An Extension Service Publication

Montana Extension Service in Agriculture and Home Economics

Montana State College and the United States Department of Agriculture, cooperating; Acts of Congress May 8 and June 30, 1914

J. C. TAYLOR, director
The Livestock Special Train

Showing the Way to Greater Profits

The Livestock Special Train, with its exhibits prepared by the Montana Extension Service, operated in central and northern Montana, October 4-24, 1928, with the cooperation of the Milwaukee and Great Northern Railroads, told an interesting story. It was interesting because it was practical and because it dealt with those factors in livestock production which determine quality and higher returns, increased efficiency and greater profits.

The exhibits on the train were varied and numerous. It is not expected that those farmers and stockmen who visited the train found all of the principles brought out on the train applicable to their own individual conditions. It is undoubtedly true, however, that no one could view the exhibits without gaining some suggestions which, if put into practice, would make his livestock or farming enterprise, whether large or small, more successful.

Neither is it expected that in the brief time alloted to the program at the train, all of the facts presented would be remembered, or that all would grasp the full significance of the points brought out. It is the purpose of this bulletin to present with illustrations the exhibits of the train and to call attention to some of the underlying principles of successful livestock production in northern and central Montana which the exhibits were designed to bring out.

As was brought out at the general feed crops meetings, held at each point where the train stopped, by far the greater part of Montana is adapted to or is at present available for livestock production only. Whatever revenue is obtained from the soil in this large area must come from livestock. Even a very small increase in the carrying capacity of the more than 50,000,000 acres classed as range land, or even a slight improvement in the quality of stock turned off these lands, would add greatly to the gross income of the livestock industry in Montana.

In the parts of the state where cash crop production is carried on, livestock has an important place. This is true, though perhaps to a more limited extent, even in those more favored areas where certain crops may be grown most efficiently and profitably.
All farms should produce at least some livestock, whether beef cattle, dairy cattle, sheep or hogs, if the most satisfactory returns are to be realized, and many farms must include livestock if operation is to be carried on at a profit.

With these facts in mind, which are not merely the opinions of those men from Montana State College who had to do with the operation of the train, but also are the firm convictions of farmers and stockmen of Montana themselves as expressed in recommendations made at agricultural economic conferences held in the state within the past few years, the livestock special train exhibits were prepared.

The order in which the exhibits are presented and discussed in this bulletin is the same as at the program at the train. It must be remembered that no attempt was made to cover the entire field of livestock production, nor to answer all questions on livestock. Such an attempt would have meant skimming the surface too lightly for any practical good. However, every visitor to the train was given an opportunity to place his name and address on a card and to designate whether or not he wished to receive this bulletin dealing with the train exhibits, a list of bulletins available from the Montana Experiment Station and the Montana Extension Service dealing with livestock and feed crop production, a copy of the breeding stock directory to be issued next spring, a copy of the catalog dealing with the 12-weeks agricultural short course given at the State College each winter, or whether he desired information or assistance in securing breeding stock. The desires expressed on these cards will receive the attention of Extension Service representatives at the earliest possible date. Those who did not have opportunity to fill out the cards at the train but who desire service or information along the lines indicated should get in touch with the local county extension agent or write to the Montana Extension Service, Bozeman.
The Livestock Exhibits

DAIRY CATTLE

There are a few essentials for successful dairy production. First of all, there must be a satisfactory market, and a dependable supply of suitable feeds. With these satisfied, good cows becomes the next essential of importance.

From a study of over 18,000 individual records from cow testing associations, it is found that for every 50 pounds of increase in butterfat production, there is an increase in returns of about $16.00 over and above the cost of feed. In other words, the cows which make the most butterfat for the year give the greatest return. As dairy cattle multiply rather slowly many years may be lost in developing a good herd if the right principles of breeding and feeding are not employed.

The exhibits of dairy cattle were not selected because of the breeds the animals represent, but for the purpose of representing principles of successful dairy production.

Improving the Herd

The first exhibit, consisting of three animals, shown in Fig. 1, pointed out how production may be improved through proper breeding. In Montana there are many farmers who do not realize the importance of developing good, profitable herds, through the selection of good herd sires. Others make the mistake of switching from sires of one breed to those of another, in the hope of developing an animal with all of the good qualities and none of the poor ones of the various breeds used. Contrary to their expectation an inferior animal is produced. In fact, the system of switching from herd sires of one breed to that of another breed is the formula for producing scrubs.

Brindle, the first cow of this exhibit, is a scrub, the result of mixing breeds. She was mated to a purebred Holstein bull. Through this mating Betty, the second generation cow was produced. Betty, in turn was mated with another purebred Holstein bull, and as a result Betty-Lou, (the third generation cow) was
Fig. 1. Three generations of improvement. The grand-dam at the top, the dam in the middle and the daughter at the bottom.
produced. The pictures and the following table tell the story.

### Year's Record

<table>
<thead>
<tr>
<th></th>
<th>Lbs. Milk</th>
<th>Lbs. Fat</th>
<th>Val. of Prod.</th>
<th>Cost of Feed</th>
<th>Returns Above Cost of Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Gen.</td>
<td>63-420</td>
<td>215.6</td>
<td>$86.24</td>
<td>$61.87</td>
<td>$ 24.97</td>
</tr>
<tr>
<td>Second Gen.</td>
<td>130-120</td>
<td>468.4</td>
<td>187.36</td>
<td>78.50</td>
<td>108.86</td>
</tr>
<tr>
<td>Third Gen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betty-Lou</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Sires Dam produced | 17701.9 lbs. milk | 811.4 lbs. butterfat |

The table shows what may be accomplished in a few years if the herd sire is carefully selected.

In some communities of the state less than 25 per cent of the farmers use purebred sires of known high-producing ancestry. As a result very little if any improvement is made in the herds.

