies or even with private individuals. A county can well afford to give these farmers the best of the deal. Later saving to the county will more than compensate for this.

It would seem that there would be threefold benefits from moving isolated families:

1. The individual who is induced to move will be placed on a farm where he has a better opportunity to make a living. His children will have access to better educational advantages and the disadvantages of living in isolation will be overcome.

2. The county as a whole will benefit because of the reduced costs of rendering county service and because the man who moves may become a regular taxpayer.

3. The owners of grazing land in the isolated area will benefit through lower taxes from the elimination of county services. Private ownership of land in such districts would, therefore, be encouraged.

At the present time it is not possible to make exchanges in which Public Domain land is involved. This seriously handicaps land reorganization plans in many counties. Legislation which would permit the trading of Federal land is now pending in Congress. This may be enacted into law.

The Montana grazing district law facilitates cooperative leasing. While it gives grazing district associations a preference in leasing county tax deed land, it nevertheless provides certain safeguards against monopoly control. It emphasizes the fact that districts of this kind are to be created only upon the request of the stockmen themselves and the management of the district is to be in the hands of the stockmen. Those who have used the range in the past are given preferential grazing privileges. The primary purpose of this legislation is to make possible the stabilizing of the livestock business and the improvement of the forage resources in localities which are adapted to this set-up.

The Soil Survey and the Cattle Business

By Clyde McKee*

There is not a man in this convention today who would purchase a livestock spread without first having seen a complete inventory of the livestock and other equipment which was to be included in the transaction. An essential part of any livestock layout is the land on which is produced summer and winter grazing and supplies of grain and forage for winter feed. The soil survey is important to livestock men because it is an inventory of the soil resources of the area in which their business is located. It provides the basic information for establishing the correct use and proper evaluation of the state's farming and grazing lands.

Much Land Already Surveyed

Approximately forty per cent of Montana's land area has been covered by the reconnoissance soil survey. Reports are available for 11 counties: Sheridan, Daniels, Roosevelt, Valley, Phillips, Blaine, Hill, Chouteau, Toole, Liberty and Glacier. The field work has been completed in 11 other counties and reports will be published as rapidly as possible.

Determining Productive Capacity

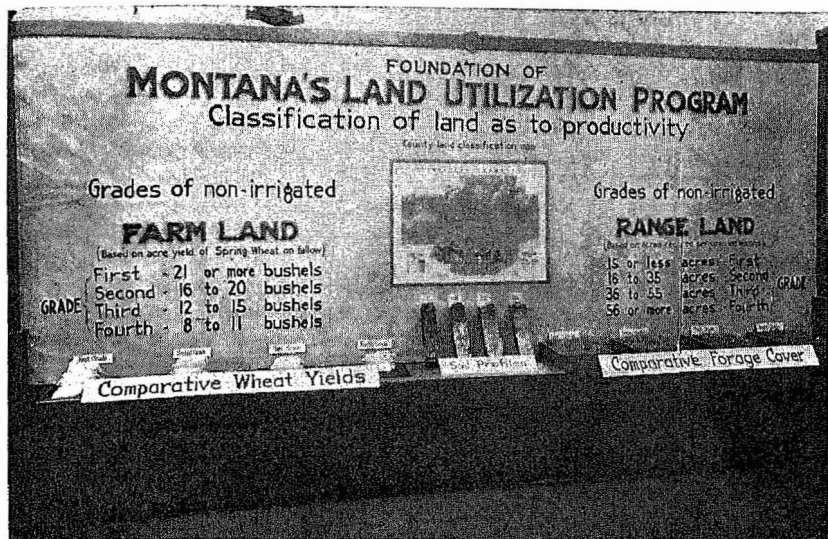
The actual value of land is based largely upon the net income which the land in question will produce. There are wide variations in the ability of soils to produce crops even when the precipitation is adequate. Therefore, one of the first things which the soil surveyor seeks to determine is the land's productive capacity for crops and its carrying capacity for livestock on a long time basis. Six important characteristics of the soil and subsoil which are used as indicators of productive capacity are as follows:

Color: Soils range from very dark to the lighter colors, depending largely upon the amount of decayed vegetable matter. In general, dark colored soils indicate proper circulation of air and good drainage and that favorable climatic conditions have existed in the past for the growing of a luxuriant grass cover, with the result that organic matter has accumulated. In contrast, a very light colored soil and sparse vegetation may indicate more limited precipitation and low productive capacity.

Texture: Refers to the size of the particles which make up the soil and plays a very important part in soil productivity because of its relation to aeration, drainage, bacterial activity, moisture holding capacity and availability of plant food. Silt loams, loams, and very fine sandy loams are best. Soils with fine particles, such as clays and gumbo, are extremely difficult to work, warm up slowly in the spring, and aeration and drainage are often poor. On the other hand, soils with coarse texture lack moisture-holding capacity and available plant food.

Structure: Is the term used to indicate the manner in which the particles go together in making up the general physical condition of the soil. Granular

*Montana Experiment Station.



structure of the surface soil is most desirable since it affords better circulation of air and movement of water through the soil, and the usual tillage operations are easily performed. In certain areas "hard pan" of clay, shale, cemented gravel or limestone may interfere seriously with the growth of roots, tillage operations, the capacity for holding moisture and makes satisfactory drainage difficult.

Depth: It is especially important to have 10 to 12 inches of surface soil because this is where the physical, chemical and bacterial processes are most active. A good depth of subsoil serves as a storage reservoir for moisture and a feeding area for the plant roots. The depth of the "lime layer" in mature soils furnishes a good indication of whether the region is one of low, medium or high precipitation.

Topography: The surface of tillable land should have a sufficient slope to provide adequate drainage, yet level enough to permit the use of the ordinary farm implements. The soil surveyor secures information as to the location of tillable and non-tillable areas as determined by topography and indicates these areas on the soil map.

Reaction: Almost every farmer and stockman knows that strongly alkaline soils will not produce satisfactory crops, hence it is highly important that extensive slick spots, scab land areas and alkali flats be segregated and mapped to show their location as well as their relative extent in comparison to other types of land.

Other Information Necessary

Much additional information must be obtained if the results of the soil survey are to be properly interpreted and correctly applied.

Climatic records: It is highly important to study the climatic records of the area in question. Precipitation, seasonal and annual; temperature, length of growing season, wind velocity and evaporation have a direct bearing on the growth of native vegetation and agricultural crops.

Native vegetation: Undisturbed native vegetation and the growth which it makes is an excellent indicator of the crop producing capacity of the land. Likewise, the present vegetation and its condition on land which has been grazed, serves as an indicator of the present carrying capacity. Experiences of the substantial stockmen using the area in question are valuable in determining the probable carrying capacity of grazing land under proper systems of management.

Streams and water supply: The soil surveyor notes with care the location of springs and streams which would serve as sources of water for livestock. The quality of water available for human consumption also receives attention.

Roads and distance to market: Information as to railroads, highways and markets for the farm and livestock produce is collected because such information has a definite bearing on the type of farm or ranch set-up which is likely to prove most satisfactory.

Adapted crops and production methods: Information is collected as to crops best adapted to the various soils which are being mapped and also the cultural methods that farmers find most satisfactory. For the livestock man, this furnishes a basis on which to plan the production of grains and forage needed for winter feeding operations.

Classifying the Land for Proper Use

The soil survey and crop investigations make it possible to designate the location and extent of the lands suitable for the production of grain and hay and also to map the areas which should be set aside permanently for grazing purposes. Other investigations seek to determine the possibilities of organizing grazing units or otherwise insuring control of an adequate amount of grazing land. Studies of the actual operation of typical livestock ranches reveals the size and nature of the spread that is best adapted to the different conditions. The best systems of livestock feeding, breeding, and management are worked out to fit various situations. Thus, the combined efforts of various research departments of the Agricultural Experiment Station in cooperation with the stockmen who are now using the land is providing dependable information which may be used by county, district, state and federal agencies in working out a program of land use which will help to insure maximum returns.

Stockmen are interested in land, primarily as a source of vegetation to furnish grazing; next, as a means of producing grain and hay for winter feeding. It is convenient, therefore, to make two classes of agricultural land: (1) Range land (based on the number of acres required per cow for a period of 10 months) and (2) Farm land (based on the acre yield of spring wheat on fallow).

Range Land: From the information obtained, it is possible to map 5 grades of grazing land; namely: First grade, black and very dark brown soils, carrying capacity of 17 acres or less per head; Second grade, dark brown

soils, requiring 18 to 26 acres per head; Third grade, brown soils, 27 to 38 acres per head; Fourth grade, light brown soils and better grassed gray soils, carrying capacity of 39 to 57 acres per head; and Fifth grade, gray soils, bad-lands, bad-land basins and eroded breaks, over 58 acres per head.

Farm Land: The next most important problem of the Montana stockmen is to produce enough feed for winter and a reserve to carry his stock through periods of feed shortage. On non-irrigated lands, suitable for crop production, alfalfa, sweet clover and crested wheat grass are important, as are also corn and the grain hays, especially oats and spring rye. Under irrigation, alfalfa is the predominating hay crop, with barley, oats and wheat producing excellent yields of grain feed. The following tables indicate that the Montana stockmen are justified in giving a larger place to the feed crops.

HAY YIELDS—NON-IRRIGATED LAND
Six years—1927 to 1932

Crop	Moccasin	Havre
	lbs.	lbs.
Oats—Swedist Select	2691	2955
Barley—Fausts	2554	2577
Wheat—Marquis	2814	2473
Rye—Prolific spring	3143	2865
Sweet clover—Yellow	3416	1891
Crested wheat grass	1875	1903
Alfalfa	2013	1694
Corn—cont.—spring plowed	4420*	3607**
*24-year average.		
**16-year average.		

GRAIN YIELDS—NON-IRRIGATED LAND
(Alternate crop and fallow)

Crop	Moccasin	Havre
	24-years	16 years
	lbs.	lbs.
Oats	1366	1197
Barley	1286	1171
Spring wheat	1104	1002
Spring rye (1927-1932)	—	1656
Corn (Fodder)	4420	3607

FEED PRODUCTION UNDER IRRIGATION AT BOZEMAN

Oats—Victory (10-year average)	3984 lbs.
Barley—Trebi (10-year average)	3979 lbs.
Wheat—Marquis (9-year average)	3436 lbs.
Alfalfa Hay (5-year average)	6.2 tons

The primary purpose of land classification is not to "black list" the land in one area or to promote that in another, but rather to recognize and advance the best possible use of the land which the facts suggest. We must face the facts—face the task of intelligent planning of land use based on unbiased facts.

