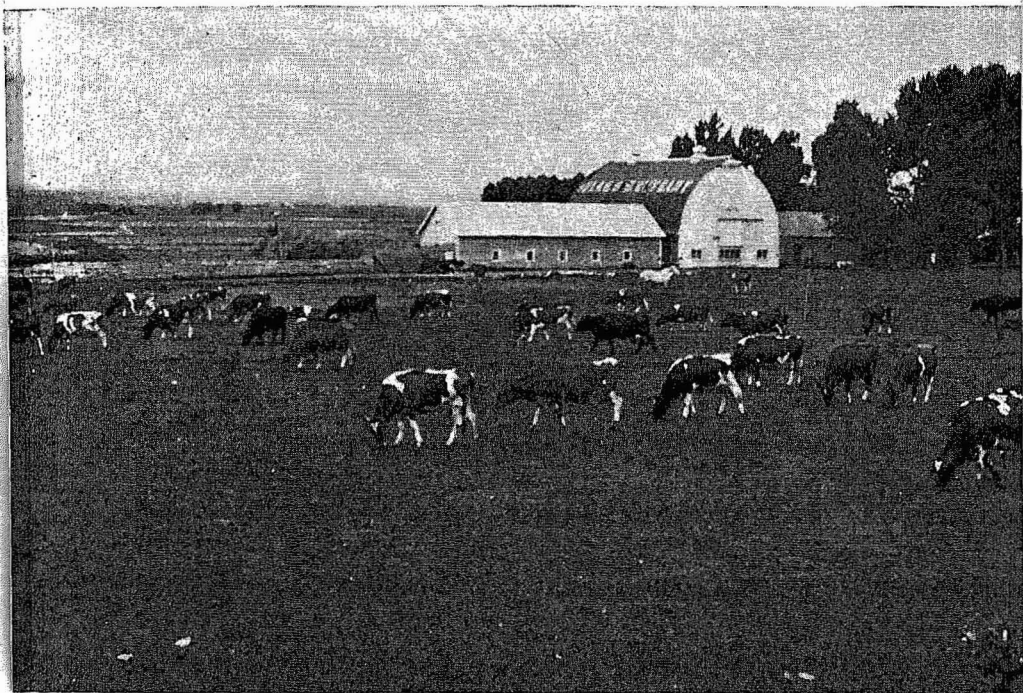


Irrigated Pastures In Montana

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Pasture Pointers

1. Livestock is necessary on irrigated farms and good pastures are essential for successful livestock production.
2. An acre of good irrigated pasture when grazed by productive dairy cows, will produce from 150 to 250 pounds of butterfat.
3. Good pastures are equally valuable for horses, beef cattle and sheep.
4. Even the best land on the farm can be used profitably for irrigated pasture.
5. In determining the size of pasture required figure one and one-half to two animal units per acre.
6. Level the field carefully so that it may be properly and easily irrigated.
7. It is advisable to use only the best grade of adapted seed.
8. Seed shallowly with a grain drill on a clean, moist and firm seed bed.
9. Pastures should not be grazed the first season and only lightly the second season until a good sod is established.
10. Frequent light irrigations will insure a good stand, rapid growth and high carrying capacity.
11. Do not turn stock on pasture too early in the spring and avoid close grazing.
12. Best results are obtained by alternate grazing and irrigation of pastures.

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Livestock are necessary for a permanent and successful agriculture on the irrigated farms of Montana. They provide a practical means for marketing feed crops and furnish profitable employment. The manure from livestock also is an important factor in maintaining the productive capacity of the soil. Livestock, however, cannot be kept profitably unless the farm has an abundance of cheap grass pasture. Information on how to secure the best results from Montana irrigated pastures is presented in this circular.

The irrigated lands of Montana have rich soils which are nearly ideal for pasture grasses and legumes. When sufficient irrigation water is available, to keep the grass green and succulent throughout the grazing season, a very high carrying capacity is obtained. Long days of almost continuous sunshine favor the production of high yields of nutritious forage.

Almost every farm has some land which is suitable only for pasture. Generally such land has soil that is shallow, stony, low in natural fertility, or too rough for proper irrigation. If such areas do not provide adequate grazing for all the livestock which logically should be kept on the farm, then good tillable land may be used to increase the pasture acreage.

Advantage of Irrigated Pastures

While an irrigated pasture makes it possible to keep more livestock and thus adopt a more diversified and permanent type of farming, there are other advantages to be derived.

Livestock Does Better: It is a recognized fact that cattle grow faster, pigs and sheep make greater gains and dairy cows produce more butterfat when grazing on good succulent pasture than when fed on dry feeds. No class of feeds will keep the animals as thrifty as will a good mixture of grasses and legumes. Irrigated pasture grass is rich in the proteins, supplies the minerals and vitamins essential for normal growth and good health.