### Two Pedigrees

The second exhibit illustrates the difference in type and breeding between a good purebred sire and a scrub bull. The good purebred sire, as noted by his pedigree given below, has a long line of high-producing ancestry. He also has the conformation and characteristics of a good dairy sire:

#### A Herd Improver

**Pedigree of purebred Guernsey bull**

- **Name**: Betty's Excelsior of Bitter Root
- **Excelsior Don of Bitter Root**
- **Searchlight Betty of Bitter Root**
- **Sires Dam produced**: 17701.9 lbs. milk, 811.4 lbs. butterfat

- **Excelsior of Crystal Springs**
  - Bro. to Craigmoor G. M.
  - whose 6 daughters aver. 388 lbs. butterfat

- **Von Don Silas**
  - Milk 10979.7 lbs.
  - Butterfat 503.6 lbs.

- **May Rose Searchlight**
  - Sire of 6 A. R. O. Daughters
  - One producing 736.2 lbs. butterfat.

- **May Rose Alice of O'Klare**
  - Sister to Beauty of Ingoldsby
  - 614.0 lbs. butterfat.
As a rule no information is available relative to the ancestry of the scrub bull. The following would be an appropriate pedigree:

**Scrub Bull**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortgage Maker</strong></td>
<td>Brown Bull sold for bologna for $39.42, when 3 yrs. old.</td>
</tr>
<tr>
<td><strong>Fence Jumper</strong></td>
<td>? ? ? ?</td>
</tr>
</tbody>
</table>

**Stray Bull**

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Doe’s White Cow</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raised her calf well</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>George Ives</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Killed on public highway by a good dairyman</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daisy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Record:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produced coffee cream for a family of four</td>
</tr>
</tbody>
</table>

The old law in nature that “like begets like” applies to the breeding of dairy cattle as well as to all other forms of plant and animal life. The kind of bulls the farmers are using today will determine the kinds of cows they will milk a few years hence.

Life is too short to waste it on milking scrub cows when high grades may be produced at approximately the same cost. Good purebred bulls for heading grade herds may now be obtained from Montana breeders at a very nominal price. In selecting a herd sire the buyer should ask for a copy of the pedigree. This should be carefully studied to learn the production of the ancestors. If the buyer is not familiar with pedigrees he should obtain the advice of someone who has had training or experience in this matter.

**Breeding too Early**

Thousands of well bred dairy heifers are ruined annually in Montana by improper feeding and too early breeding. This is one of the greatest mistakes made by dairymen.

The fourth exhibit, Fig. 2, showed a grade Holstein cow that will be three years old this fall that was seriously stunned due to
early breeding and improper management during her growing period. She weighs only 690 pounds (about 200 pounds less than Betty-Lou, the seventeen months old heifer in the preceding exhibit). Cows stunned in this way have a very limited capacity for food and generally lack vitality. Note the narrow, shallow chest; long, slim neck, and narrow, weak-appearing head, characteristic of animals injured in this way. Cows thus stunned will never pro-

duce as much butterfat as they would, had they been properly fed and managed. The heavy producing cow must be well fed and developed from the time she is dropped until maturity. Good breeding and proper feeding must go hand in hand to make a success with dairy cows. The man who is having difficulty in raising dairy calves will do well to consult his neighbors who are successful or obtain information on raising dairy calves, from their county agents or from the Montana Extension Service, Bozeman.

Well grown and well fed dairy heifers may be bred so as to drop their first calves according to the following schedule: Jerseys and Guernseys, 24 to 27 months; Ayrshires, 25 to 28 months;
and Holsteins, Brown Swiss and Milking Shorthorns, 27 to 30 months.

To make the best cows, dairy heifers should be fed so as to keep them growing steadily until they are matured. Shortly before freshening they should be fed so that they will be in best physical condition, carrying considerable flesh.

For Milk and Beef

On many of the dry land farms of Montana, feed, water and natural conditions are not favorable to the highly specialized dairy cow. On these farms milk is needed in the home, while the income of cream adds materially in keeping down the expense of operating the farm. The skim milk from the dairy is also a big asset in the raising of pigs and the feeding of poultry. On these farms the dual-purpose type of cattle are in demand. This type of cattle will not produce the best type of steers nor are they equal to the dairy bred cattle for the production of butterfat.

The fifth exhibit was the Milking Shorthorn cow, sometimes called the dual-purpose Shorthorn. The cow in this exhibit is Rockrose Clarice, owned by Dwight Smith & Son of Bozeman, Montana. She is a cow which carries considerable beef along the back, over the rump, and in the thigh. She is also a cow which has made a good record at the pail by producing 264 pounds of butterfat at two years of age. (See Fig. 3.)

Fig. 3. A good milking Shorthorn cow has a place on many Montana farms.
Care should be exercised in selecting a herd sire of this breed as both milk and beef is sought after in the same cattle. Sires should be bought only from those breeders who are actually breeding dual-purpose cattle and where the owner milks his own cows, and keeps a record of the production. Unfortunately, farmers frequently buy what they suppose is a dual-purpose sire, and later find they have an inferior bull, of the beef breed.

BEEF CATTLE

The animals in the beef cattle exhibit were selected for the purpose of demonstrating the improvements that may be expected by following certain definite rules of good management and through the use of good bulls. It is not contended that Montana in general produces inferior cattle, for it is well known that the stock that comes from the ranges of this state has a high reputation on the markets. But even with a full recognition of this fact there is still room for improvement and the exhibits were prepared to stimulate such improvement.