We are firmly convinced that the use of grazing land for grazing purposes only, and the production of feed grains and hay on land suitable for farming will aid materially in placing Montana's livestock industry on a more stable and permanent basis.

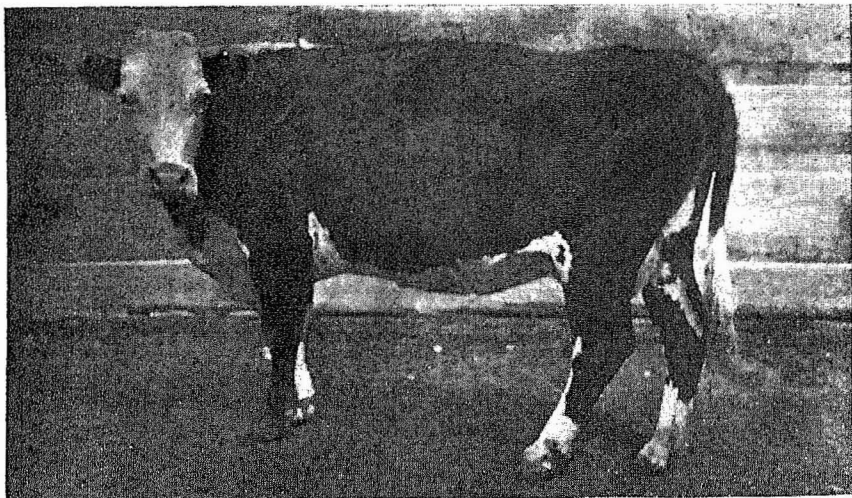
Grass and Feeds

By Louis Vinke*

We have been shown what progress is being made in rectifying land mistakes of earlier days. Recent grazing legislation makes possible a step toward permanent range holdings. Soils are being tested and classified so that farming will only be carried on where soil and climate are favorable to crop production. Our greatest heritage—grass—has been squandered in many sections of the state by misuse such as dry land farming and over-grazing.

Our livestock industry must return to prosperity by a greater use of grass. In the old days grass was the only feed. No provision was made for winter feed and losses were great. Now we feed too much hay. Under present day lease costs (which are too high) every day of hay feeding to cattle costs from 2 to 6 times the cost on grass in Montana. According to figures obtained from stockmen in this state it costs from \$4.65 to \$6.25 per ton to produce a ton of hay. It costs from one to two cents to graze one head one day.

Where feed is hard to raise and grass conditions are favorable, the grazing season can be extended by the use of cottonseed cake or other supplements that can be fed without waste on grass. If cattle can obtain a fair fill on grass, one pound of cottonseed cake per head daily will more than maintain the weight of the cattle.



Wintered Well

*Montana Experiment Station.

Figuring a grass cost of one and one-half cents per head a day, it is easily seen that if one pound of cake per head daily is added to the grass cost it would not increase the cost to more than three cents per head per day under present price conditions. This is cheaper than hay at four cents or five cents per day.

Feeds must be produced of course for part of the winter and it is considered a good policy to hold over hay stacks as a feed reserve for winters following drouth seasons.

Roughages

The kind of roughage to feed depends upon tonnage, cost, safety in feeding and efficiency of the feed. For five years five common roughages have been compared when fed alone to uniform lots of cows to determine their relative feeding values. In each of the five years oat hay surpassed alfalfa, sweet clover, bluejoint and corn fodder in feeding efficiency. The oat hay varied in quality but even poor quality oat hay proved to be superior to the other feeds. No evidences of sweet clover disease were observed in these trials, although the disease occurred in northern Montana during the time of these trials. Oat hay was the best followed by alfalfa, sweet clover and bluejoint, while corn fodder was the least efficient. (In years when the fodder contained 18 to 20 bushels of corn per acre it was fully equal to alfalfa. With less corn it ranked lowest of the five roughages.)*

Small Grains

The use of small grains in winter rations is limited in the range country, principally because of the difficulty in feeding without excessive loss of feed unless fed in troughs. For best results wheat should be coarsely ground and barley and oats either rolled or ground.

1 lb. of grain will replace $2\frac{1}{4}$ to 3 lbs. of hay

2 to 3 lbs. of wheat will replace 1 lb. of cottonseed cake

3 lbs. of grain plus 10 lbs. of hay per day will maintain a cow

Of the grains, wheat is to be preferred with barley and oats close seconds. Rye is a good feed but it is less palatable than the other grains and is last choice. Frosted wheat or shrunk wheat is about as good as sound wheat, provided it weighs as much per bushel.

Feeds for Fattening

Fattening cattle in Montana is recommended only where there is a surplus of feeds produced cheaply. Fattening cattle is a method of marketing these feeds. Over a period of years feed can be sold through fat cattle at higher prices than it can otherwise be disposed of. Furthermore, if a ranch is so organized that more feed is raised at low cost than necessary to maintain a breeding herd, it is advisable to market the feed as grain-fed cattle.

1. **Sugar Beet Areas.**—The areas in the state where beet by-products are available offer the best possibilities for a fattening program. Beet tops, beet pulp and beet molasses are valuable when fed in proper combinations with home-grown feeds and cake.

A daily ration of

Wet beet pulp, full fed, about 125 lbs.

Alfalfa hay, full fed, about 15 lbs.

Beet molasses, 4 lbs. per head daily

Cottonseed cake, $1\frac{1}{2}$ lbs. per head daily

has proved to be most efficient. One year a test pen of two-year-old steers made an average daily gain on this ration of over $3\frac{1}{4}$ pounds over a four-months' feeding period at Billings. It takes about eight tons of pulp, 180 pounds cake, 480 pounds of molasses and one ton of hay to feed a two-year-old steer 120 days by this method. Dried molasses, beet pulp has proved to be fully as good as grain when fed with grain.

Beet tops can be fed in the feed lot or can be picked up by cattle in the fields. Hay should be fed at night when tops are fed. A ration of 10 pounds of beet tops and 15 pounds of alfalfa hay per head per day is a good one to start cattle if they are to be finished on pulp. The tops from an acre of beets yielding 10 tons is equal to a ton of alfalfa hay. Sometimes there is trouble with scours in feeding tops, but if hay is fed at will, this trouble is minimized.

Economy of gains and rapidity of gains are the two big points of advantage when beet by-products are fed judiciously. Our beet sugar districts are in a position to successfully compete with any other fattening area in the west.

2. Montana Baby Beef Production.—This is a plan of fattening calves for baby beef developed at the North Montana Station at Havre. The plan grew out of a necessity of finding some way to fatten calves without bloat epidemics and the plan evolved included Montana's greatest feed asset—native grass. Furthermore, this plan calls for the marketing of calves in the fall after one year's feeding. Fall prices average the highest of the year for young grain-finished cattle. A 400-pound calf well-bred and of good quality after feeding for one year according to this plan should weigh at least 1000 pounds at South St. Paul and top the fat cattle market. Here is



Good Range Bulls

the plan: Feed three pounds of grain per head daily with all of the alfalfa they will eat from November to May. When grass gains strength in May turn the calves out on native grass pasture and full feed grain until September. From September to November feed all the alfalfa hay and grain the cattle will eat. This means a total of about $1\frac{1}{4}$ tons of grain, a ton of hay and a few acres of native grass.

This plan has worked successfully at Havre for the last four years. In each of three years the money received paid for the feeder calves at strong market values, paid for the feed at strong market prices and left \$15 to \$30 per head for labor, interest, taxes, etc. The fourth year the cattle just paid for cattle cost and feed. The feeds required per head for this enterprise are:

2,500 lbs. wheat or barley

2,500 lbs. alfalfa

4 months' native pasture

(100 lbs. cottonseed cake, optional for grass)

3. The Ordinary Method of Winter Fattening by Full Feeding Grain.—

This plan is adapted to sections where there is a surplus of hay and grain such as our irrigated valleys. Roughly, it takes a ton of hay and a ton of grain to fatten a yearling steer and a little less for a calf. Under this system of fattening, it pays, according to a large number of tests, to full feed grain to yearlings and calves. Yearling steers of beef type will finish for eastern markets with 150 days of full feeding grain, and calves will finish at from 180 to 200 days. Except for unusual markets, the cattle should be practically finished before shipping.

In conclusion we may say that grass is our best crop. Legislation for grazing districts is a step in the right direction. The soil survey gives us an inventory and a guide to prevent further misuse of unproductive lands by turning them upside down. A study of feed production possibilities and feeding values will help us toward more economical and more efficient cattle production.



Shorthorns in the Feed Lot

Factors Affecting Size of Calves on the Range

By Louis Vinke* and W. F. Dickson*

Results obtained during the past eleven years at the North Montana Branch Station from experiments in which grade Hereford cows were wintered on various roughages brought to light certain definite relationships regarding the influence of the amount of winter gain made by the cows, their weight, age, and kind of roughages wintered on, upon the birth and weaning weights of their calves. Also the relationships between the birth weights of the calves and their ages at time of weaning upon their weaning weights were established.

A few of the results of these experiments are discussed here, but complete information can be found in Bulletin No. 275, which will be sent by the Agricultural Experiment Station, Bozeman, Montana, upon your request.

How Much Should Cows Gain During the Winter?

Winter gains made by 419 cows show that the more the cows gained in weight during the winter feeding period, the more they lost in weight during the following summer. Cows making only small winter gains made proportionally smaller summer losses, and cows which lost in weight during the winter, gained in weight during the summer.

Cows in good condition in the fall only need to hold their weight during the winter. Cows in medium flesh should gain up to 75 pounds, or enough to offset the birth weight of their calves. If cows are in poor condition in the fall and no more than hold their weight during the winter, they are usually very thin and weak at calving time. Poor cows, therefore, should be fed so as to gain from 100 to 150 pounds during the winter.

Records of 250 cows which raised calves during the past seven years indicate that the amount of winter gains made by the cows, except in the case of young cows, have little or no effect upon the birth or weaning weights of their calves.



Wintering Cows in the Brush

*Montana Experiment Station.

Winter gains are expensive gains.

What Should a Cow Be Fed During the Winter?

Five different roughages, oat hay, sweet clover, bluejoint, corn fodder and alfalfa, were fed for five successive years. The average winter gain and summer loss were about the same on each roughage. There were no significant differences in either the birth weight or the weaning weight of the calves.

