Recommended Farm Practices
For Northern Montana

ISSUED BY
MONTANA STATE COLLEGE EXTENSION SERVICE
BOZEMAN, MONT.
Acknowledgment

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Edited by John Dexter.
Recommended Farm Practices for Northern Montana

Knowledge of Conditions Necessary

In the Milk River Valley and throughout northern Montana, as in every other agricultural area, success in farming depends largely upon the knowledge and ability of the farmer and upon the application of that knowledge and ability to the conditions under which he must operate. This bulletin presents information on farm practices which have been found most successful. The recommendations given here will have to be changed as new and better methods are discovered.

Soils Vary Greatly

Certain facts regarding soils, rainfall and temperature are presented to indicate the wide variations in these factors which play such an important part in the production of crops and livestock.

Production Possibilities of Different Soil Types

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Forage acres per section</th>
<th>Approximate fallow wheat yields per acre</th>
<th>Acre value unimproved land</th>
<th>Acre value improved land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turner Loam</td>
<td>378</td>
<td>10 to 45 bu.</td>
<td>$5 to $12</td>
<td>$12 to $25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average 20 bu.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scobey Sandy Loam</td>
<td>291</td>
<td>8 to 40 bu.</td>
<td>$3 to $10</td>
<td>$10 to $20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average 18 bu.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheyenne</td>
<td>296</td>
<td>8 to 40 bu.</td>
<td>$3 to $10</td>
<td>$10 to $20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average 18 bu.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scobey Stony Loam</td>
<td>250</td>
<td>Mostly grazing</td>
<td>$2 to $5</td>
<td></td>
</tr>
<tr>
<td>Rough and gravelly</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phillips Loam</td>
<td>180</td>
<td>All grazing</td>
<td>$1 to $5</td>
<td></td>
</tr>
<tr>
<td>Blowout soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laurel Clay Loam</td>
<td>163</td>
<td>Grazing andsweet clover</td>
<td>$1 to $5</td>
<td></td>
</tr>
<tr>
<td>Heavy, fair drainage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laurel Clay Loam</td>
<td>48</td>
<td>Poor grazing</td>
<td>25c to $1.50</td>
<td></td>
</tr>
<tr>
<td>Gumbo, alkali</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lismas</td>
<td>46</td>
<td>Poor grazing</td>
<td>25c to $1.00</td>
<td></td>
</tr>
<tr>
<td>Upland gumbo</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1.—The Soils of Blaine County
Soils deserve particular study by the farmer. Soil survey bulletins with maps and facts regarding the value and productivity of the different soil types found in this area are available at the offices of county extension agents. Soil maps of three northern Montana counties are presented here to show the variations that occur.

The need for careful study of soils is indicated by the accompanying table showing the production possibilities of different types of soil. The term
"forage acres" is used to designate the carrying capacity of the natural grasses found on different soils. It requires about 6.4 forage acres to pasture a 1,000-pound cow eight months.

**Rainfall and Temperature**

The accompanying charts give information on rainfall and temperature in northern Montana. The experience of farmers bears out the conclusion that may be arrived at from a study of the charts, that in a period

![Figure 3.—The Soils of Valley County](image-url)
of ten years the farmer may expect about three good crop years, four average crop years and three below-normal crop years.

**Tractors, or Horses?**

Tractors have been adopted quite generally by dry land farmers in northern Montana. If the tractor is to be a profitable investment the farmer should have at least 800 acres of land under cultivation, with 400 acres in crops and 400 acres in summer fallow each year. Information on the size of tractor for different sized farms may be obtained from the county agent.

A farmer with $4,000 invested in machinery and equipment must have 150 acres of wheat yielding 17 bushels to the acre and which brings 97 cents per bushel to pay for his overhead. This estimate is based upon 1929 prices for gasoline, oil and machinery.