A Good Pure Bred Bull

The good purebred Hereford bull exhibited on the train was loaned by L. L. Chatterton of Spion Kop, Montana. As evidence
of this bull's good qualities, he placed first in his class at the Lewistown, Billings and Bozeman fairs in the fall of 1928. Although he is a better bull than will ordinarily be turned on the range he is above criticism for the purpose of illustrating the type of range bull most desired. Such a bull is needed in the grading up process which enables the producer of beef cattle to develop a breeding herd of high grades that closely approach pure bred cattle in their utility value. Beginning with a range herd of common cows successive crosses of pure bred beef bulls will show the following results.

<table>
<thead>
<tr>
<th>Crosses with purebred sires</th>
<th>Per Cent Pure</th>
</tr>
</thead>
<tbody>
<tr>
<td>First cross</td>
<td>50</td>
</tr>
<tr>
<td>Second crosses</td>
<td>75</td>
</tr>
<tr>
<td>Third crosses</td>
<td>87.5</td>
</tr>
<tr>
<td>Fourth crosses</td>
<td>93.75</td>
</tr>
<tr>
<td>Fifth crosses</td>
<td>96.875</td>
</tr>
<tr>
<td>Sixth crosses</td>
<td>98.4375</td>
</tr>
</tbody>
</table>

Range bulls should be selected with care. It is often said that “the bull is half the herd,” and someone has added the equally true statement that “an inferior bull is all of the herd.” The U. S. Department of Agriculture estimates that there are nearly 250,000 farms producing beef cattle which use grade and scrub bulls. In breeding all kinds of farm live stock the offspring is expected to be better than the dam, and the sire is relied upon to bring about this improvement. In breeding beef cattle for the market, it is well to have good cows, but it is an absolute essential to have a good bull. He must be a good individual, he must be pure bred, and he should come from a good line of ancestry. These three points are guarantees as to his breeding ability. (Fig. 4.)

Three Generations of Improvement

The improvement which may be made in a beef herd by the use of good bulls was demonstrated in the exhibit of two Hereford cows and a calf representing three successive generations of breeding. These Herefords were loaned to the college for this purpose by Ernest Monforton from his Gallatin Gateway Ranch. They are shown in Fig. 5.

The old cow, representing the first generation or original cow is rangy, a little too high from the ground, and has a plain
rump and head. This cow was mated to a good pure bred bull and her heifer shows a marked improvement, being more blocky and having a greater depth and width of body, more flesh, and a shorter head and neck than the old cow. The improvement shown by this heifer is quite typical of what may be expected when the right bull is used. All of the first cross heifers in the herd from which this animal was selected were of a better type than their dams. The calf from this heifer, representing the third generation, is a real beef type calf, showing about the same relative improvement over the heifer as the heifer shows over her dam.

**Market Grades of Feeder Steers**

Feeder steers are graded for market as fancy, choice, good, medium and common. Only three grades—fancy, good and common—were exhibited on the train and two of these—fancy and common—are shown in Fig. 6. These steers are exhibited to show the increased value of cattle of good breeding as compared to those of average or inferior breeding, and should not be interpreted as a recommendation for the sale of yearling feeders for out-of-the-state fattening.
A fancy selected feeder is well described as being short legged, broad, deep, with straight even lines, short neck and short, broad and clean-cut head. The animal exhibited on the train to illustrate this grade is practically above criticism, possessing the best form, quality, constitution and fleshing. He is a yearling Shorthorn weighing about 800 pounds.

The steer exhibited to represent the good grade of feeder steer lacks the blocky type and smoothness of form possessed by the top steer, but is typical of this grade.

The common steer shown on the train, although practically of the same age as the Fancy feeder, weighed only about 560 pounds. This steer is a narrow, rangy animal that will never grade very high when finished for market. Assuming that these two steers have each consumed an equal amount of feed, one has cost about as much to produce as another, but there is a great difference in their present value. The owner of the fancy selected feeder has made more economical use of his hay and pasture by marketing it through a well bred animal than has the owner of the inferior steer.
The following telegram shows the market prices for feeder steers on Monday market October 2, 1928: "Fancy Select yearling 13½ to 14 Good yearling 12 to 13 Medium 10¾ to 11¾ Common 8½ to 10¾."

Thus the fancy steer is worth about five cents per pound more than the common steer. Assuming that the yearling steers in this exhibit each weigh 750 pounds, the top steer would be worth $37.50 more than the common one. This extra value is due almost entirely to the better breeding of the fancy select feeder. It pays to use good bulls.

**Breeding too Young**

To show the effects of breeding heifers too young, there was shown a two-year-old heifer weighing 560 pounds with her 5 months old calf weighing 260 pounds (Fig. 7.) The heifer was raised well, from the standpoint of feeding, and her small size and stunted condition is due largely to having been bred as a short yearling.

![Fig. 7. An under-sized, poorly developed heifer and her calf. The effect of too early breeding.](image-url)
Too early breeding stunts the heifers, and the calves that are produced from this early breeding are under-sized and lack vitality. When heifers are to calve as two-year-olds they require additional care and feed and there also is more loss at calving time. For comparison, there also was shown a heifer bred as a two-year-old, weighing 1050 pounds. Her calf weighed an even 400 pounds although of the same age as the calf from the heifer bred too young.

Montana range cattlemen are agreed that heifers should not be bred until they are two-year-olds but find it difficult to carry out this practice. Some range cattlemen, however, have found it profitable to run their yearling heifers in separate pastures where they can be kept away from the bull during this growing period.

HOGS

The hog exhibit for the Better Livestock Train was planned with two purposes in mind, first, to show modern types of breeding hogs, and second, to show some of the results of feeding trials carried on at the Experiment Station at Bozeman this summer.

Fig. 8.—A good Duroc-Jersey boar at left and a desirable type of gilt at right.

The hogs selected for the train represent a practical type for the production of market pigs. They are not of the extreme length and stretch desired by many of the pure bred breeders at this time.