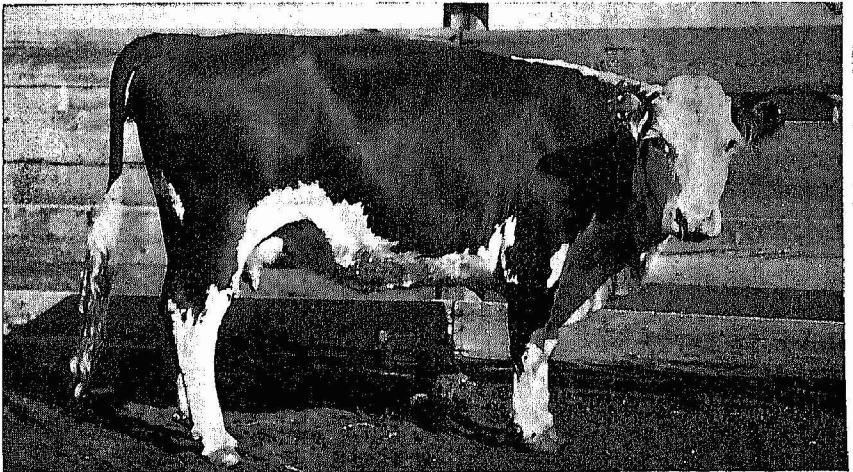
The weaning weights of calves from 153 cows fed protein roughages, such as alfalfa and sweet clover, were compared with the weaning weights of calves from 203 cows fed carbonaceous roughages, such as bluejoint, corn fodder, corn silage, silage and straw and there was found to be no difference.

Cows wintered on straw and a pound of cottonseed cake per day weaned calves just as heavy as cows wintered on alfalfa hay or bluejoint.

It is the condition of the cow in the fall and the amount of winter gain made (providing of course there is ample feed from calving time on) which determines the weaning weight of the calf, and not the kind of feed the cow is fed during the winter.

Do Big Cows Wean Big Calves?

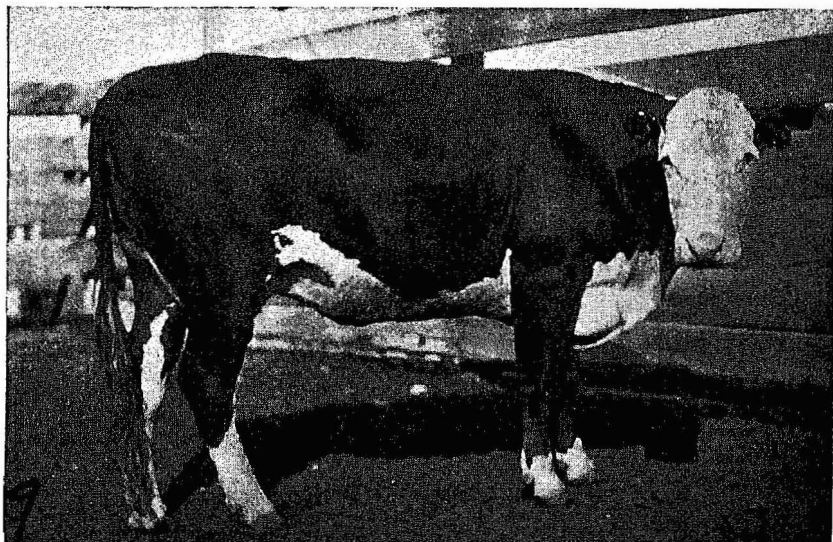
Records of 245 cows which weaned calves during the past seven years show that for each increase of one hundred pounds in the weight of the cows from 800 to 1200 pounds, that the weaning weight of the calves increased by about 20 pounds.



Good Type of Range Cow

How Late Should Calves Be Dropped?

During the past five years our calves began dropping about the first of April and were weaned about the 10th of October. Calves 170 days old at weaning time weighed more than calves 150 days old, but calves 140 days of age, weighed 62½ pounds less than calves 150 days old. This difference cannot be entirely due to the difference in ages. A reasonable explanation of this difference in weight seems to be as follows: The calves less than 150 days old were dropped after May 15th. In years of normal rainfall grass begins to cure in July in the plains area. As a result, there is a reduction in the milk flow of the cows. Evidently calves dropped after May 15th are too young to obtain enough nourishment from the curing grass to offset the decreased supply of milk from the cows. Cows bred before August 15th will drop calves before May 15th and these calves should make maximum growth before weaning time under plains conditions.



Good Type of Range Cow

Fattening Calves for Baby Beef

By W. F. Dickson*

This experiment is the second one of a series built around two feeds which represent the basic feeds available in practically all parts of Montana for feeding livestock. The object of the experiment was to determine whether or not the feeding value of wheat and alfalfa would be enhanced through the addition to the ration of cottonseed cake which is high in protein and phosphorus, or bran, which is rich in phosphorus, or through the substitution of barley and dried molasses beet pulp, both of which are relatively high in fiber, for part of the wheat.

Sixty range calves of Hereford breeding from the upper Yellowstone were obtained for this trial. They were dehorned and vaccinated after arriving at Bozeman, and fed alfalfa hay and a light feed of oats for two weeks before the experiment started, in order to get them accustomed to their new quarters and to get over the effects of dehorning. The 17 heifers and 43 steer calves were then divided as uniformly as possible into five different lots, and started on oats and alfalfa. Previous experiments conducted here at the Experiment Station have demonstrated that by starting cattle on oats and continuing until they are on a full feed and then gradually substituting wheat or barley for the oats that the danger of bloat is minimized.

Our experience here has been that cattle going on feed usually bloat when receiving from about five to seven pounds of grain. Oats were fed to these calves until they were over the danger period and then wheat and the substitutes gradually replaced oats in their rations.

Results of the Experiment

Lot III was fed the basic ration, wheat and alfalfa. The calves in this lot required less grain and alfalfa to make 100 pounds gain than did any other lot; their gains cost less, there was no significant difference in the



Montana Baby Beef

*Montana Experiment Station.

total gain or the rate at which they gained, and there was little difference in the condition of this lot, as compared with the other lots at the end of the experiment.

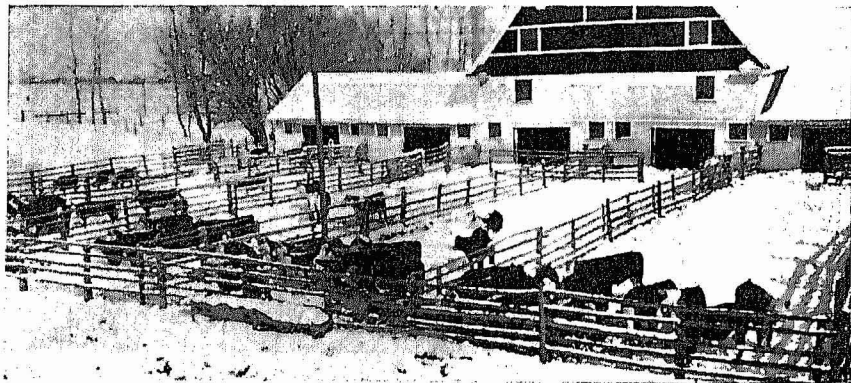
Comparing Lots III and I.—It was originally intended that a mineral rich in phosphorus be added to the wheat and alfalfa ration of this lot. Although added to the grain ration in very small amounts, this mineral was evidently unpalatable to the calves and caused them to go off feed twice before it was decided to substitute bran, which is also high in phosphorus, for the mineral form. The set back these calves received in trying to get them to take the mineral may account for the fact that this lot made a relatively poor final showing, and these results should not discredit the use of bran until further tests have been made.

If all the differences between Lots III and I are changed to the addition of bran to the wheat and alfalfa ration, in this trial there was no advantage in adding bran to the ration, total gains were less, and the calves did not carry as much condition at the end of the experiment as did Lot III. The cost of gains were increased by eight cents per hundred pounds.

Comparing Lots III and II.—Cottonseed cake added to a ration of wheat and alfalfa in Lot II, increased the cost of gain but did not increase the rate of gain. There was little difference in the finish of these two lots.

Comparing Lots II and IV.—In Lot IV barley was substituted for one-half of the wheat. Cottonseed cake and alfalfa were fed as in Lot II. More grain and cake but less hay were necessary in Lot IV to make equal gains with Lot II and as a result the cost of gains were increased, while Lot II was judged to carry slightly more condition than Lot IV.

Comparing Lots IV and V.—Equal parts of dried molasses beet pulp, wheat and barley were fed to Lot V. More grain and less hay were required for equal gains with Lot IV, the cost of gains were increased by 44 cents per hundred; while there was no increase in the rate or total amount of gain. Lot V carried more condition than did Lot IV.



Experimental Feed Lots

If the beet pulp had cost the same as the grains used, the cost of gains in this lot would still have been 23 cents more per hundredweight than in Lot IV.

CALF FEEDING EXPERIMENT
AGRICULTURAL EXPERIMENT STATION BOZEMAN

Nov. 22, 1932 to May 13, 1933—172 days

(Figures given below are averages per head).

Lot	I	II	III	IV	V
No. of head	12	12	12	12	12
Ration	Oats*	Oats*	Oats*	Oats*	Oats
	Wheat	Wheat	Wheat	Wheat	Wheat

*(Oats and alfalfa fed first 48 days.
Wheat and supplements gradually
replacing oats, change completed
in 23 days.)