Accounts kept by farmers show that it costs from $1.25 to $1.50 per acre of land under cultivation for gas and oil each season.
Figure 5.—Temperature Chart Showing Frost-free Period
Figure 6.—Distribution of Rainfall Throughout Season
Following is a simple method of figuring approximate costs of power farming:

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on a $4,000 outfit</td>
<td>$320.00</td>
</tr>
<tr>
<td>Depreciation and repairs at 20%</td>
<td>800.00</td>
</tr>
<tr>
<td>Taxes</td>
<td>150.00</td>
</tr>
<tr>
<td>Gas and oil for 800 acres at $1.50 per acre</td>
<td>1,200.00</td>
</tr>
<tr>
<td></td>
<td><strong>$2,470.00</strong></td>
</tr>
</tbody>
</table>

A farmer should have at least 300 to 400 acres of land under cultivation or ready for cultivation before buying a tractor, and then he should have at least enough cash to buy gas and oil for the first year of operation.

The newcomer deciding whether to buy horses or a tractor must base his decision upon the amount of tillable land on his farm and the amount of available grazing land. Some northern Montana farmers who have much good summer and winter pasture and who farm a small acreage operate with horses at very low costs.

From four to six horses are ample for the properly managed irrigated farm.

In many cases it is much cheaper for small operators to hire all of their tractor work done than to own and operate a tractor.

**Some Important Suggestions**

A careful study of many successful farms in northern Montana shows that the following general principles must be observed if profitable enterprises are to be developed:

Soil, climate, markets and other local factors affecting production or marketing must be studied carefully and operations adapted to those factors.

The best summer tillage practices must be followed for successful crop production on dry land farms.

Reserves of cash, feed or livestock must be established to tide farmers over years of low returns.

Machinery and equipment must be adapted to the farm. Money tied up in unnecessary machinery is a dead load of expense that has been the downfall of many otherwise promising enterprises. On the dry land farm the investment in machinery should not exceed five dollars an acre.

The successful dry land farmer must own or control at least 600 to 800 acres of tillable land.

The farmer who is just starting must have at least enough cash to see him through the first year.

For the most successful crop production the best obtainable seed of adapted varieties must be used.

Operations must be based upon reliable information gained from reliable sources. The office of the county extension agent is the center of such information.
The farm should produce enough livestock, poultry and garden vegetables to furnish a living, so that returns from the main cash crop can be used to pay off indebtedness, build up reserves and take care of overhead costs.

All tillable land should be put into production as quickly as possible. Careful systems of rotated grazing should be practiced on pasture and range to maintain carrying capacity.

The farmer who conducts his business on the most efficient basis must keep accounts. See the county agent for account books and suggestions.

Proven Types of Farms

Certain rather definite types of farms have been successful in northern Montana. The size and type of farm are largely determined by the following factors: soil, irrigated or dry land, rough or tillable land, economy of operations, location with reference to markets and shipping points, and the managerial ability of the operator.

In presenting the different types of farms it will be noticed that livestock has a place on all of them. Some farmers on dry land with little or no land that is not tillable, have been successful in growing wheat exclusively by using large-scale, low-cost methods. Such farmers must establish cash reserves to carry them over poor years.
Six types of farms are presented with a brief analysis of each showing the size of farm, the acreage to be devoted to different crops, kind and amount of livestock and equipment. The recommendations are based upon practices which have been found most successful under the different conditions for which each type is intended.

**Combination Grain Farm**

Farms of this type are adapted to the good soil areas and should contain one or two sections of land.

Crop Acreages: 300 to 400 acres in clean summer fallow or corn—corn acreage determined by feed needs; 200 to 300 acres in wheat or flax; 100 acres in barley, oats, rye or speltz for feed requirements and reserve; 20 to 40 acres of alfalfa in rows or on flood irrigated bottoms for hay and pasture where conditions are favorable, or sweet clover with grain in areas not adapted to alfalfa.

![Figure 8](image_url)
Livestock: 6 to 10 milk cows, 4 to 6 brood sows, 100 early pullets or 10 to 15 turkey hens.

Equipment: Three or four-plow tractor and four horses; one 3 or 4-bottom plow; one 12-ft. duckfoot cultivator; one 12-ft. combine; one 18-ft. spring-tooth harrow; one 12-ft. press drill. A rotary rod weeder may be included. If hay is grown a wagon, mower and hay rake will be needed.

Net income, which represents owner's salary and interest on land investment, will vary from year to year. The average gross income should range from $5,000 to $8,000 per year with a net income of $2,000 to $5,000 per year, depending upon methods used and climatic conditions.