In raising hogs the tendency is for them to “shorten up” and become so chunky that the sows produce small litters. When put in the feed lot the pigs from such sows become fat before they reach the most desirable market weight of around 200 pounds.
Thus, pure bred breeders select and raise hogs with more length to be able to furnish desirable breeding stock to the commercial hog man.

Montana is not one of the leading hog producing states but a few hogs are desirable on the farm to take care of feed and by-products which otherwise would be wasted.

**Useful Types**

The boar shown on the train is a Duroc March pig weighing about 250 pounds, has medium length, a strong back, is smooth and free from wrinkles and coarseness in the shoulders, and has strong feet and legs. He also shows masculinity with quality. Somewhat more length of body in the boar would be desirable. He is shown at the left in Fig. 8.

**The Gilt**

The gilt shown at the right in Fig. 8 is of the same general type as the boar. He is a desirable type for producing market pigs.

All of the hogs on the train are of one breed, but it should be clearly understood that the College does not recommend one breed of livestock over another.

**Feeding Trials**

Trials carried on during the past summer by Louis Vinke of

![Fig. 9. A poor pig at the left and a good gilt at the right.](image)
To show the results of these trials there was exhibited on the train a pig to represent the average of each lot of fifteen pigs used in these feeding trials. The pigs selected for the dry lots all weighed about 50 pounds when they started on the trials two months before the train started.

Both pigs weighed 50 pounds at the start of the trial. Sixty days later, No. 1, fed barley alone in a dry lot, weighed 92 pounds. His gain cost 11 cents per pound. No. 2 was fed wheat and tankage and 60 days later weighed 140 pounds. His gain cost 7 cents per pound.

**Dry Lot Feeding**

The results of the dry lot feeding trials were shown on the train by three pigs. They were all of about the same weight (50 pounds) at the beginning of the test. The pig that was fed straight barley weighed only 92 pounds at the end of the trial and his gain cost 11 cents per pound. The pig that was fed barley and tankage weighed 130 pounds and his gain cost 7 cents per pound. The pig that was fed wheat and tankage weighed 140 pounds and his gain cost 7 cents per pound. The grain for these trials cost $150 per hundred and the tankage cost $4.00 per hundred.

It requires about 700 pounds of straight barley to produce 100 pounds of pork and only 436 pounds of barley when 30 pounds of tankage is fed in addition. In the wheat and tankage trial 390 pounds of wheat and 30 pounds of tankage produced 100 pounds of gain.

Besides the difference in weights of the three pigs there is a marked difference in their appearance. The pig fed on straight barley developed into a “runty” individual and is the picture of poor management, while the pig fed on wheat and tankage shows more “bloom” and condition than the pig fed on barley and tankage.

All of the pigs in the feeding trials were fed from self feeders and had access to all of the grain they desired at all times. The lots that were fed tankage had the “free-choice” of either wheat or tankage from self-feeders in one lot and barley in the other
lot. An interesting fact is that each lot of pigs ate exactly the same amount of tankage in proportion to the amount of grain.

When pigs are to be fed in a dry lot or in the winter time when pasture is not available, tankage mixed with either wheat or barley, at the rate of about eight pounds of tankage to 100 pounds of grain, produces more economical gain than straight grain. Skim milk is always a valuable supplementary feed for hogs and may be substituted for tankage.

**Pasture and Grain**

To compare with the three pigs representing the dry lot tests, the exhibits also showed a pig representing the pasture trial where 1 1/2 pounds of barley was fed daily to pigs on good alfalfa pasture. This pasture pig made gains at the rate of 1/2 pound per day at a cost of 4 1/2 cents per pound for grain; as compared with 11 cents per pound gain for the pig fed on straight barley in the dry lot, and about seven cents per pound for the pigs on either wheat and tankage or barley and tankage in dry lots.

Alfalfa is recommended as the best pasture for pigs in irrigated sections and sweet clover for dry land.
SHEEP

Six points were illustrated by the sheep on the livestock train: 1, Size of fine wool range ewes as a factor in production; 2, Grading up fine wool ewes in wool production; 3, Hampshire versus Rambouillet rams as sires of market lambs from grade fine wool ewes; 4, The Lincoln x Rambouillet cross-bred sheep; 5, Hampshire ram lamb, and 6, Types of Rambouillet ram lambs.

The figures and information presented in connection with the sheep exhibit are from the records of Dr. W. E. Joseph in charge of sheep investigations for the Montana Experiment Station, except as otherwise noted.

Size of Fine Wool Ewes

Two seven-year-old ewes were included in the exhibit and are shown in Fig. 11. Both have produced seven fleeces and six lamb crops. The small ewe has raised six lambs and the the larger ewe nine lambs.

The ewe at the left weighs 144 pounds in mid-winter form. Average weight of seven fleeces was 10.4 pounds and of six lamb crops, 105 pounds. The ewe at the right weighs 104 pounds. Average weight of seven fleeces was 6.8 pounds and of six lamb crops, 66 pounds.

The weights and cash values of the average wool and lamb crops from 131 ewes of different weights that raised five lamb crops and produced six fleeces were as follows (wool @ 40c and lambs @ 11c):

<table>
<thead>
<tr>
<th>Weights of ewes</th>
<th>Average lamb crop lbs.</th>
<th>Average wool clip lbs.</th>
<th>Value of av. lamb crop &amp; av. wool clip</th>
</tr>
</thead>
<tbody>
<tr>
<td>34 ewes 105 or less</td>
<td>76</td>
<td>8.5</td>
<td>$11.76</td>
</tr>
<tr>
<td>63 ewes 110 - 120</td>
<td>85</td>
<td>8.6</td>
<td>12.79</td>
</tr>
<tr>
<td>34 ewes 125 or over</td>
<td>89</td>
<td>9.0</td>
<td>13.39</td>
</tr>
</tbody>
</table>

Grading Up Fine Wool Ewes

Three generations of ewes are shown in Fig. 12. The ewe at the right is the grand-dam, the ewe in the center the dam, and the ewe at the left the daughter. Their respective wool clips to date are 7.7, 10.2 and 11.2 pounds. The respective weights in mid-winter form are 126, 137 and 142 pounds. The lamb crops averaged 89, 96 and 71 pounds. The ages are 7, 4 and 2 years.
Fig. 11. Two ewes, illustrating the relation of production to size. The one at the left weighs 144 pounds, the one at the right, 105 pounds.