Green grass not only is Nature's best feed for livestock but it also is the cheapest, so the best land on the farm may be used to advantage for the irrigated pasture and will return substantial profits if properly managed.

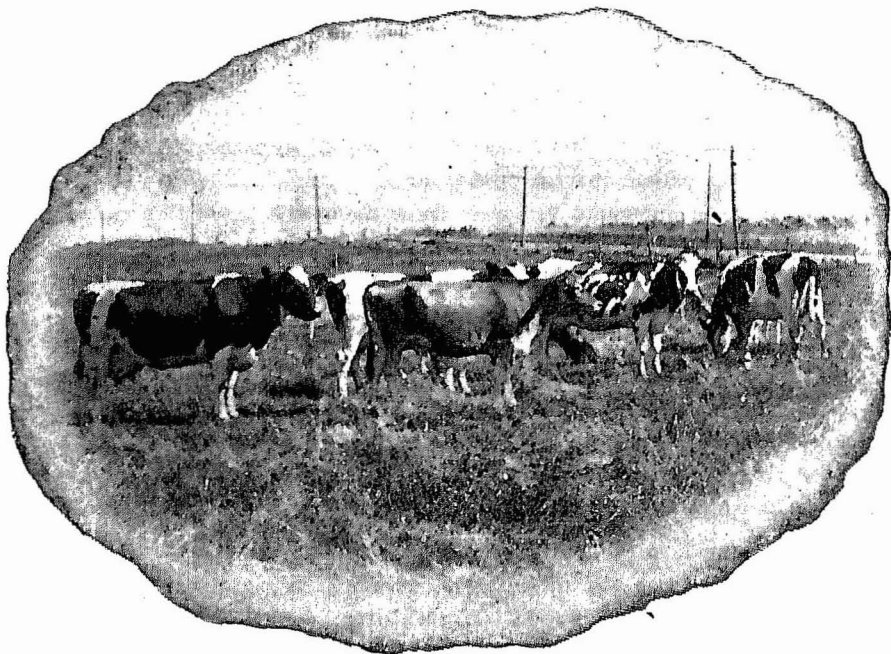


Fig. 1—A good pasture provides the cheapest dairy feed.

Economical Feed for Dairy Cattle: Experiments conducted at the Branch station near Huntley, since 1913 and at the Montana Agricultural Experiment station at Bozeman show that good land devoted to irrigated pasture, when properly managed, will return a net profit fully equal to that of many other common irrigated crops. It has been found that a good irrigated pasture will carry from $1\frac{1}{2}$ to 2 or more good dairy cows per acre for 4 to $4\frac{1}{2}$ months and that the production of butterfat will be from 150 to 250 pounds or more per acre.

The experienced dairyman has found that a good irrigated pasture, properly managed, will prolong the flush milk season, and that little if any grain feeding is necessary. Records of the Yellowstone Dairy Herd Improvement association, covering a 3-year period, show that members, who had good pasture for their cows, had a return above cost of feed, of \$24.65 per cow greater than their neighbors who had little if any pasture. This difference in returns was due largely to the saving of grain and dry roughage. Since a good irrigated pasture will carry $1\frac{1}{2}$ to 2 or more cows per acre the gross cash return amounted to \$36.97 to \$49.30 per acre.

Beef Cattle Make Good Gains on Pasture: Irrigated grass pasture makes excellent feed for growing and fattening steers. In 1936 the Montana Agricultural Experiment station fattened 10 yearling grade Hereford steers on 10.5 acres of irrigated mixed grass pasture from May 16 to September 25. The grass mixture was principally blue grass, with some white clover and slough grass in the lower places, together with small amounts of other grasses. These steers had been wintered on alfalfa hay up to the time when pasture feeding started.

In addition to the pasture the steers received choice cottonseed cake at the rate of .24 pound per head daily. During the pasture season of 132 days the average gain in live weight, per steer, was 274.5 pounds or a daily gain of 2.08 pounds.

An Excellent Feed for Ewes and Lambs: Irrigated pasture is equally valuable for sheep. A well managed pasture will carry 5 to 7 ewes and their lambs per acre during the summer grazing season. While on such pasture the ewes have plenty of milk and the lambs make cheap and economical gains. Best results are secured with lambs dropped in February and marketed in July.