				Barley	Barley
				Dried	Dried
				Molasses	Molasses
				Beet Pulp	Beet Pulp
				C. S.	C. S.
				Cake	Cake
				Alfalfa	Alfalfa
Initial weight (lbs.) (Nov. 22)	482.4	483.0	480.3	484.7	497.1
Final weight (lbs.) (May 13)	791.5	800.4	806.0	815.8	828.5
Average daily gain	1.80	1.89	1.90	1.93	1.93
Maximum daily feed (lbs.)					
Oats**	9.17	9.17	9.17	9.17	9.17
Alfalfa**	5.00	5.00	5.00	5.00	5.00
Grain	13.33	14.17	14.17	14.17	16.07
C. S. Cake		1.00		1.00	1.00
Bran	1.00				
Alfalfa	2.67	2.67	2.67	2.67	2.67
Total feed (lbs.)					
Oats*	384	397	401	388	392
Wheat	1205	1288	1345	685	506
Barley				685	506
Dried Molasses beet pulp					506
C. S. cake		83		103	103
Bran	107				
Alfalfa	633	670	670	645	594
Feed cost of 100 pound gain***	\$3.43	\$3.58	\$3.35	\$3.70	\$4.14
Cost of calf @ 5c	\$24.12	\$24.19	\$24.01	\$24.24	\$24.85
Feed cost per head	10.61	11.65	10.94	12.25	13.74
Cost of calf plus cost of feed	\$34.73	\$35.84	\$34.95	\$36.49	\$38.59
Necessary selling price (Bozeman) to break even	\$4.30	\$4.43	\$4.33	\$4.47	\$4.66
Appraised value (So. St. Paul less \$4.00)	5.15	5.15	5.25	5.35	5.50
Margin over cattle & feed costs	4.85	5.85	2.41	7.16	6.98

**First 48 days. Change over to wheat and supplements started after this time.

***Feed costs per ton: grain \$11, dried molasses beet pulp \$14, cottonseed cake \$25, bran \$5, and alfalfa \$4.

Conclusions

Two feeding trials have shown that wheat and alfalfa is an adequate ration for fattening calves. In both trials, the lots fed wheat and alfalfa have made the cheapest gains.

Two trials have indicated that the addition of cottonseed cake to a wheat and alfalfa ration did not increase the efficiency of the ration, as judged by the amount of feed required for given gains, did not increase the rate of gain, has increased the cost of gain and in only one trial did the lot fed cake carry more condition.

In several trials with yearlings and calves there did not seem to be any advantage in adding barley to a wheat and alfalfa ration.

The results of two trials indicate that the practicability of using dried molasses beet pulp in the grain ration depends upon its price in relation to grain.

How Montana Stockmen Have Reduced Their Operating Cost

By M. H. Saunderson*

The severe decline in cattle prices since 1929 has made it necessary for ranch operators to cut costs. Although costs vary according to productivity of the ranch and other natural operating factors, nevertheless, actual records from about 100 stockmen in the state have shown where some of the greatest cuts in operating costs have occurred.

TABLE I.—CHANGES IN OPERATING COSTS AND INCOME IN THE MONTANA RANGE BEEF INDUSTRY, 1920-1932
(Figured on a Cow Unit Basis)

	1920	1930	1931	1932	Per Cent Change 1920 to 1932
Labor	5.76	5.42	5.51	4.46	-23%
Supplies	1.67	1.05	1.04	1.21	-28%
Feed bought	1.43	1.40	1.57	1.20	-10%
Leases	1.51	1.87	1.84	1.44	-5%
Taxes	1.03	1.05	1.85	1.01	-1%
General ranch expense	2.05	2.47	2.58	1.93	-6%
Depreciation on equipment	1.00	1.05	1.02	1.03	-3%
Total Expense	15.10	15.60	16.11	13.12	-13%
Interest paid	2.75	3.01	2.95	2.98	8%
Gross Income	20.50	21.40	10.20	13.10	-50%

In the above table the figure on the labor cost of running a cow unit is based upon the hired labor cost, except for the smaller ranches where but little labor is hired. In this case the operator's time was included at the current wage scale. The supplies account is the cost of the provisions and supplies for the labor. Feed bought includes the cost of salt, hay, grain, etc. purchased for the cattle. This was increased by drouth in the eastern Montana ranches in 1931. Leases includes the cost of forest grazing. Approximately fifty per cent of the range used is leased, on the average. The account for taxes includes the cost of this item on both land and cattle. General ranch expenses include the cost of miscellaneous supplies, repairs, insurance, ranch auto and truck expense, etc. As far as possible all items of personal living expenses of the operator have been separated and are not included in these figures. The depreciation charge on equipment is based upon the average cost and life of various types of equipment. The interest charge is based upon the borrowed money on both the land and cattle. The average rate on all money was about seven per cent up to 1932. The figures on gross income are based upon sales and inventory changes. If the year's increase in cattle was not all sold, the numbers kept were added to the income at the same price as those sold, and any decrease was subtracted

*Montana Experiment Station.

from the sales. The increase in operating costs in 1931 is accounted for by drouth conditions which prevailed over a good part of the state, increasing the cost of feed and range, and causing numbers to be reduced severely in some cases.

It has been impossible to reduce operating expenses as rapidly as income has fallen. This has been partly due to the fact that the amount put into labor, feed, equipment, etc., cannot be forced down beyond a certain rate without loss in efficiency, but more to the large element of fixed charges in the costs. This is especially true of leases, interest, and taxes on land.

These reductions have not been enough to offset reduced income from sales. Although conditions vary considerably, most stockmen have considered the following points and decided the following are necessary:

1. Reduced lease costs
2. Labor cost per unit of production must be lowered
3. Reduced taxes

In addition the stockmen have considered changes in their methods of operation. Where possible they are using more range and depending less on feed. They have considered carefully bull costs, value of range supplements and reduction of other costs.

In the following table an attempt is made to estimate normal land investment and lease values for different grades of range and hay land based upon present ranch organization and operating costs, and a 40 year average of Montana ranch prices of cattle.

TABLE II.—ESTIMATED NORMAL LAND VALUES*

	Normal Lease Value Per Acre	Normal Tax Cost Per Acre	Normal In vestment Value Per Acre (at 6%)
Range land with a normal carrying capacity of:			
40 cow units per section for 9 months.....	23c	8c	\$2.50
30 cow units per section for 9 months.....	16c	5½c	1.80
20 cow units per section for 9 months.....	10c	3¾c	1.10
10 cow units per section for 9 months.....	4½c	1½c	.50
Hay land with an average production of:			
One half to one ton per acre.....	\$1.10	38c	\$12.50
One to one and one-half tons per acre.....	2.00	65c	21.00

*The method of arriving at the results given in this table is illustrated in the October and November, 1932, issues of the Montana Stockgrower.

This material is derived from the four year series of records on 100 typical Montana cattle ranches, and from a study of the history of Montana cattle prices and ranch organization and operating costs.

These normal lease values are based upon a land charge per cow unit of \$4.00 per unit. The actual land charge paid in the form of land leases, taxes, and interest during the past four years has varied with different ranches from \$3.00 to \$7.00 per unit, with an average of about \$5.00.

In the following table are given the production cost and income factor averages of the ranch records for the past four years, which have been used in the above estimation of the long-time normal value of the forage.

TABLE III.—PRODUCTION COST AND INCOME STANDARDS IN THE MONTANA RANGE BEEF INDUSTRY

Year	Acres of range per head*	Cost per acre of leased range	Pounds hay per head	Per Cent calf crop raised	Cows per bull	Per Cent cattle loss
1. Western Montana.						
1929	11	23½c	3200	68	26	2½
1930	11	24c	2400	65	26	2
1931	11	22c	2500	70	25	2
1932	11	20c	2100	71	28	2½

*This is the spring-fall range acreage. Forest grazing is additional.

2. Central Montana (East Slope)

1929	16	19½c	1800	72	28	3
1930	18	18c	1300	72	27	2½
1931	19	18c	1400	73	30	1¾
1932	19	16c	1600	73	30	2½

*Some forest grazing additional.

3. Eastern Montana.

1929	27	10c	1400	70	30	3
1930	26	12c	1000	71	28	2½
1931	27	11c	1000	70	29	2½
1932	28	9c	1300	74	30	2

The typical Montana range beef ranch can maintain its present basis of organization over a period of years on six to seven cents ranch price for beef. But in a good many cases these prices would not support the present land charge and interest on indebtedness.

New Methods of Disease Control

The Veterinary Research Laboratory at the Montana Experiment Station was organized in 1929 under a cooperative agreement between the Experiment Station and the Livestock Sanitary Board. This increase in work on animal diseases at the Experiment Station was made at the request of representatives of the livestock industry. This work is administered under the direction of an advisory committee on which the Montana Stockgrowers' Association and the Montana Woolgrowers' Association are represented.

For many years before this reorganization, Dr. Welch had been in charge of the Experiment Station Veterinary Department. An outstanding achievement was the discovery that goiter in new-born calves, lambs, and pigs, was due to lack of iodine, and could be prevented by feeding iodized salt. Dr. Welch has also made extensive observations on the symptoms and treatment of phosphorus deficiency, which will be discussed later.

The Veterinary Research Laboratory at present has two cattle disease projects under way. During the last three years more sheep projects have been carried, due to a demand for study of sheep diseases. The two cattle projects are a study of coccidiosis, which produces a bloody diarrhea in young cattle; and the control of infectious abortion in range cattle.

PHOSPHORUS DEFICIENCY IN CATTLE

By H. Welch*

The mineral content of the grasses in different parts of Montana differs very widely. In several large areas, and in a great many small areas, the feed is very deficient in phosphorus. Both man and animals require phosphorus for normal growth, development, and daily maintenance of the body. Cattle on phosphorus-deficient feed first show the deficiency by a depraved appetite, chewing bones, corral poles, rocks, dirt, old leather, or nearly anything. Later, as the reserve phosphates are withdrawn from the bones, the cattle may become lame and footsore, thin, and either hump-backed or sway-backed. Young growing cattle and cows with calves show the lack of phosphorus most plainly. The calf crop may be small, the cattle are unthrifty, and generally unprofitable. There is also an actual death loss from cattle becoming choked on bone fragments.

To remedy this situation we must supply phosphorus. Bone meal, obtainable through any feed dealer, is high in phosphates, and can be very effectively used to bring the cattle back to normal. Mixed half and half or one-third and two-thirds with stock salt, cattle will eat it readily. Good results cannot be expected from salt mixtures carrying less than one-third bone meal. There is no danger whatever that they will eat too much bone meal, but there is danger that they will get too little. Just as cattle do not show the effects of a phosphorus deficiency for several months, just so it

*Veterinarian at Montana State College.



A Symptom of Mineral Deficiency

may require a couple of months for the bonemeal to produce any noticeable improvement in condition. At present bone meal is the best supply of phosphorus available, but it is likely that other sources of phosphorus will be developed.

It is not easy to locate definitely the areas of phosphorus deficiency in the state, for in dry years bone-chewing and other indications of the phosphorus lack are reported from many areas that ordinarily have no trouble. The territory west and north of Great Falls, extending north far into Canada, much of the district drained by the Musselshell, and the lower Missouri and Yellowstone valleys are among the larger districts in which cattle are most commonly affected. Besides these, smaller areas in the Ruby and Jefferson valleys in the Flathead and Milk River valleys, show a pronounced deficiency of phosphorus.