A rather striking increase in wool production was obtained by the use of good rams. The grand-daughter yielded a 14-pound fleece in 1928 and she promises an average fleece over a period of years well above 12 pounds. This improvement is somewhat more striking than can be expected in the average band, but results available at present indicate that an average increase of

Fig. 12. Three generations of improvement through the use of a good buck,
a half pound per fleece may be obtained by the exercise of care in the selection of rams for mating with fine wool ewes that are well up to the average in wool production.

**Hampshire Versus Rambouillet Rams**

Four years results comparing Hampshire and Rambouillet rams as sires of market lambs indicate that, on high mountain range where feed is abundant, good in variety, and fresh during most of the season, the Hampshire x fine wool lambs come off the range heavier by 6 to 10 pounds per lamb and higher in condition than the straight fine wool lambs.

Limited results indicate that on foothill or low mountain range that dries up early in the season and that contains little variety of feed, the difference in weight and condition of the two types of lambs is practically negligible.

At the left in Fig. 13 is illustrated a fine wool lamb which weighed 88 pounds when taken off the range. At the right is a Hampshire x fine wool lamb which weighed 97 pounds when taken.
off the range, both weights following a 12 hour shrink. This represents approximately the relations in average weights of lambs of the two types out of similar ewes and run in the same band on high mountain range. The difference in condition is equally marked. On foothill range with little variety of feed the differences were almost negligible. Both are about five months old.

The Hampshire x fine wool ewe lamb was grown by the Experiment Station but is now owned by John Fechter, Bozeman, Montana.

**Lincoln x Fine Wool**

A Lincoln x Rambouillet ewe and a Lincoln x fine wool ewe lamb were included in the exhibit because of the interest in this type of sheep. They were loaned by O. A. Schulz and Son of Sheridan, Montana.

The type of sheep shown in Fig. 14 is produced by crossing

![Fig. 14. A cross-bred ewe—Lincoln x Rambouillet. This cross produces good mutton lambs that do well on the range. The wool is quarter or three-eighths blood but fleeces are often uneven.](image-url)
a Lincoln ram and a grade Rambouillet ewe. This type produces quarter and three-eighths blood wool. Their fleeces are fairly heavy but are often uneven. Their lamb production is good. They are profitable on good summer range for producing mutton lambs.

**Hampshire Ram Lamb**

The Hampshire ram lamb from the flock owned by Montana State College exhibited on the train illustrated a desirable type of a lamb of his breed. He is shown in Fig. 15. At the age of 221 days his weight was 136 pounds. He is an excellent type of Hampshire ram lamb, crossed with fine wool range ewes. This type of ram produces a heavier, fatter lamb than the straight fine wool lamb provided the summer feed conditions are very favorable. On dry summer feed the difference is almost negligible.

Fig. 15. A desirable type of Hampshire ram lamb. Weighed 136 pounds when 221 days old.
Rambouillet Ram Lambs

Three Rambouillet ram lambs from the flock owned by Montana State College were shown to illustrate types of this breed of sheep. They were used for demonstration by a team of 4-H Club boys. The boys and two of the lambs are shown in Fig. 16.

Fig. 16. 4-H Club boys demonstrating ram selection.
The Feed Car Exhibits

The nine exhibits in the feed car were intended to supplement the livestock demonstrations shown on the flat car. These included a wool exhibit showing grades and factors which affect market prices for wool; a display calling attention to the value of wheat as a feed for livestock; another giving information on pastures; one on practical methods for wintering beef cows; an exhibit illustrating the use of grain hays; one dealing with alfalfa and sweet clover; one showing the different native grasses; one illustrating the value of sweet clover as a feed for dairy cows; and one indicating the value of rye for fattening hogs.

The following illustrations are reproductions of some of the brief messages which were printed on large cards above the exhibits to bring home certain important points to those who passed through the feed car. There also is included brief discussions of the principles brought out by the exhibits.

THE WOOL EXHIBIT

The wool exhibit shown on the train was assembled by the Montana Wool Growers Association. It was intended to show the various market grades of wool and some of the common defects in fleeces which affect prices.

Small samples of wool were on exhibit showing the numerical wool grades used in England and other countries and the corresponding trade names for the various grades used in the United States. In the United States the highest grade is known as “Fine” and is marked at 64’s, 70’s and 80’s in the numerical system; half blood wools are known as 58’s and 60’s; three-eighths blood as 56’s; quarter blood as 46’s and 50’s; low quarter blood as 46’s; common as 44’s, and braid as 36’s and 40’s.

The exhibit also showed fleeces of fine wool, half blood, three-eighths blood and quarter blood of both the staple and clothing grades. It was explained that staple or the longer fibred wool also is known as combing wool. Clothing is the shorter fibred wool. The quarter blood clothing fleece exhibited also illustrated a “break” or weak spot in the fibre which is sometimes caused by a period of severe weather, scarcity of feed or other condition which may adversely affect wool growth.
The exhibit also brought out the damage caused by the use of hard drying paints for marking fleeces. Such paints cannot be removed in the scouring process and therefore reduce the market value of the wool. Scoured and unscoured tags were shown to illustrate the need for tagging sheep before shearing and for keeping clean and unstained wool separate. The exhibit also showed light and heavy shrinking fleeces, both scoured and in the grease.