Cash and feed reserves are necessary if operations are to continue after unfavorable years.

Figure 9
Power Wheat Farm

Farms of this type are adapted to the good soil areas and should contain two or more sections of land.

Crop Acreages: 600 to 900 acres in clean summer fallow; 500 to 800 acres in wheat or flax; 100 acres in grain hay and feed crops; 80 acres in alfalfa and sweet clover for pasture or hay.

Equipment: One 6-plow tractor and 4 head of horses; one 6-bottom plow; two 10-ft. one-way plows or three tandem disks; one 20-ft. combine; three 10-ft. duckfoot cultivators; two 10-ft. press drills; three rotary rod weeder; wagons; mower and stacker.

Livestock: 60 to 80 head of cattle, or 300 to 400 breeding ewes, or 8 to 10 brood sows; 100 early pullets or 10 to 20 turkey hens. Good fences and plenty of water for stock are necessary, if livestock is to be raised.

Net income, which represents owner’s salary and interest on land investment, will vary from year to year. The average gross income from this set up will vary from $10,000 to $14,000 per year with an average net income of $4,000 to $5,000 per year. Each year 10 per cent of the gross income should be placed in a reserve fund for adverse years.

Livestock and Feed Crop Farm

Farms of this type are adapted to areas combining good and poor types of soil and should contain from two to 10 sections of land, depending upon the grazing value of the poorer land. The farm should have at least 640 forage acres. (The term “forage acres” is defined on page 6.)

Crop Acreages: Alfalfa on flood irrigated bottoms for pasture and hay; alfalfa and sweet clover on better uplands; alfalfa in rows for seed; 200 acres in fallow or corn; 100 acres of barley on fallow; 50 acres of oats for hay or feed and 50 acres of spring rye for hay or feed.

Livestock: 60 beef cows, 2 bulls, 54 calves and 50 yearlings, or 500 breeding ewes, 6 rams and 8 to 10 gilts to farrow each spring. This ranch should have some surplus of hay and feed for sale to neighbors.

Equipment: 12 head of horses or general purpose tractor; one 2-bottom plow; one 12-ft. binder; one 18-ft. spring-tooth harrow; one 10 to 12-ft. duckfoot cultivator; one 10 or 12-ft. press drill; two wagons; one mower; two buck rakes, and one stacker.

The farm should be fenced and should have watering places for livestock. Deferred grazing should be practiced, and one to two years’ feed reserve should be built up.

Net income should be from $1,000 to $3,000 per year; gross income from $3,000 to $8,000 per year. The figures are based on an average covering a period of years.
Livestock Ranches

Enterprises of this type are adapted to good and poor upland soils but which include some good bottom lands. Ten or more sections of land are needed and there should be at least 2,500 forage acres. This is essentially a cow and calf ranch but yearlings may be kept over when there is a surplus of hay. The ranch should be divided into three grazing units. The grazing on the different units should be rotated as indicated in the above plan to maintain or increase carrying capacity. (The term "forage acres" is defined on page 6.)

Livestock: 300 to 400 high grade beef cows and their calves, 12 to 15 purebred bulls, or 1,500 to 2,000 high grade Rambouillet ewes and their lambs, 35 to 40 purebred Rambouillet rams.

Equipment: 12 head of horses or one general purpose tractor; one 2-bottom plow; one 3-ft. binder; one 12-ft. spring-tooth harrow; one 9-ft. duckfoot cultivator; one 10-ft. press drill; two or three mowers; three buck rakes; two dump rakes, and one over-shot stacker.

Grazing and Crop Acreage: Grazing land should be divided into three units of 800 to 1,000 forage acres each, and deferred grazing practiced according to the following plan:
Water must be provided for each grazing unit. From 500 to 600 acres of hay and feed crops should be grown each year on summer fallowed or irrigated land. Alfalfa can be grown on the bottom lands that can be irrigated with spring flood waters or from farm storage reservoirs.
Good upland soils should be summer fallowed for growing alfalfa or sweet clover, spring rye or oat hay.

Sweet clover may be seeded in rough coulees in wet seasons. It may also be grown on barren gumbo soil that is plowed or listed, left rough and flood irrigated.

The average gross income on a livestock ranch should range from $7,000 to $15,000 per year with an average net income of $2,000 to $5,000.