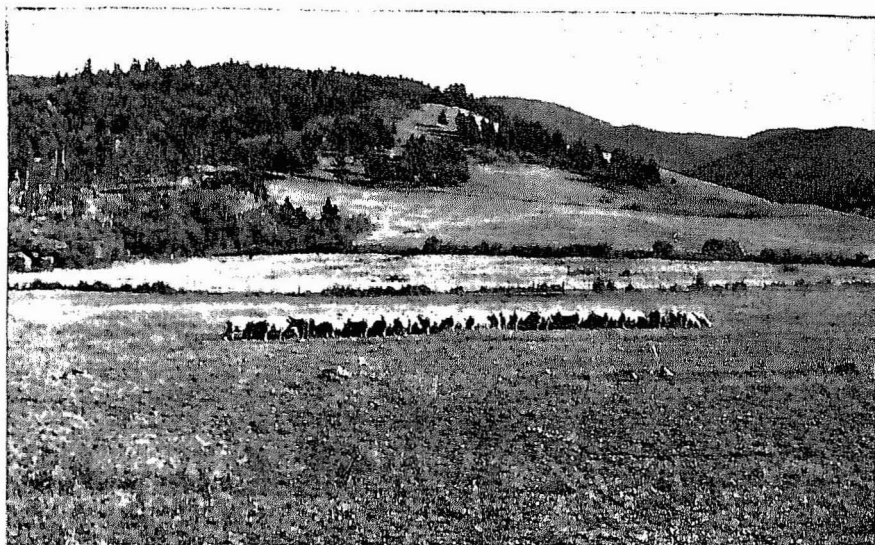


Fig. 2—A farm flock on an irrigated pasture.

Good Pasture Essential for Hogs: Sufficient pasture is essential in profitable hog production. It furnishes a cheap source of protein and minerals, which are necessary in the rations for hogs. It is particularly desirable for brood sows and growing pigs. Exercise and sunshine are assured when the growing hogs, sows, and pigs are on pasture. Pasture is the best source of vitamins and is the best conditioner. Alfalfa is the best of hog pastures. In palatability and in production of protein, it has no equal as a pasture crop.

Labor Is Reduced: No labor is involved in harvesting, storing or feeding crops which are pastured by livestock. With conveniently arranged pastures the livestock may be kept near the barns and thus time and labor is saved in caring for them. This is particularly important in regard to dairy cattle and hogs.

A well established irrigated pasture is a permanent improvement on the farm. Some irrigated pastures have been in use in Montana for more than 30 years with good results. Such permanent pastures require proper management, but save much labor and expense in connection with fencing, plowing, seeding and leveling for irrigation.



Fig. 3—Young pigs are more healthy, grow faster and make more economical gains if they have good pasture.

Planning the Pasture

Enough land should be devoted to pasture to furnish grazing for all of the livestock kept on the farm. Good irrigated pastures will carry from $1\frac{1}{2}$ to $2\frac{1}{2}$ large cows or the equivalent per acre for a period of 4 months or more. Because it is necessary to irrigate several times during the season the pasture should be located where it may be irrigated to the best advantage and the land leveled and ditched so that water may be applied frequently and uniformly. On farms where dairy cows are kept, that part of the pasture used by dairy cows should be located near the barns and thus save driving the cows long distances to and from the pasture.

If there is some untillable land on the farm, or land that is difficult to cultivate, it should be seeded to permanent pasture. Under proper management such land may be made to yield fair to good returns.

What to Sow: While mixtures of grasses and legumes are preferred, there is no set rule to follow in mixing seed for an irrigated pasture.

Grasses should be selected which produce a palatable leafy growth and a compact sod that will not be injured or destroyed by grazing animals. A mixture of several grasses and a legume is preferred for several reasons. It produces a higher yield, gives variety to the feed, makes more efficient use of the soil and because of the seasonal variation in growth of the different grasses and legumes, furnishes more uniform pasturage throughout the grazing season. Legumes such as white and alsike clover give variety to the pasture, help to maintain the nitrogen content of the soil and increase the protein content of the feed. In some areas where bloat is a serious problem, clover may be omitted from the pasture mixture or its proportion reduced. The mixture selected should include crops which suit the local climatic and soil conditions as well as the type of livestock to be grazed.

Suggested Pasture Mixtures

The following mixtures are suggested for special soil and moisture conditions where a permanent pasture is desired:

Well Drained Irrigated Land (Ample Supply of Irrigation Water)

A pasture mixture that has given satisfactory results at the Huntley Branch station and on various farms in the state is recommended for well drained irrigated land where there is an ample supply of water.