**FEEDING WHEAT TO LIVESTOCK**

With the present price of wheat many livestock men are confronted with the question of whether to feed or to sell wheat. The answer depends entirely on the market value.

Trials conducted last winter at Bozeman by Louis Vinke of the livestock department of the Montana Experiment Station proved that frosted wheat is an excellent feed for fattening yearling steers when fed with alfalfa hay. The important features of these trials are given here to show the results from feeding frosted wheat alone, barley alone, and a 50-50 mixture of the two grains.

![Fig. 17. Wheat is a good feed for hogs, sheep and cattle.](image)
It must be remembered that the results given are based upon last year's prices of livestock. Prices, of course, vary from year to year and within a given year, and price changes must be considered when deciding which feed should be used.

The frosted wheat used in the feeding trials was rejected at the local elevator because it had no value for milling purposes. It weighed 55 pounds to the bushel, was badly shrunken and of very poor appearance. Frosted wheat in these trials surpassed hulled barley in gains, economy of gains, in finish and in profit in fattening yearling steers.

Prices Received for Steers

According to the results obtained at the Experiment Station, if alfalfa hay is estimated at $10.00 per ton the steers fed barley and frosted wheat returned $2.59 for each 100 pounds of grain; those fed frosted wheat alone returned $2.87 per 100 pounds of grain; and those fed barley alone returned $2.43 per 100 pounds of grain. Figuring grain at $1.50 per 100 pounds the steers fed barley and wheat returned $30.10 for each ton of hay; those fed frosted wheat alone returned $35.58 per ton of hay; and those fed barley alone returned $27.00 per ton of hay.

For further information on these trials write to Montana State College for special circular No. 1, Animal Husbandry Department, "Experimental Results with Fattening Steers."

Results of experiments in feeding wheat screenings to lambs at the Miles City Range Station show that if the screenings are worth $1.00 per 100 pounds, alfalfa hay returned $18 per ton. This trial was conducted on 300 lambs over a three-year period.

Fig. 17 shows the relative value of wheat as a feed for the different classes of livestock.

PERMANENT PASTURES PAY

Many stockmen and dairymen must provide suitable summer pasture since irrigated valleys and adjacent uplands often do not supply sufficient feed through the summer months. The use of relatively high priced irrigated land for pasture purposes can be justified only when that pasture has a high carrying capacity. Often pasture land that is unfit for the growing of crops is not available so that it becomes necessary to use highly productive
land for this purpose. The methods of establishing pastures of high carrying capacity deserve careful attention.

Prepare Seed Bed Carefully
Since pastures are usually intended to occupy a field for a number of years, and the cost of seeding is relatively high, it is important that much care be used in the preparation of the seed bed and in leveling the land for irrigation. Most grass seeds are slow in germinating and require a fine, firm seed bed.

When and How to Seed
Seeding in the spring without a nurse crop is probably the most certain method of getting a good stand. Seeding is best done with a grain drill set to run as shallow as possible. Even distribution of the seed is very important. The grass seed should be thoroughly mixed and seeded through the hopper of the drill while the clover should be seeded through the alfalfa seed attachment.

In late summer the grass may be seeded in the stubble, without disk ing or other preparation, as soon as the grain crop is removed, but the land should be irrigated immediately after seeding.

Proper irrigation is the most important factor in securing
a good pasture stand. Frequent and light irrigation is necessary to keep the soil well supplied with moisture since most grasses are shallow rooted and cannot use water stored at any great depth in the soil.

**Clipping to Control Weeds**

Frequent clipping may be needed to prevent weed growth. Do not overstock the pasture or allow it to be grazed too closely before the sod is well established. To secure the highest carrying capacity, pastures should be divided for alternate grazing and irrigation.

**Manure Increases Carrying Capacity**

Barnyard manure when applied at the close of the pasture season or during the winter months will help keep the pasture in a vigorous condition. Harrowing before the next season will help distribute the manure evenly and help mix it with the soil.

**Mixtures Produce Greater Returns**

The Huntley Experiment Station has developed a pasture mixture that has found great favor in irrigated sections of the state. It has a high carrying capacity and may be mixed at home. Seed can be purchased from state seed dealers.

The suggested Huntley Pasture mixture:

<table>
<thead>
<tr>
<th>Seed</th>
<th>Rate of Seeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth Brome Grass</td>
<td>3 to 4 pounds per acre</td>
</tr>
<tr>
<td>Kentucky Blue Grass</td>
<td>4 to 6 pounds per acre</td>
</tr>
<tr>
<td>Orchard Grass</td>
<td>4 to 6 pounds per acre</td>
</tr>
<tr>
<td>Meadow Fescue</td>
<td>3 to 4 pounds per acre</td>
</tr>
<tr>
<td>White Clover</td>
<td>1 to 2 pounds per acre</td>
</tr>
<tr>
<td>Alsike Clover</td>
<td>1 to 2 pounds per acre</td>
</tr>
</tbody>
</table>

Total...... 16 to 24 pounds per acre

The cost of seeding is usually from $3 to $6 per acre. For further information write to Montana State College at Bozeman for Bulletin 166, "Irrigated Pastures."

**SUBSTITUTES FOR SNOW BANKS**

Grain crops can be grown for hay purposes when the regular hay crop falls short of the tonnage necessary for the stock on
hand. Feed reserves cannot be over emphasized and should be
given careful consideration each year, so that there will be plenty
of hay on the ranch each winter. Grain hay can be used to good
advantage in years when the hay crop is short.

Oats, beardless barley, spring wheat and spring rye can be
utilized for hay purposes not only because they produce a good
tonnage but are high in feed value as well. These grains when
cut in the dough stage are very palatable as well as nutritious.