The use of phosphate fertilizer on hay meadows will be the solution of the problem in some cases, securing an increased yield of hay as well as correcting the deficiency for the cattle. In other cases the use of bone meal, or other phosphorus supplement, with feed or salt will be necessary. Cattle on feed that is so deficient in phosphorus that the symptoms of bone-chewing is commonly noticed, cannot yield a normal profit to their owners.

TWO PREVENTABLE DISEASES OF NEW-BORN CALVES

By E. A. Tunnicliff*

The tendency of some cattle outfits to calve early and use sheds for shelter during the first few days after birth has in some instances resulted in losses which could have been prevented had the owners realized the hazards of such a system.

Two common preventable diseases of new-born calves, calf scours and calf diphtheria, are the result of filth-born infections and inclement weather. The germs causing these infections gain entrance to the calf's digestive tract from the cow's teats, which are continually coming into contact with wet

*Of the Veterinary Research Laboratory, Montana Experiment Station.

manure. If these germs are to cause disease, they must have protection from the sun and a warm place in which to live. Accumulation of manure and bedding in sheds and corrals or small pastures eventually makes an ideal environment.

Adverse weather reduces the young calf's vitality, and at the same time makes the corrals and sheds more unsanitary. However, the filth germs must be present to start the infection, because cold weather alone will not cause these diseases.

Where sheds are used for protection at calving time, manure should not be allowed to accumulate, but cleaned out regularly and often, using only light coverings of clean bedding. The safest procedure is to keep all pregnant cows on the range at calving time, in this way avoiding infection in sheds and heavily-stocked pastures. It is better to take a small loss from bad weather rather than run the risk of a much heavier disease loss.

Calf scours is easily recognized since the diarrhea is of a watery, foul-smelling consistency, appearing 1 to 5 days after birth. The worst cases are dead in 2 to 3 days.

The best results in treating such calves have been by the use of intestinal antiseptics, such as phenol-sulphonates, 1 teaspoonful either in a capsule or dissolved in water, and given once a day by the mouth; or 1 teaspoonful of lysol in a pint of warm water. There is a preventive serum on the market for calf scours, but our experience with serum for scours in either calves or lambs is that it is not of sufficient value to justify its use.

Calf diphtheria is a form of necrobacillosis, belonging to the same group of diseases as foot-rot of sheep, which may appear any time within a month after birth, affecting the mouth, tongue, or throat. Excessive salivation and difficulty or inability to swallow should prompt an examination of the mouth where reddened, greyish or yellow ulcerated areas, if found, are sufficient to inform one of the presence of this infection.

Treatment is unsatisfactory and usually useless, because of the inaccessible location of the ulcers. The ulcers that can be reached can be cured by cauterizing with a caustic agent such as bluestone crystals or silver nitrate sticks.

THE CONTROL OF INFECTIOUS ABORTION IN RANGE CATTLE

By H. Welch and H. Marsh*

Infectious abortion of cattle has been studied very extensively all over the world, but very little of this work has been done on practical methods of control of the disease in range cattle. The Montana Livestock Sanitary Board has done much work in the past few years in blood-testing range cattle and controlling the disease on the basis of the reactions. A year ago, at the request of the State Veterinarian, the control of abortion in range cattle was made a project of the Veterinary Research Laboratory. Work has been started along three lines, as follows: (1) The modification of the blood test so that it can be carried out immediately at the chute, and the

*Of the Veterinary Research Laboratory, Montana Experiment Station.

reactors segregated without a second handling and without individual identification; (2) the study of the experimental herd of 500 breeding cows at the Federal station at Miles City, to determine the practicability of controlling the disease by adopting a certain system of management; and (3) cooperation with the Livestock Sanitary Board in testing in a range herd the efficacy of a new method of vaccination which was developed by the U. S. Bureau of Animal Industry.

One of the generally recognized methods of producing and maintaining a clean herd free from abortion disease is to repeatedly blood test the herd and remove reacting animals. This method of developing an abortion-free herd presents some difficulties in range cattle. However, in Montana we have considered it practical to keep this disease under control by testing the breeding herd late in the summer after calving is completed, and shipping all reacting cows and all dry cows. In a beef herd these animals are usually as valuable for beef as they are as breeders.

The standard method of testing requires the drawing of a blood sample from each animal, and identifying each animal by a mark of some kind. Then the blood serum is shipped to the laboratory for testing. When the report comes back, the herd must be worked again and the reacting cows cut out. In order to eliminate the individual identification of the cows and a second handling of the herd, we have attempted to develop a modification of the test which will enable us to classify each animal as a reactor or non-reactor while it is still in the chute. We have found this test to be very accurate, and hope that it may be possible to use it in range herds to reduce the infection to a minimum. This test would not replace the standard method now used, but if found practicable under field conditions on a large scale, can be applied to range herds where the standard method is impracticable.

COCCIDIOSIS OR BLOODY DIARRHEA IN YOUNG CATTLE

By H. Marsh*

Coccidiosis is a disease which produces a severe bloody diarrhea and often death in young cattle on feed in the winter, caused by a microscopic parasite in the intestine. There has in the past been some confusion between this disease and hemorrhagic septicemia, and for this reason hemorrhagic septicemia vaccine has been advocated to prevent coccidiosis. This laboratory has carried out a field experiment to test the efficacy of such vaccination, using 3380 calves, half of which were vaccinated and half left unvaccinated. Out of these cattle, 102 cases of coccidiosis were reported, of which 53 were vaccinated and 49 not vaccinated. There were 17 deaths from coccidiosis, of which 15 were in vaccinated animals. Evidently the vaccine failed to protect against this disease.

We are attempting to carry on experiments leading to possible preventive measures, but meanwhile we are trying treatment. Recent tests indicate that the most effective medicinal treatment has been drenching the calves with one pint of a one per cent solution of copper sulphate. This has been very successful in preventing losses in several outbreaks.

*Of the Veterinary Research Laboratory, Montana State College.

Cattle Dehorning and Branding

By I. M. C. Anderson* and Ross Miller**

The use of a red hot iron for burning designs to signify ownership on the hides of western cattle and horses is a practice which has developed with the range livestock industry. Objections to this method are, damage to the hide for leather and the pain to the animal. A trade marked paint-like preparation recently put on the market gives promise of a change in the old method. It is claimed by the makers of this material that it will be more economical, more humane, and does not mar the hide. These claims have been tested at Montana State College.

The first demonstration was made February 25, 1933. A red shorthorn steer and a crossbred Hereford-Shorthorn heifer were used in this test. The branding irons used were made from three-eighth inch square iron. The stamp design used was X—B connected. This design was $3\frac{1}{2}$ inches high by five inches long, the connecting bar being two inches long from center of X to the letter B. The points of the X were one-fourth inch from the B. The running iron used was made of three-eighth inch square material. The two faces used were a half circle and a straight bar. The X—B design was used because of its number of angles and circles together with the five marks joining at a common center. It was thought that this design would be a supreme test for the material. A heated iron of the size and dimensions given above would blotch more often than it would make a legible brand. The day these tests were made, February 25, 1933, the temperature was 20° F. The paint was very stiff and would pour very slowly. The following brands were made:

Hereford-Shorthorn heifer (with long winter hair) branded

X—B, stamped on clipped, dry hair, right hip

C, stamped on clipped, wet hair, right hip

C, stamped on long, dry hair, right loin

MSC, "run" on long, dry hair, right ribs

X—B, stamped on long, dry hair, right ribs

X—B, stamped on long, wet hair, right shoulder

The brands placed on long, wet hair failed to go through the hair. Those placed on long, dry hair were fair but the best results were obtained on short, clipped, dry hair. The one placed on short, clipped, wet hair made a dim brand. The brand put on with the running iron was very good where the design was stamped but the attempt to smear a line failed to get a brand.

The Shorthorn steer with long winter hair was branded February 25th as follows:

X—B, right hip, clipped, dry hair

X—B, right ribs, long, dry hair

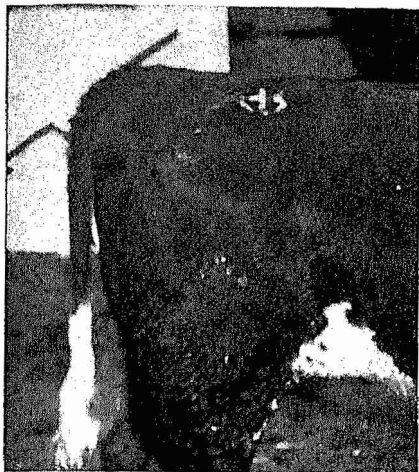
X—B, right shoulder, long, wet hair

*Livestock Specialist, Montana Extension Service.

**Of the Livestock Department, Montana State College.

The hip brand on clipped hair made a fairly good brand. The side iron on long, dry hair left some marks but not a legible brand. The shoulder iron on long, wet hair left practically no mark.

On February 27th the crossbred heifer was rebranded with the X—B on clipped hair on the left shoulder, on long, dry hair on the hip and the letter M was “run” on long hair on the ribs. The brand on the short hair burned through in good shape but blotched slightly where the X points came close to the B. The M which was “run” on the ribs made a brand but the stamp iron on the hip failed to get through the hair.



This same day, February 27th, a Holstein cow was branded with the X—B stamp iron on the hip and ribs. The hip brand was on clipped hair and the rib brand on long hair. A half circle stamp iron was placed on long, wet hair on the hip. All of these made legible brands. The Holstein cow had been kept in the dairy barn during the winter and her hair, while very thick, was much shorter than the beef animals. The temperature was about 20° F. at the time of these applications. The paint was heated enough so it would stir readily but returned to air temperature before application was made.

Liquid Branding

As all these tests were made when the temperature was below freezing and the branding paint was rather sticky, a trial was made with

the paint heated over hot water to 100° F. Four calves were branded, one with the paint cold and the other three with the warm paint. These brands were applied on long hair. The cold iron was pressed down hard, held in place, and rocked around to make sure that the paint penetrated the hair. This brand burned rather deeply and blotched in the center. The warm paint was applied with a slight pressure and removed quickly. This failed to make a legible brand. The next calf was branded with the warm paint with the iron pressed down firmly and rocked just enough to insure the paint had penetrated the hair. This made a legible brand but slightly blotched.

The brand was “run” on the fourth calf. The difficulty was in keeping the paint warm long enough to “run” the brand. However, a legible brand was made. The air temperature was about 24° F. when these tests were made.