**Small Irrigated Farm**

Farms of this type are adapted to the light soil areas and should contain 160 acres, of which 100 to 125 acres are irrigable.

![Diagram of a small irrigated farm](image-url)
Livestock: 15 to 25 good milk cows with 10 to 20 head of young stock and one good bull; 5 to 10 bred sows; 6 horses, and 200 pullets. If the farmer prefers sheep or beef cattle to dairy stock he should have 150 ewes and 4 good bucks, or 20 to 30 beef cows. A carload of baby beeves may be fattened for market each year.

Crop Acreage: 50 acres of alfalfa hay—10 acres plowed each year; 10 acres potatoes, corn or beans on alfalfa breaking; 20 acres sugar beets; 10 acres barley; 10 acres seeded to alfalfa with grain nurse crop; 15 acres of permanent pasture seeded with Huntley pasture mixture; 7 acres farm-steam, garden, poultry runs and hog pasture; 38 acres river bottom, waste land, ditches, roads, etc.

Machinery: One two-way plow; one three-section spike-tooth harrow; one double disk; one 10-ft. grain drill with alfalfa seed attachment; one home-made box float; one log grader; one fresno scraper; one Martin type ditcher; beet and potato machinery; mower; side delivery rake; buck rake; stacker; cream separator; wagon, and manure spreader.

Light soils of the Milk River Valley are well adapted to the growing of cash crops such as sugar beets and potatoes. Profitable yields of these crops, however, can be maintained only by growing them in definite rotations with alfalfa or sweet clover and by applying barnyard manure. Livestock feeding is the key to successful farming on the Milk River Project.

The gross income on this type of farm should equal $5,000 to $8,000. The net income, which represents interest on investment and operator's labor income, should equal $1,000 to $3,000.

Large Irrigated Farm

Farms of this type are adapted to areas where heavy soils predominate and should be 320 acres in size.

Livestock: 50 to 60 beef cows; 1 or 2 good bulls; or 250 to 300 ewes and 6 to 8 rams (mutton type rams preferable on this type of farm); 8 sows; one boar; 6 horses. Some livestock may be fattened on this farm each winter. Either one or two cars of lambs or steers.

Crop Acreage: 150 acres alfalfa hay; 100 acres barley; 40 acres sweet clover; 10 acres permanent pasture; 20 acres farmstead, waste land, roads, etc.

Equipment: One two-way gang plow; one tractor to be used in planting, haying and harvesting; one double disk; one spike-tooth harrow; one grain drill with alfalfa seeder attachment; one box leveler; one fresno scraper; one Martin ditcher or grader; one tractor mower; one side delivery rake; two buck rakes; one stacker; one 8-ft. power binder; one wagon; one manure spreader, and some miscellaneous equipment.

The heavier soils of the Milk River Valley are more fertile than the lighter soils but are more difficult to work. The choice of crops, there-
fore, is limited to those that require a minimum of plowing and cultivation, such as alfalfa for hay or seed, sweet clover, permanent pasture, bluejoint and timothy hay, alsike clover, barley and oats. The greatest returns can be realized from these crops only by feeding them to cattle, sheep or hogs on the farm and returning the manure to the land.

This type of farm should return a gross income of $5,000 to $10,000 and a net income of $1,000 to $3,000.

Some Farming Essentials

There are certain production practices to which farmers must give particular attention. Some of the more essential ones are discussed here. The recommendations given are based upon the experiences of farmers and upon the results of many years of experimentation at the North Montana Experiment Station at Havre. Farmers who follow these practices obtain higher average yields over a period of years than those who do not. In some seasons and under some conditions it may not be possible to fol-
low all recommendations to the letter but every effort should be made to do so. In years of abundant rainfall yields from poorly prepared fields may be as great as from summer fallowed fields but this should not mislead the farmer into believing that this always will be true. The same may be said of other recommendations presented here, but in the long run the practices suggested are those which will give the best results.

Handling Sod

Break sod from four to six inches deep. Breaking should be done when there is enough moisture in the soil to do a good job.

When the soil moisture is down from 15 to 18 inches, land that has been broken early in the spring may be double disked and harrowed until a firm seed bed is established, and immediately seeded to flax.