The Moccasin Station reports the following average yields
for 1922-1926 inclusive:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Rate of Seeding</th>
<th>Yield per Acre in lbs.</th>
<th>Lbs. of Protein Per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats</td>
<td>48 Pounds</td>
<td>4652</td>
<td>213.3</td>
</tr>
<tr>
<td>Barley</td>
<td>48</td>
<td>4397</td>
<td>211.0</td>
</tr>
<tr>
<td>Wheat</td>
<td>60</td>
<td>4450</td>
<td>178</td>
</tr>
</tbody>
</table>

Fig. 19. Grain hays are valuable.
The Havre Station reports the following yields for 1922-1926 inclusive:

<table>
<thead>
<tr>
<th>Crop</th>
<th>Yield Per Acre in Pounds</th>
<th>Pounds Protein per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats</td>
<td>2725</td>
<td>122.6</td>
</tr>
<tr>
<td>Barley</td>
<td>2309</td>
<td>110.8</td>
</tr>
<tr>
<td>Wheat</td>
<td>2454</td>
<td>98.08</td>
</tr>
</tbody>
</table>

**WINTERING BEEF COWS**

Many farmers and ranchers in Montana find it necessary to produce beef as a major enterprise, or as one of the main farm enterprises. Beef production enables the rancher to employ land best suited to grazing and to utilize in a profitable way the coarse and low grade roughages with a minimum amount of labor.

The success of a breeding herd of cows in this state is largely dependent upon the cost of winter maintenance. Experiments conducted to date indicate that there are only two requirements of a winter ration—to maintain the weight of the cows from year to year and to have them vigorous, strong and healthy at calving time.

The condition of the cows in the fall determines to a large extent the kind of ration necessary to maintain them in good flesh and to raise a strong calf. If the cows are in a fleshy and vigorous condition in the fall, winter feeds may consist of the cheapest roughage as fleshy cows can lose as much as 150 pounds during the winter without impairing their vigor or the size and quality of the offspring. On the other hand, if the cows go into the winter in a thin condition, feeds and rations must be selected that will produce enough gain in weight so that the cows will have plenty of strength at calving time and will maintain their weight from year to year.

**Use Home Grown Feeds**

The kind of ration in wintering beef cows is also dependent upon the kinds of feeds that are available. Home grown feeds, as far as possible, should be used. Cheap, unmarketable roughages should furnish the basis of every winter ration. Corn fodder, straw and, if necessary, the cheaper grades of hay can be used for this purpose.

Fleshy cows in good physical condition can be wintered on
barley or oat straw alone, if plenty of warm water and salt are provided.

Good corn fodder, free from mould, is a very satisfactory feed for wintering beef cows. Corn fodder grown in Montana is very palatable and cows will not leave any part of the plant when it is properly fed. An average daily feed of 20 pounds of corn fodder per head will more than maintain the weight of the cows. The substitution of straw for a part of the corn fodder will reduce the gain, but if the straw is plentiful and the supply of corn fodder is limited, straw may well be included in the ration.

Three year’s trials show that the addition of five pounds of mixed hay per head to a straw ration will result in lower winter losses in weight of cows that were in very good condition in the fall than when straw alone is fed. For an emergency feed either cottonseed cake or linseed cake is valuable as it can be easily transported, is highly nutritious and can be fed on the snow. Cottonseed cake can also be used in connection with winter grazing by feeding one to two pounds per head daily.

There appears no advantage from adding high protein feeds to winter rations, as far as the calf crop is concerned. It does not seem necessary to feed mature cows more than enough to maintain their weight from year to year.

Wintering Yearling Heifers

In wintering yearling heifers the object is to furnish enough feed of the right kind for good growth at the least possible cost. Such heifers can make use of much cheap roughages during the winter, but it is advisable to feed so that they will continue to grow at a satisfactory rate. In many range sections it has been a problem for the cattlemen to maintain sufficient size in the breeding herd. Liberal winter feeding of open yearling heifers will tend to maintain size. Water and salt always should be available.

Under Montana conditions hay and straw probably are the principle feeds used. Timothy, such as grown in the higher mountain valleys, is a fairly satisfactory feed. Both mixed alfalfa and timothy hay, and alsike clover are highly prized among stockmen for wintering yearlings. Bluejoint hay and alfalfa hay also are widely used.
HINTS ON HANDLING HAY

Hay crops are among the most important of crops yet are the most neglected and carelessly handled. The successful management of livestock depends not only upon sufficient hay tonnage to feed a given number, but also upon the kind and quality of hay. While it is true, of course, that the proper curing of hay is dependent upon weather conditions, a few principles should be kept in mind so that hay of the best possible quality will be available.

To be of good quality, hay must be cut at the right time and cured in the best possible manner. The principles of hay making are much the same for practically all hay crops. The crop must be cut at the stage of maturity that will give the highest yields and the most palatable hay. Hay should be cured in such a manner that it will be properly dried without loss of leaves or injury to color or quality due to weathering.

Legumes, like alfalfa and sweet clover, are the hardest hays to cure and still retain all of the desirable qualities. These hays have a large part of their feeding value stored up in the leaf. In curing every effort should be made to save the leaves.

Time of Cutting

The time of cutting alfalfa and sweet clover largely deter-
mines the amount of feed value in the hay. Alfalfa should be cut for hay when the plants are one-tenth in bloom or when the new shoots are one to two inches long. Cutting earlier than this reduces the vitality of the plants which results in thin stands. Cutting late means a hay of much lower feeding value. A good policy to use in determining the proper time to cut alfalfa for hay is to watch the bloom as a guide in dry weather and the new shoots when it is wet.

The best time for cutting sweet clover may be judged much the same as alfalfa except that the second growth does not come from the base of the plants. Sweet clover should be cut when the flower buds appear. Leave from six to eight inches of the plant standing to insure a good second cutting. Sweet clover matures very rapidly and becomes tough and woody in a very short time so that early cutting is very important.