All of the above tests were made with a smooth faced iron. Then the iron was ground to make the face slightly concave, the depression being about one-sixteenth of an inch. The Holstein calf that the paint had not

penetrated the hair was rebranded with this concave iron, the pressure of the iron being about the same as the one that had previously failed. The paint was applied cold. This branding resulted in a legible brand but slightly blotched.

On March 27th a black horse was branded on long hair on the shoulder with the concave running iron. The design was a lazy B made with the half circle applied twice and a bar applied once. This was a saddle horse, kept in the barn but had fairly long hair. The temperature was about 40° F. This resulted in a good, legible brand.

These brands applied from February 25th to March 27th had not completely healed by April 20th. The brand on the horse, although the last one applied, had peeled off by April 15th or about 20 days. There was never a sore but the outer skin peels off leaving a dry scab.

On April 26th five grade Hereford calves about ten days old were branded

L

— with a running iron. An effort was made to stamp each individual mark

N

of this iron with a straight, concave-faced, three-eighth inch iron. A check eight days later indicated that four of these brands were doubtful. The brand on the fifth calf would "hold" the animal but the lower part of the L and part of the N were missing. These brands were all placed on the natural hair. There was a light shower during the time of this branding but the hair was only damp, not wet.

Advantages of Paint Branding

1. Easily applied—The above irons were all applied while the animals were standing up with the head secured, except the $\frac{L}{N}$ which was "run" on the five small calves while two men held them.

2. Less discomfort to the animal—There was very little indication that the paint was causing pain.

3. May be applied any time—The brand may be applied any time of the year if long hair is clipped.

4. Less danger of injury to the animal—Cows heavy with calf may be branded as it is not necessary to have them squeezed solid.

5. Less apt to blotch—Experience here has been that the paint is not as bad to blotch as hot iron.

6. Better for complicated designs—The fact that it is not as apt to blotch as fire irons, makes it more desirable for making complicated designs.

7. Does not injure the hide.

8. Durable—This part has not been proved at this station but there is plenty of evidence of its durability where it has been used for a year or more.

Best results are obtained when: (1) Paint is stirred before using. (2) Stamp iron has one-half inch (one-fourth inch for horses) concave face.

(3) Angles are of 90° or more. (4) Iron is dipped in one-eighth inch of paint. (5) Temperature is above 40° F. (6) Lines of design are three-fourths inch or more apart. (7) Applied to short hair.

Poor results are obtained when: (1) Stamp iron has convex face. (2) Temperature is below freezing. (3) Hair is long and cold. (4) Hair is wet and cold. (5) Points or lines of separate letters are closer than one-half inch. (6) Angles of design are less than 45°. (7) Where an excess of paint is used.

Dehorning

Butchers often say that horns and prime carcasses are seldom found on the same animal; meaning that many of the bruises on the carcass, which detract from its appearance and sale value, are caused by horns. Horned cattle generally bring 25 to 75 cents per hundred weight less than the same grades of hornless cattle. The earlier in a calf's life the horns are removed the better. A common practice among range cattlemen is to dehorn the calves with a saw or some other dehorning instrument at weaning time, or yearlings are dehorned just before fly time in the spring. The use of caustic on the horn buttons of the one to two-weeks-old calf has not met with favor for range use because of the necessity of clipping the hair and "ruffing" the horn button before it is applied.

Dehorning Paste

Several companies now prepare "dehorning pastes" which require less trouble and detail in their application than caustic. To date, May 10, seven calves have been treated with paste. The application was made directly on the horn buttons without previous preparation, except the hair surrounding one horn on one calf was clipped and the skin around the horn was "ruffed" slightly with a knife. The results, obtained by this latter method as compared with the application direct to the horn button with no previous preparation, were no better, produced a larger scab and took longer to heal. The simplicity of applying this material should make it a popular material for dehorning young calves on the range. We will have definite results on this in one year.

Dehorning Spoon

The dehorning spoon is a good instrument to gouge out the horns of calves under three months old. This small instrument, shaped like a spoon on the cutting end, can be held in one hand. The dehorning operation with this instrument is accomplished as follows:

Grasp the horn between the thumb and the spoon, press the cutting edge through the skin at the base of the horn, rotate the hand back, then forward, and a slight twist of the wrist will bring the horn out. The operation is much like pulling the cork out of a bottle.

The Barnes Dehorner

This instrument, when open to receive the horn, forms a cylinder which is pressed over the horn. The handles are parallel and close together.

To complete the dehorning operation press the dehorners firmly against the calf's head and spread the handles until the horn comes out. This instrument is suitable for dehorning calves from three months to one year old.

Both of the above instruments "go in after the horn," therefore, there is less danger of leaving part of the horn producing tissue which may afterwards develop bad looking seurs or stub horns.

Cattle one year old or older that have not been dehorned have generally developed a good horn that must be removed with a saw or some one of several heavy horn clippers. Cattle of this age suffer more, are harder to handle and take longer to recover than those dehorned as calves.



A Good Dehorning Squeeze

Outlook For Beef Cattle Prices

Paul Carpenter*

The livestock markets have felt little beneficial effect as yet from the inflation that followed locking up "tight" the nation's gold supply. Devaluation of the dollar has affected prices first in those commodities freely traded in on futures exchanges. Here people have a means for expressing their confidence, or lack of confidence, in values at a future date. Second, those commodities entering freely into international trade, such as cotton and wool, are revalued at once roughly to correspond with the depreciation of the dollar in terms of moneys of other nations.

Meats have not had the benefit of either set of circumstances. It seems that meat producers must wait for "theirs" until such time as there is more money in pay envelopes, until employment picks up. There could, however, be an upturn in feeder demand in advance of any general improvement in employment. Feeders must bet on conditions three to twelve months ahead. A disposition to "look up" on the part of corn belt feeders could pull feeder stock out of line with slaughter animals any time now.

Meat markets tend to follow wages. It is not to be forgotten that wage rates lag behind general business recovery, just as they lagged behind business volume on the down slide into depression. Only during the last 12 months has there been any general revision of wage scales in the organized crafts. It is likely that upward revision will be equally slow. Meat markets in the immediate future probably will have to depend more upon buying by an increasing number of people put back to work, even at low wages, rather than upon any sudden rise in wage rates.

During the course of the depression storage of meats and meat products declined, contrary to the situation with wheat and cotton. Hence beef operators and other meat producers are in a favorable position to take advantage of any genuine improvement in consumer buying power.

That business recovery with its increase of employment is now something other than hope is attested by such significant changes as a rise in steel production, increased car loadings and a great use of electric power in manufacturing industries.

The size and the make-up of the national cattle herd has changed considerably in the last few years. There are a seventh more beef cattle in the United States than in 1928, a quarter more in Montana. As market values continued to drop growers the country over have been compelled to sell down their steer holdings, so that the beef cattle increase is mostly that of she-stuff, especially of aged cows. Five years back the slaughter of cows and heifers exceeded that of steers. This last year 56 steers went to killers for each lot of 44 cows and heifers.

The danger of running up a great excess of beef tonnage however, owing to the expanded condition of the breeding plant, seems rather remote. The

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swing has been so much from heavy, mature steers to younger stuff for slaughter that the greater number of beef cows may even account for less total weight than a smaller number heretofore.

Cattle growers have a stake in recently enacted "farm relief" legislation despite the fact that theirs is not one of the "basic" commodities according to the terms of the act. Just to the extent that the powers of inflation conferred upon the President put men to work, the law will help. Further, a determined effort is to be made to pull hog prices out of the cellar, probably by reducing the tonnage. If successful, results in the hog program should not be long in forthcoming. From breeding date to marketing can be well under a year.

Considerably more pork than beef is consumed in the United States. Beef values can not but be supported by improvement of hog producers' position.

Markets can be expected to show heavy premiums on whatever is not offered. An occasional load of heavy steers with finish may make the summer top, few being in sight. Looking a little farther ahead, it seems inevitable that cattle of prime slaughter grade, notably steers, being in short supply, will go to heavy premiums over animals of poor grade and low finish. While just a lot of cows must go to town in the next few years, it seems probable that breeding cows will continue to make up a larger percentage of cattle holdings than in the past.

While large areas in Montana and Wyoming doubtless will continue to feature steer production, other western districts, and the whole of the corn belt with its heavy beef population, already have moved far towards a cow and calf basis. Apparently this preference of the retail meat buyer for choice but light cuts is more than a passing fad. Small retail cuts mean animals finished and moved to slaughter at younger ages, mean more cows to account for any given tonnage of beef.

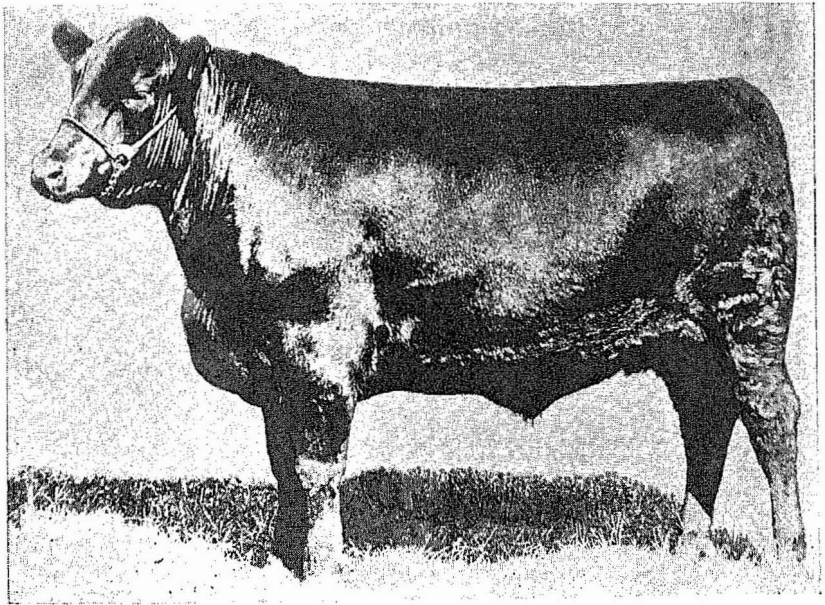
Market Classes and Grades of Cattle

By J. K. Wallace* and I. M. C. Anderson**

The public demand for smaller cuts of meat has changed the style of our beef animals. The bullock, weighing a ton or better, popular a generation ago, has practically disappeared from the market. The 1,600 pound two to four-year-old steers are arriving on the market in smaller numbers and facing a decreasing demand. The 900 to 1,100 pound baby beef now brings the top of the market; unless there happens to be offered a carload of "ultra baby beef" (finished 10 to 12 months old calves weighing 750 to 800 pounds).