Mixture*	Amount of Seed Per Acre
Smooth brome grass	3 to 4 pounds
Kentucky blue grass	4 to 6 pounds
Orchard grass	4 to 6 pounds
Meadow fescue	3 to 4 pounds
White clover	1 to 2 pounds
Alsike clover	1 to 2 pounds
Total amount of seed per acre.....	16 to 24 pounds

Wet or Poorly Drained Soils

Mixture	Amount of Seed Per Acre
Red top	5 to 6 pounds
Timothy	5 to 8 pounds
Reed canary grass	4 to 5 pounds
Alsike clover	2 to 3 pounds
Total amount of seed per acre	16 to 22 pounds

*This is known as the "Huntley Mixture."

Alkali Land (Poorly Drained or Seeped)

There are very few grasses or legumes available for this type of soil. With the exception of western wheatgrass or bluejoint, the crops listed are expensive and have not been thoroughly tested. The mixtures suggested should be tried on a small scale to determine their value on any particular alkali or salty soil.

Mixture	Amount of Seed Per Acre
Strawberry clover	5 to 6 pounds
Western wheatgrass	10 to 14 pounds
Total amount of seed per acre.....	15 to 20 pounds

Mixture	Amount of Seed Per Acre
Astragalus rubyi	6 to 10 pounds
Western wheatgrass	10 to 10 pounds
Total amount of seed per acre.....	16 to 20 pounds

Well Drained Soil (Limited Irrigation Water)

Where the supply of irrigation water is limited so that only 1 or 2 irrigations may be applied during the growing season, drought resisting plants must be included in the mixture.

Mixture	Amount of Seed Per Acre
Smooth brome grass	4 to 6 pounds
Crested wheatgrass	4 to 6 pounds
Tall oat grass	3 to 4 pounds
Orchard grass	3 to 4 pounds
Biennial yellow sweet clover.....	2 to 4 pounds
Total amount of seed per acre.....	16 to 24 pounds

The above mixtures are suggested for convenience and as a guide to those who are planning to seed a pasture mixture.

Cost of Seed: The cost of seed for these mixtures will vary from \$4 to \$10 per acre depending upon the amount, kind and quality of seed used. It is poor economy to use anything but the best grades of seed* when seeding down a permanent pasture. The first cost may seem high, but is not because the pasture may be used for many years. It is usually desirable to buy the various kinds of seeds separately and make up the mixture on the farm

Seed Bed Preparation

Because of the relatively high value of good irrigated land, the high cost of the seed, and the fact that a pasture usually will occupy a field for many years, great care should be taken in leveling the land for irrigation and preparing the seed bed. A well pulverized, clean and firm seed bed will insure prompt germination and a vigorous, uniform growth which can compete with weeds. It is recommended that land infested with perennial weeds, such as Canada thistle, be thoroughly summer fallowed at least one year before seeding. This will insure a good seed bed and will enable the pasture mixture to keep any remaining weeds under control.

Seeding: Time, Method and Rate

Spring seeding without a nurse crop probably is the most certain method of obtaining a stand under Montana conditions. Sometimes the pasture mixture may be planted with a light seeding of wheat, oats or barley as a nurse crop, in which case the grain or hay harvested may pay for the expense of seed and seeding. However, small grains often lodge badly on irrigated land, thus smothering the grass and clover seedlings. If a nurse crop is used, it should be harvested as early as possible and the land irrigated immediately. Pastures have been seeded in small grain stubble in the late summer (August 15 to September 15) without soil preparation but the land must be irrigated immediately after the seed is planted. The stubble should be left for winter protection.

Seeding is done best with a grain drill set to run as shallowly as possible. Small seeded crops are usually planted $\frac{1}{2}$ to $1\frac{1}{2}$ inches deep. Seeding may be deeper in sandy soils than in heavy clays or loams. The grass seed should be thoroughly mixed and seeded through the grain hopper, while the clover seed may be run through the "grass seeder" attachment. It may be

*The Montana Grain Inspection Laboratory at Bozeman will test samples of seed for purity and germination free of charge

necessary to mix the seed in the grain hopper occasionally to insure uniform seeding.

The amount of seed to use depends upon the condition of the seed bed and the cost of seed. If the prices of seed are sufficiently high to be a factor, the rates of seeding suggested for the various mixtures may be reduced. However, it is important to use enough seed to insure a thick stand and a good sod. Considerably less seed will be required to produce a good stand on a well prepared, clean, moist and firm seed bed than on a seed bed which has been poorly prepared. Grasses usually require a year to become established and productive. Therefore, farm operators should not make the mistake of plowing up what appears to be a poor stand of grass the first season.

Proper Management Means Increased Carrying Capacity

First Year's Care Important: The success of the irrigated pasture depends largely upon the care which it receives during the first year. Frequent, light irrigations are desirable since the surface soil must be well supplied with moisture at all times. Such conditions insure thick stands and vigorous growth, two essentials of high carrying capacity.