All other breaking should be left rough unless weeds necessitate working, and should be laid over until the following spring when it should be worked down and seeded either to wheat or flax.

Summer Fallow

Unless insect control is essential a wheat farmer may have half plowed and half plowless fallow each year. Such a fallowing system provides for

Figure 14.—Ridged and Cloddy Fallow Checks Soil Blowing and Holds Moisture
Figure 15.—Timeliness Is Important

a better distribution of labor. Fields should be alternated in the practice of plowed and plowless summer fallow. Plowless fallow is preferred for sandy soils that have a tendency to blow.

On land free from stones the one-way disk is being used successfully to cultivate the ground the first time for fallow.

When moisture conditions are favorable in the fall, plow ground from five to seven inches deep. Leave the land rough over winter and fallow.

Plow, one-way disk, or duckfoot ground between five and seven inches deep in the spring before May 25th and fallow. A clean, cloddy surface is desirable for ideal fallow condition.

Cultivate ground for fallow from two to three inches deep with a rotary rod weeder or duckfoot cultivator as soon and as often as weed growth starts. Three to four cultivations are usually necessary. Avoid cultivation between August 10th and October 1st unless weeds are troublesome.
Go over fallowed land with duckfoot in the fall to make shallow ridges. Leave land rough over winter.

Timely cultivation to control weeds is the most important factor in successful fallow.

**Irrigation and Drainage**

Anyone planning an irrigation system should make a thorough study of soil types, topography, climate, drainage, crops, water supply and cost of land preparation. Methods of successful farmers deserve careful study though sometimes methods used in a locality have nothing to recommend them but custom. The farmer should make use of all assistance available in solving irrigation problems.

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**Figure 16**

CONTOUR DYKES  CONTOUR DITCHES

FLOOD IRRIGATION
New, and often old, settlers seldom appreciate the importance of proper land preparation so that crops may be easily and properly watered. The preparation of land is a first cost and if done thoroughly the first or second year there need be little expense afterward for this item. The difference in cost between a smooth, well graded field and a rough, poorly graded one may not exceed $5 to $10 per acre, yet far more than this sum often is lost each season by diminished yields due to imperfect watering caused by a rough, uneven surface. Following are discussed some of the different irrigation methods:

**Wild Flooding and Contour Dykes.**—Used principally where little control is necessary or possible and adaptable particularly to irrigation of native hay, especially where spring flood water is used. Sometimes a few ditches or dykes are used to spread the water over the land.
Border Checks or Check System.—This method is confined mainly to alfalfa and consists of dividing the field into contour or rectangular checks surrounded by a levee or dyke. This method should never be used on soil that bakes or where there is danger of summer scalding or winter freezing due to standing water. It is expensive to construct and is not adapted to growing crops in rotation.

Contour Ditches.—Used on rolling or moderately steep ground. Adaptable to the irrigation of alfalfa, clover, pasture and small grains and easily changed for other crops. The land should be dragged with a box leveler before planting. With the aid of a level the ditches should be located soon after planting, and may be quickly constructed with a plow and ditcher or road grader. Corrugations are sometimes used as well if the land is rough.
Border Ditches.—Border ditches are adapted to lands with moderate, uniform slope. This system is often used while land is being prepared for the border flooding system. The system is well adapted to growing crops in rotations. The ditches may be permanent or rebuilt each year and are constructed after planting, with a plow and ditcher or grader.

Border Flooding.—A smooth regular surface having a slope in one direction of about two and a half inches per hundred feet is regarded as ideal for the border method although the method may be used on lands with slope from one inch or less to two feet per hundred feet. The method permits the use of large heads of water with a minimum of labor and is especially well adapted to the irrigation of alfalfa and grain. Row crops also may be grown in the rotation with but little change in the borders.

The field should be carefully surveyed in order to determine the location of the borders and the amount of leveling necessary. After plowing, the borders are staked out and the field is skinned crosswise with fresno scrapers which dump the soil in windrows to form the border dykes. These rough dykes are smoothed with a ridger which leaves the dyke about 12 inches high, 12 inches wide on top and 3½ feet wide at the base. Borders also are made by back furrowing and forcing the earth into the border dykes with a crowder or grader. The space between dykes should be carefully leveled to permit the flow of water in a thin sheet from one end to the other of each strip. Crops are planted and machinery is operated right over the dykes.