Market Classes of Cattle

Cattle are divided into five classes—steers, heifers, cows, bulls and stags. These general classes are divided into three sub-classes—slaughter, feeder and stocker cattle except the stags which are all considered as slaughters. The sub-classes are divided by age and weight. The fifth and last sub-dividing of market cattle is known as grading, and the units resulting from the sub-division as grades.

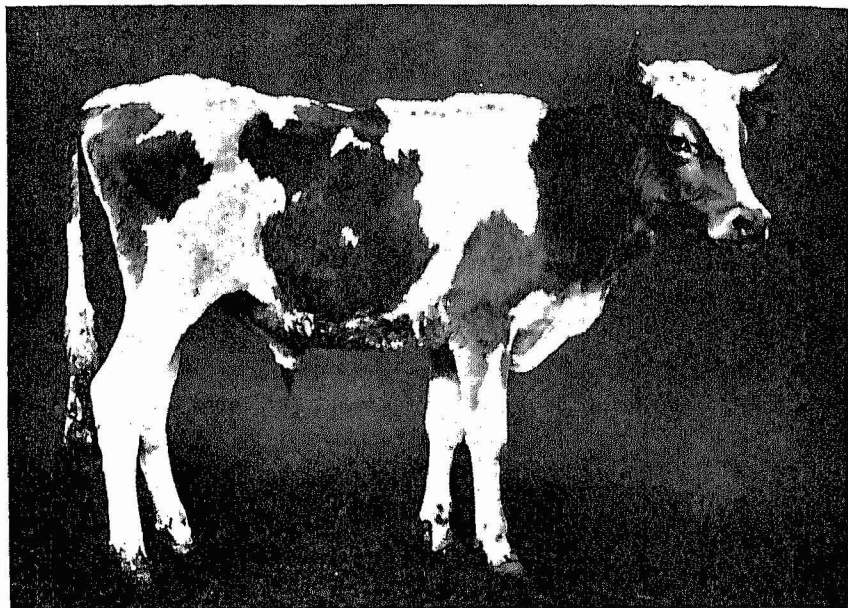


Prime Slaughter Steer

*Senior Marketing Specialist, Washington, D. C.

**Livestock Specialist, Montana Extension Service.

U. S. D. A. bulletin number 1360, "Market Classes and Grades of Livestock," describes in detail all these grades and classes. A limited supply of this bulletin is available for distribution on request. A demonstration of grading the different classes of slaughter and feeder cattle will be made. Sixty head of cattle were used in this demonstration.



Low Cutter Steer

The Tax Dollar, Where it Comes From

By R. R. Renne*

Governments are established and maintained to render those services which the people need or demand and which they realize can be rendered more effectively and cheaply by government than by other means. If the citizens believe that the best government is the one that governs least, governmental services will be few and taxes small. But in the United States, due in part to changed economic conditions and in part to a changing political philosophy, the tendency in recent years has been toward greater rather than less regulation and service by government. Increases in population have made administration of government more difficult and more expensive; improved transportation facilities have required more and better highways; advances in education methods and in number of students have required increased expenditures for schools; and the increasing need for regulation of trade, protection to person and property and other governmental services as society has become more complex, has resulted in an expansion of the services rendered by government and an increase in taxes.

Increased Cost of Governmental Services

The cost of all government in the United States (Federal, state and local) increased from 3 billion dollars or an average of \$30.12 per person in 1913 to nearly 13 billion dollars or \$105.31 per person in 1930. The cost of Montana state government increased from less than 3 million dollars or \$6.66 per person in 1913 to more than 13 million dollars or an average of \$24.99 per person in 1930. The cost of all local governments in Montana (counties, cities and towns, school districts, and irrigation and drainage districts) increased from 15 million dollars or an average of \$36.25 per person in 1913 to 32 million dollars or \$59.55 per person in 1930.

Increased expenditures for protection (principally maintenance of army and navy and veterans' compensation) accounted for more than half of the increase in Federal costs from 1913 to 1930; increased expenditures for highways accounted for almost half of the increase in costs of the 48 state governments and increased expenditures for education and highways combined accounted for more than half of the increase in costs of all local governments. Increased expenditures for highways accounted for approximately

TABLE 1.—COST OF GOVERNMENTAL SERVICE IN MONTANA, 1913 AND 1930

Unit	1913	1930
State government	\$2,793,000	\$13,442,000
County government	7,552,000	13,281,000
School districts	3,538,000	11,765,000
Cities and towns	4,026,000	6,277,000
Irrigation districts	77,000	687,000
Grand total	\$17,986,000	\$45,452,000

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three-fifths of the increase in costs of Montana state government and increased expenditures for education accounted for more than half of the increase in costs of Montana local governments.

Where Governments Get Their Income

Almost half of the combined Federal, state and local tax revenues in the United States is obtained from the general property tax. The chief source of revenue for the Federal government at the present time is income taxes on individuals and corporations, whereas before the war the chief source was customs tariffs on imports. The chief source of revenue for the 48 state governments is taxes on gasoline, while before the war the chief source was the general property tax. The chief source of revenue for local governments is the general property tax which was also the chief source for revenue during the pre-war period. The chief source of income for the Montana state government at the present time is taxes on gasoline, while before the war the chief source was the general property tax. Montana local governments at the present time rely almost entirely on the general property tax for their revenue as they did before the war. Approximately four-fifths of the tax revenue and two thirds of the revenue from all sources for Montana state and local governments come from the general property tax.

Since the farmer requires a larger amount of real estate for securing a given income than operators in other occupations, our tax system, which has relied so heavily upon the general property tax, has put an undue tax load on our farmers.

The Farm Tax Burden

The estimated taxes per acre which Montana farmers paid on their land and buildings for the support of governmental services in 1932 were 62 per cent higher than those paid in 1913, but about 20 per cent less than those paid during and just after the World War. About 12 per cent of this 20 per cent reduction since the war occurred in 1931 and 1932, but the tax burden increased because of greatly reduced income due to the large decline in farm prices during these years.

Montana farmers paid an estimated average tax of 12.2 cents per acre in 1932 compared with 7.6 cents in 1913. Taxes reached their highest point in 1921 when Montana farmers paid an average of 15.3 cents per acre or more than twice the 1913 figure. In addition to these taxes Montana farmers paid special assessments for irrigation and drainage projects averaging .2 of 1 cent per acre in 1913 and 1.7 cents in 1932. This is an increase of more than seven fold and indicates the large development in irrigation and drainage projects during this 20-year period. These special assessments are for capital improvements and, of course, apply only to those farms upon which the special improvements are being made.

The increase in taxes since 1913 has not been the same for different types of land. Taxes have increased most on irrigated land, less on non-irrigated tillable land, and the least on grazing land. Taxes including special assessments on irrigated land in 1932 were about $2\frac{1}{2}$ times as great as in

1913, those on non-irrigated tillable land less than 2 times as great, and those on grazing land less than $1\frac{1}{2}$ times as great.

On the basis of prices received by Montana farmers in 1913, 1.1 pounds of beef, 1.3 pounds of lamb, and less than one-half pound of wool were required to pay the average farm tax per acre that year; while in 1932, the prices received, 3.2 pounds of beef, 3.2 pounds of lamb and 1.2 pounds of wool were required to pay the farm tax per acre. In other words, because of the extremely low prices in 1932, about three times as much beef, about two and one-half times as much lamb and three times as much wool were required to pay taxes as were required to pay taxes in 1913.

TABLE 2.—AMOUNT OF BEEF, LAMB AND WOOL REQUIRED TO PAY TAXES IN 1913 AND IN 1932

Product	Farm prices	1913		1932	
		Farm real estate tax per acre	Number of pounds of product required to pay tax per acre	Farm real estate tax per acre	Number of pounds of product required to pay tax per acre
Beef	\$6.68 per cwt.	7.6c	1.1	\$3.83	12.2c 3.2
Lamb	\$5.77 per cwt.	7.6c	1.3	\$3.86	12.2c 3.2
Wool	17 $\frac{1}{2}$ c per lb.	7.6c	.4	10c	12.2c 1.2

About 10 per cent of the total acreage assessed for taxes or between four and five million acres in Montana had already been acquired by the counties through tax deed or were subject to such deed at the end of 1932. In several counties the acreage is as much as one-fifth or one-fourth of the total assessed acreage of the county. Considerable additional land is delinquent one or two years in payments. Such a large amount of delinquency is very good proof that the tax burden placed upon these farmers is greater than their means to pay. The burden is unusually heavy for the following reasons: (1) the income of the farmer has declined very greatly due to the fall in prices of agricultural products; (2) the income of the farmer comes almost entirely from real estate and other tangible property which ordinarily cannot escape the assessor, while in recent years many people have had large increases in intangible property in the form of stocks, bonds, etc. which can easily be hidden and thus to a large extent escape the assessor; (3) the farmer unlike many other groups is not able to shift taxes by adding them to the price of the products he sells because he is not strongly organized and his products sell mainly on national or world markets; and (4) farmers pay taxes locally for purposes such as schools and roads, the benefits and advantages of which are diffused over a very large area.

Functional Distribution of Farm Taxes

Approximately 68 cents out of each dollar of taxes paid by Montana farmers in 1932 were levied by the county, 23 cents by their school districts and 9 cents by the state. In 1913 the proportions were 70 cents by the county, 18 cents by the school districts, and 12 cents by the state. State taxes per

acre amount to considerably less than either county or school district taxes and also increased relatively less during and just after the war and have since declined the most. In other words, a greater proportion of the taxes paid by Montana farmers today is levied by themselves locally in their own school district and a smaller proportion is levied by their county and state officers than before the war. This increase in district taxes for rural schools in the face of a falling income is evidence of the farmers' willingness to sacrifice their own immediate interests to the education and advancement of their children.

Table 3 shows the distribution of the Montana farm tax dollar by various purposes for 1913 and 1932. From this table it can be seen that in 1913 a larger proportion of each dollar of taxes paid by Montana farmers was levied (1) for elementary and high schools, (2) for interest and amortization of county bonds, (3) for the Greater University of Montana, and (4) for county poor relief than in 1932; while a smaller proportion was levied (1) for general state administration, (2) for general county administration, (3) for roads, (4) for bridges, (5) for miscellaneous state purposes, and (6) for miscellaneous county purposes. The greatest relative increase over this 20-year period occurred in levies for county poor relief and the greatest relative decrease occurred in levies for roads.