Sweet clover hay cut at the right time has about the same feeding value as alfalfa. Many farmers find it practical to cut this crop for hay with a grain binder setting the bundles in a shock to cure. The outside of the bundle will weather somewhat, but on the inside the hay will be green with all the leaves attached. Sweet clover hay should always be fed with some other feed as it may cause thinning of the blood of the stock to which it is fed if used alone.

The leaves are the important part of both alfalfa and sweet clover hay. 100 pounds of alfalfa leaves contain as much protein as 240 pounds of the stems. The leaves comprise about 75 percent of the protein of the entire plant. Do not allow the leaves to be exposed to the sunlight for a very long period as they dry rapidly and become brittle. In handling in this condition much shattering of leaves results.

Do not allow the alfalfa to lay in the swath after the plant has wilted. Finish curing in the windrow or bunch.

NATIVE GRASS

In most parts of Montana 15 to 30 acres of native grass are required per cow, while in some sections as high as 70 acres are necessary. The number of cattle any rancher should have depends on the carrying capacity of the range or pasture that he can control and the feed that is available for winter feeding.

In many parts of the state the range has been depleted by
over-grazing. This practice weakens or kills out many desirable plants, and allows undesirable plants to come in. Natural revegetation may be brought about by deferring grazing in the spring until after the grass has made a good start or has produced seed. Often this depends largely on the amount of home grown feed available as stock often must be kept on winter feed until later in the spring if deferred grazing is to be practiced.

**Divide the Range**

A good practice is to allow one or two pastures to mature while the others are being grazed if the desired divisions of the range may be made without too great cost for fencing. Later, when the stock is placed on the grass that has matured, very little loss of feed or forage will result and the seed will be tramped into the ground.

It will take several successive seasons of deferred grazing to establish strong new plants. After one area has been protected

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**Fig. 21.** The best native grasses are destroyed by over-grazing—save them.
long enough to establish it thoroughly, other areas may be treated similarly until the entire holding is built up. Many ranchers have large piles of manure around the buildings that could be used to increase the carrying capacity of pastures close to the buildings. Grasses are very shallow rooted and need new plant food and moisture close to the surface of the soil. The manure should be added in the late fall and winter months so that the spring rains will wash the plant food into the soil.

**SWEET CLOVER**

Sweet clover has proved itself to be a forage crop of economic importance to the dry lands of Montana.

Farmers of the northern great plains have found that the many desirable qualities of sweet clover can be used to a profit-

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**SWEET CLOVER**

*A good crop for a Dryland Farm*

- Suitable
- Dependable
- Valuable

- Cut Sweet Clover early for good hay
- High protein pasture
- Piling Humus into soils that blow

*Watch stock closely on sweet clover pasture during June and July and in wet years for bloat. Be sure to feed other feed with sweet clover hay.*

Fig. 22. Sweet clover fills an important place on the dry land farm.able advantage in their farming system. Being a biennial (two-year) crop it fits into rotations either on a straight wheat farm or those with wheat and livestock combinations.

**As a Pasture**

Sweet clover is particularly valuable as a pasture crop because
of its vigorous habit of growth and ability to grow on almost any soil of this state. It makes excellent pasturage under dry conditions. However, livestock on sweet clover pasture should be watched closely during June and July in sections where bloat occurs, particularly in wet years. Some sections, such as the Judith Basin and Teton County, report losses from bloat, while in northern counties very slight losses are reported. Mixtures of grasses with sweet clover are being tried out in areas where bloat losses are most serious in an effort to reduce the hazard.

**As a Soil Builder**

The large fleshy roots of sweet clover penetrate the soil to a considerable depth and decay very rapidly, thus adding a great deal of humus to the soil. This factor is particularly important to the wheat farmers and can be used to a good advantage where soils are subject to blowing. The increasing practice of stubble burning will hasten the time when organic matter is needed in the soil to prevent blowing.

Sweet clover also adds nitrogen to the soil, another important item for the wheat grower, since soils high in nitrogen usually grow wheat of a high protein content.

**As a Hay Crop**

Sweet clover also can be used for hay provided it is cut at the proper time. Cutting with a binder at the time the first blossom appears will give an excellent quality of hay that compares favorably in feeding value with alfalfa. The plant becomes more woody as it comes into bloom. Six or eight inches of stubble should be left so as to insure a good second crop. Other feeds should be fed with sweet clover to prevent trouble from blood thinning. Those desiring further information on the growing of sweet clover should write to the Montana Experiment Station, Bozeman, for circulars 62 and 118.

**FEED RYE FOR CHEAP PORK**

Rye is a relatively important crop in some of the semi-arid districts of Montana because it is a good “rough and tumble” crop. It is quite generally adapted to the plains area of this state as it withstands dry growing conditions fairly well. It can be stubbled in at a low cost per acre, aids in distributing labor and divides crop risks.
Experimental tests at the Havre Branch Station show that Montana grown rye can be used satisfactorily for fattening pigs for market.

Rye, supplemented with alfalfa hay, will give very economical gains; but mixtures of barley and rye supplemented with alfalfa hay will give more rapid gains and a higher finish than where rye only is used.

The economy of gains will vary with the percentage of barley used in the ration. That is, the feed required to produce one pound of gain decreases as the amount of rye in the ration is increased, when fed with good quality alfalfa hay.

Four hundred and eleven pounds of rye and 41 pounds of alfalfa will produce 100 pounds of gain, while it requires 444 pounds of barley and 83 pounds of alfalfa hay to produce 100 pounds of gain. However, hogs can be finished in eight per cent less time when fed equal parts of rye and barley. Bulletin No. 192, entitled “Fattening Pigs with Rye,” tells of the experiments on feeding rye to pigs and can be secured from the Montana Experiment Station, Bozeman.