Corrugation or Furrow Method.—The corrugation method of irrigating field crops is a modification of the furrow method used in irrigating row crops. Its chief use is on new land that has not been properly prepared for some other method of irrigation or where only a small head of water is available. It is especially adapted to the irrigation of steep slopes and also is an aid to the border system on flat soils. It often is used on flat heavy soils subject to baking as crusting is reduced to a minimum. It should be considered a special method to use where no other method is satisfactory. The furrows, made immediately after planting, should be four or five inches deep and from one to four feet apart. Heavy soils on steep slopes require much closer furrows than light soils and little slope. A cultivator or home-made device may be used to make the corrugations.

Drainage and Maintenance.—Experience has demonstrated that the greatest danger to irrigated lands is lack of drainage. When there is not good natural drainage it should be supplied artificially. The most effective means of accomplishing this is to prevent, as far as possible, the largest losses due to seepage and absorption in earth canals. More time and money should be spent in preparing the surface fields for irrigation, and in applying the water in such a way as to have the bulk of it remain within the root zone of plants, to be drawn upon as the plants require moisture. A great deal of seepage is caused by trying to force the water over too long a run. This causes excessive seepage at the upper end of the field. 
Weed and brush growth along canals may be kept in check if canal banks are seeded to a pasture mixture and pastured with sheep.

Flood Irrigation.—Already thousands of acres on the dry land farms and ranches of northern Montana have been brought under irrigation by holding back spring flood water and spreading it over the land by means of contour dykes or ditches. There should be a slope of from three to six inches to one thousand feet so that water may be brought out of a coulee and carried along the sides of the area to be irrigated, finally ending on the higher elevations from which the water may be spread very easily.

By listing or duckfooting furrows parallel with the ditches and seeding the ground to sweet clover enough flood water is forced out of the main ditch into these furrows to soak up the ground so that an excellent pasture and hay crop may be produced even in the driest years.
Farmers who have lands that may be flood irrigated should get in touch with the county agent's office for assistance in surveying and planning projects. Each project presents a problem by itself and several different methods may be used to flood irrigate lands.

Two good cuttings of alfalfa hay or one cutting of hay and one seed crop a year may be produced on most flood irrigated lands.

**Ditching and Leveling Equipment.**—Steel ditcher—used to make V-shape ditches and levees. Road grader—for building ditches, levees and leveling land. Fresno—common and rotary, for making cuts and fills. Go-devil—leveler for leveling rough land. Box-leveler—should be used every spring in preparing seed bed for irrigated land. Commercial levelers—used for grading and leveling.

**Weed Control**

**Common Weeds**—Plant clean seed. Sow pastures or forage plants on roadsides, ditch banks and waste places so they can either be cut for hay or pastured with sheep or cattle. Adopt a definite crop rotation and practice timely cultivation.

**Wild Oats.**—Avoid sowing wild oats by using clean seed. Burn stubble of badly infested fields immediately after harvest. In lightly infested fields, disk stubble after harvest and practice plowless fallow methods. Duckfoot immediately after burning and irrigation where possible. Practice plowless fallow and shallow, clean cultivation the following year. If the land must be cropped, seed winter rye and cut for hay just before the wild oats head out. Fall burning or diskimg of stubble is not recommended for any other purpose except weed control.

**Noxious Perennials.**—Spray small areas with calcium chlorate solution, one pound dissolved in one gallon of water (enough for 100 square feet). Apply with a pressure sprayer just before bloom. Repeat applications five weeks later. If applied with a sprinkle type sprayer, mix one pound with two gallons water and apply to the same size area.

On large areas shallow cultivation each week during the growing season with an implement of the goose-neck slicker type is recommended. Eradication depends on complete destruction of all plant growth above ground.

These methods apply to such weeds as Canadian Thistle, Wild Morning Glory, Russian Knapweed, Perennial Sow Thistle, Quack Grass and Blue Flowering Lettuce.