TABLE 3.—MONTANA FARM TAX DOLLAR BY PURPOSES OF LEVY,
1913 AND 1932

Purpose	1913 Cents	1932 Cents
State:		
General state administration	6.6	3.4
Greater University of Montana	3.4	4.2
Miscellaneous	2.0	1.4
Total state purposes	12.0	9.0
Local (county and school district):		
Elementary and high school	35	48
General county administration	23	15
Interest and amortization of county bonds	4	11
County poor relief	1	7
Roads	15	5
Bridges	5	3
Miscellaneous (county fair, county library, county agricultural agent, insect pests, etc.)	5	2
Total local purposes	88.0	91.0
Total state and local	100.0	100.0

Comparisons With Other States

The increase in farm real estate taxes since 1913 is by no means confined to Montana. Taxes paid by Montana farmers averaged less than 8 cents per acre in 1913 and 14 cents in 1930, an increase of 83 per cent; taxes paid by Washington farmers averaged 34 cents per acre in 1913 and 68 cents in 1930, an increase of 99 per cent; those paid by Wyoming farmers averaged about 4 cents per acre in 1913 and 9 cents in 1930, an increase of 112 per cent;

those by Idaho farmers averaged 30 cents in 1913 and 65 cents in 1930, an increase of 118 per cent; those by North Dakota farmers averaged 15 cents in 1913 and 38 cents in 1930, an increase of 148 per cent; and those by South Dakota farmers averaged 15 cents in 1913 and 44 cents in 1930, an increase of 188 per cent. Thus Montana shows a lower rate of increase in farm taxes per acre since 1913 than any neighboring state. In addition Montana shows a lower rate of increase in taxes per acre than any of the 41 states of the United States for which comparable data are now available.

Montana farmers pay less taxes per \$100 of full value of land and buildings than the farmers in the neighboring states of North Dakota, South Dakota, Idaho and Washington. In 1930 Montana farmers paid an average tax of \$1.20 per \$100 of full value, Washington \$1.22, South Dakota farmers \$1.41, Idaho farmers \$1.48 and North Dakota farmers \$1.73. However, Montana shows a greater percentage increase in the rate per \$100 of value since 1913 than either Washington or Idaho, but a smaller percentage increase than either North Dakota or South Dakota.

The Tax Dollar, Where it Goes

By J. P. Fabrick

Public assembly and debate make the governments of the nation, states and larger cities much more spectacular than that of our counties. While the press keeps us informed from day to day what takes place in these larger units of our government, to the activities of the county only very little space is given. In the wave of tax-resistance, specially noticeable in 1932, too much thought was concentrated on national and state affairs, and not enough consideration was given to the taxing power and tax disbursements of the smaller, and possibly the weakest link in our government—the county.

So-called tax committees were organized in many of the Montana counties as well as elsewhere; and very definite demands for reduction in taxes were voiced; but advice as to how these demands might be met was lacking in many instances.

In a general way Gallatin is probably somewhat representative of the average of Montana's counties, and the figures quoted are taken from the report of the tax committee of the Gallatin County Farm Bureau, made in the spring of 1932.

The total amount of taxes collected in Gallatin County in 1931 was from:
Agricultural sources 28 per cent—Land 21 per cent, improvements 3.2 per cent, livestock, 2.37 per cent, personal property 1.43 per cent.

Public utilities 29.3 per cent.

City lots and improvements 28 per cent.

Goods, wares, fixtures 5.3 per cent

Money and stocks 2 per cent.

Other personal property 2 per cent.

Industrial sites and improvements 5.4 per cent.

For every \$100.00 of taxes collected, we have, for 1931, the following distribution:

For State purposes:

Higher education	\$6.67
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Government	4.00
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Total for State purposes	\$10.67
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For County purposes:

General fund for operation of all county offices, buildings, courthouse, county agent's office, etc.	\$12.00
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Bridge fund	4.00
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Road fund	10.00
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Poor fund	5.00
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Bond sinking fund	4.00
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BEEF CATTLE

47

Bond interest	3.00
Fair fund	1.00

Total for County purposes\$39.00

For School purposes:

General school	\$12.00
High school	16.00
Average district	21.72

Total for School purposes\$49.72

Undistributed 61

Total\$100.00

Adding the \$6.67 paid for higher education to the \$49.72 for school purposes, we find that out of every \$100.00 in taxes, \$56.39 is expended for education. More than half of the county money is spent for education, hence a large portion of the time in several of the county offices is given to matters pertaining to education and schools, which adds to the cost thereof in excess of the figure quoted.

A reduction of 13 per cent in the cost of education in the counties, would reduce taxes as much as the total elimination of the Greater University of Montana, and a further reduction in the county cost of education of an additional eight per cent would equal the total elimination of our state government as well.

The concentration on the affairs of finance in the state, evidenced during sessions of the state legislature, although necessary, would seem out of proportion to the amount of tax money involved.

A comparison of the cost per pupil per year in our different schools shows interesting variations, the highest being \$369.43, the lowest \$60.59. The highest cost per pupil per year is found in schools with an enrollment of from three to five pupils, the lowest in schools with an enrollment of thirty-five. Schools with fifteen pupils show an average annual cost per child of \$118.00. An increase in number of pupils over thirty-five indicates an increase in cost as well.

The elimination of schools with very small enrollment and transportation to a consolidated district school is possibly a better way to cheaper (and better) education than excessive salary cuts; while consolidation of high schools offers a similar opportunity.

Mills levied in the rural school district of Gallatin county run as high as 24 mills and as low as zero, while in some districts without a school, the mills levied are considerably higher than in other districts where a regular school is conducted. A fairer and more equitable distribution of the cost of education might well be investigated.

The right to vote at school elections under present regulations, gives a floating population with only a temporary interest in the community, the

power to settle debts on the property within a school district, without sharing the burden of paying these debts.

Income received from the automobile vehicle license tax appears to be more than sufficient to maintain the county roads; in fact, that item of income leaves a small surplus, after all maintenance is taken care of, for new construction. (Federal Aid Projects are being maintained by the State Highway Department). If a similar situation presents itself in other counties, such counties undoubtedly have materially reduced the road fund, as has been done in Gallatin county.

The use jointly by adjoining counties of heavy road machinery, often discarded before worn out, offers an opportunity for reduced capital outlay for road-building and road-maintenance.

The charitable functions for Gallatin county, including

1. Poor farm
2. Outside poor
3. Care poor outside institutions
4. County physician
5. State tubercular sanitarium
6. Mothers' pension
7. Old age pension

require a cash outlay for 1929-30 of \$31,249.79

1930-1931 of \$36,104.40

appropriation 1931-1932 of \$48,313.00

The thought that the operation of one poor farm jointly by two or more counties to offset this alarming increase of cost for taking care of the poor, is suggested for consideration.

Dividing the total assessed value of all cars and trucks in Gallatin county by the number of licenses issued, gives us an average value of \$203.00 for each vehicle. If actual cash values apply for valuations of motor vehicles, then a like basis should be used for other property, such as livestock, farm lands or homes. The assessment of property is the foundation upon which the tax load for the different classes of wealth is based. The importance of a fair and equitable valuation of all property is immediately evident; changes in values must therefore be taken into consideration by the assessor. Lands, in previous years considered valuable for agricultural purposes, and assessed as such, are now in many cases considered as suited for grazing only, and their values have in many sections of the state not been correspondingly reduced.

Conceding the great educational value of a county or other fair, it is nevertheless primarily a recreational activity which, under present circumstances, might possibly be dispensed with.

Charges allowed for mileage of cars used in connection with county activities, should be reduced to a level approaching that set by the State Board of Examiners, which allows 7½ cents per mile for employee-owned cars.

Payment of county debts as rapidly as possible must, in ordinary times, be encouraged; debts, however, can more easily be reduced in times of

plenty than in times of stress. A temporary slowing up of liquidation of county indebtedness might afford some welcome relief at this time.

With better roads and more rapid means of transportation, the number of voting precincts in the counties can materially be reduced without undue hardship to the voter. The hours, during which the polls are open in the smaller precincts, and the number of clerks and judges employed, can very well be lowered, all of which measures would in turn reduce the excessive cost of elections under our present system. Gallatin county in 1931 paid to judges and clerks the sum of \$4500.00, which figure does not include printing and other costs associated with elections. Total cost of elections, which come every other year, amount to approximately \$7000.00; the highway bond issue, being a special election, boosted the total cost for Gallatin county for 1931 to \$8450.00, and the public should realize the cost of such special elections.

During the past ten years Gallatin has dropped from being a third class county to the fourth class, and finally to the fifth class group. Making allowance for the fluctuation due to that change, and taking into consideration the changed and often increased activities of the different offices, necessitated through newly enacted legislation or modified conditions, the cost of operation of these offices has remained practically the same during that ten year period. Whether each newly elected officer merely followed the precedent set by his predecessor, or whether efficiency and economy had ten years ago already established the lowest possible minimum in operation cost, is a debatable question, and only a very thorough analysis of the operation of each office by men qualified to do so, can enlighten us on that subject.

The layman, however, knows that each county office is operated as a distinct and separate unit, resulting in lack of cooperation between these offices. Each office employs deputies and assistants in excess of its average daily requirement in order to be able to take care of its peakload, and that the time of the peakload is not the same in each office. The manager form of government, very successfully in use in the City of Bozeman for several years now and operating with the elimination of politics and at a great saving for the people of that city, offers opportunities of duplication for county that invite investigation. Recent legislation allows, after a county has by vote expressed its desire for that form of management, the appointment of a manager by the three commissioners, and in turn the appointment of all subordinate officers by the manager. People unqualified need, under that system, not be perpetuated in office, while consolidation of offices, joint use of deputies and other simplifying measures can be applied to reduce the complicated and top-heavy character of present day county government. The chief advantage, however, would be the elimination of politics, while the duties of the county commissioners could be reduced to that of outlining general policies, the execution of these policies to be delegated to men particularly qualified for their assignments. The manager form of government for counties undoubtedly holds out the greatest promise for cheaper administration and as a consequence for lower taxes.

The first necessity for having economical county government (and a fair and equitable tax system as well) is that the public must take more interest in its local governmental affairs, and realize that we cannot have the many forms of service, convenience and support we generally demand, without paying the price. The remedy for heavy taxes lies, after all, within the power of the public itself.