Where a nurse crop is grown, it should be removed from the field as early as possible, so that irrigation water may be applied. Pastures seeded in the spring without a nurse crop may require frequent clipping to prevent smothering by weeds. It is advisable to raise the sickle bar of the mower to avoid close clipping the new seeding. The newly seeded pasture should not be grazed during the first year. However, under exceptionally favorable conditions, such pastures may be grazed lightly but overstocking and late fall grazing should be avoided. Stock should not be grazed on new pastures when the ground is wet from rain or irrigation.

Alternate Grazing and Irrigation: Maximum carrying capacity is possible only by a systematic plan of alternate grazing and irrigation. The irrigated pasture should be divided into at least 2 fields so that one can be grazed while the other is being irrigated and the grass allowed to recover. After 10 days or 2 weeks, the stock should be shifted to the second pasture while the first is being irrigated. It is impossible for an irrigated pasture to produce maximum carrying capacity under constant grazing and with little or no attention to irrigation.



Fig. 4—Frequent and careful irrigation assures greater carrying capacity.

Frequent Irrigations Are Best: Frequent light applications of irrigation water will produce more grazing than a large amount applied once or twice during the season. The method and amount of water applied will probably depend upon the supply of irrigation water. However, with an unlimited supply of water light frequent irrigations induce continuous plant growth and results in a greater carrying capacity throughout the season.

Early Spring Grazing: Early spring grazing of irrigated pastures should be avoided. The plant foods absorbed from the soil and the air must undergo certain changes within the leaves before this food may be used by plants in making growth. Thus plants that are grazed closely from early spring until late fall do not have opportunity to build up the strong root systems, necessary for vigorous growth of leaves and stems, since all of the energy is used in making new growth. Pastures which are allowed to make a vigorous growth in the spring maintain a constant heavy carrying capacity throughout the remainder of the season. It is a good practice to keep the livestock off the pasture until the forage is 3 to 4 inches high.

Avoid Close Grazing: Since leaves are necessary for proper growth of pasture plants, close grazing at any time should be avoided. There should be considerable leaf growth at all times if maximum returns are to be obtained.

Late Fall Grazing: Pasture grasses and clovers should have ample time in the fall to produce a good growth of leaves for winter protection and to store reserve food in their root systems for an early and vigorous spring growth. It is suggested that livestock be removed from the pasture early enough in the fall to allow for 3 or 4 inches of top growth.

Fertilizers: Most pastures respond favorably to some type of fertilization because of the heavy demand of grasses on available plant food. Top dressing with well-rotted barnyard manure at the rate of 10 loads per acre applied every year has increased the carrying capacity of pastures 14 per cent at the Huntley Branch station.*

It may not be possible, however, to apply manure every year to pastures because of the need for manure on other fields. Top dressings of manure should be made at the close of the grazing season or during the winter. Early the following spring the pasture should be harrowed to distribute the manure and to scatter the droppings of the animals from the previous year.

Soils in certain areas of Montana are deficient in phosphorous. Where this condition exists, it may be desirable to apply top dressings of commercial phosphate fertilizer. The available or soluble forms of phosphate fertilizer should be used and at the rate of 100 to 250 pounds per acre every 3 or 4 years.

Carrying Capacity and Length of Grazing Season

The carrying capacity depends mostly on the kind of pasture mixture, the productivity of the soil and the amount of water available for irrigation. However, it is not uncommon for good irrigated pastures to carry 1½ to 2½ mature cows for 4 to 4½ months. The length of grazing season depends upon the locality, climate and management of the pasture. At the Huntley Branch station, Huntley, Mont., where the average period between killing

* Montana Bul. 166—"Irrigated Pastures" (out of print).

frosts is about 130 days, pastures alternately grazed and irrigated have produced grazing for a period of 140 days. At the Montana Agricultural Experiment station at Bozeman with an average frost-free period of 115 days, irrigated pastures have provided an average of 125 days of grazing. The pastures mentioned are allowed to make 3 or 4 inches of growth in the spring before grazing commences and the livestock is removed in the fall in time for the pastures to make some recovery before winter. Pastures which are grazed continuously and are poorly irrigated, usually provide grazing for a much shorter period.

During the spring or early summer when the pastures are producing maximum growth, there may not be enough livestock to prevent some of the grasses from heading or going to seed. Allowing the grasses to head and mature reduces the carrying capacity of the pasture and furnishes low quality forage. In such cases it is suggested that part of the pasture be allowed to produce a hay crop or be clipped to prevent excessive growth.