**Control of Pests and Diseases**

**Gophers and Prairie Dogs.**—Invest a few dollars in poisoned grain prepared and distributed through the county agent's office. One gopher can easily destroy a bushel of wheat in a season. Enough native grass will be eaten by 240 prairie dogs or 60 jack rabbits to feed a 1,000-pound steer for eight months.
Pocket Gophers.—Buy traps through the county agent's office.

Grasshoppers.—Destroy breeding places by disk ing or shallow plowing weedy fields and fence lines in the fall. Apply grasshopper poison as soon as the young hoppers are hatched. Keep poisoning until the insects are under control.

Pale Western Cutworm.—Plow all ground for fallow. Do not work fallow between August 10th and October 1st. Seed grain with a press drill. Do not seed any grain on infested stubble.

Foot Rot in Winter Wheat.—Do not seed till after September 15th.

Wire Worms.—No one hundred per cent effective method of control is known. Deep cultivate stubble ground early in the spring. Plow for fallow in June. Seed flax or sweet clover in badly infested fields.

Control weeds and many pests and diseases will be controlled at the same time. Get in touch with the county agent's office as soon as injury to crops by insects or diseases is discovered.

Some Seeding Suggestions

Seeding Fallow.—Seed spring rye as early as possible (before April 15th) without preworking the ground.

Seed oats and barley about April 20th if possible by cultivating the ground from two to three inches deep and seeding immediately. The press drill is preferred.

For spring wheat cultivate the ground shallowly as soon as the ground is in good condition to work. Then do not touch the land until the Russian Thistle sprouts are about an inch long which is usually within ten days or two weeks after cultivation. Cultivate again between April 20 and May 5 from two and a half to three inches deep, and drill immediately. The press drill is preferred. Earlier seeding than April 15 or later than May 15 is not generally recommended.

Many farmers, especially on the heavier soils, find it more practical to cultivate the ground from two and a half to three inches deep and seed in one operation as soon as the land is in good workable condition.

A cloddy surface after seeding is desirable to check soil blowing and to save run off water.

In case of a serious Russian Thistle infestation seeded fields may be dragged without serious injury to the grain crop (except on sandy soil) just as the wheat is coming up.

Seeding Corn Ground.—Double disc as soon as the ground is in good workable condition and seed immediately.

Stubbling-in Grain.—Seeding grain in stubble is not recommended unless ground is clean and tests show three or more feet of moisture in the soil.
Burn stubble in the spring, cultivate and seed in one operation as soon after burning as ground conditions will permit.

Seeding grain on spring plowing is not recommended unless the soil has three feet or more of moisture and if it is done the ground should be plowed early, four inches deep and packed and seeded immediately before it can dry out.

**Grain Under Irrigation.**—Plow alfalfa or stubble fields in fall and leave rough over winter. If grain is to follow cultivated crops, plowing is unnecessary.

Fall irrigate heavy soils and early spring irrigate light soils.

Level with box float as soon as land can be worked in spring. Cultivate two or three inches deep, level again and plant to moisture with disc drill.

Drill at right angles to slope on steep fields and in the direction of the slope on flat land.

To facilitate irrigation of flat land, especially in heavy soil areas, corrugate or furrow out in rows two to three feet apart and from three to five inches deep, parallel with the slope. This should be done immediately after planting.

Clean head ditches and construct field ditches immediately after planting so banks will be firm when irrigation begins.

If ground is unusually dry so that grain will not germinate promptly, irrigate immediately after planting and harrow as soon as possible.

Usually the best time to irrigate growing grain is in the boot stage. If another irrigation is required it should be applied at about the bloom stage.

Irrigate before the crop shows indications of drouth which is shown by the leaves curling and wilting in the day time and turning a dark green color. Do not allow water to pond on grain fields.

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**Grain and Other Crops**

There are certain specific recommendations for the production of grains, hay crops, pastures, garden crops, trees and shrubs which farmers should follow. It is essential for the farmer to know the best varieties to grow, how to treat seed to prevent certain diseases, the rate of seeding, date of seeding and the best method of preparing the soil. This information, stated as briefly as possible, is presented herewith.

**Wheat**

**Dry Land Wheat.**—Varieties: Marquis and Supreme. Ceres is an early bearded wheat showing considerable promise. Treatment: Use the 20 per
cent copper carbonate dry treatment. Rate of Seeding: Seed from 40 to 55 pounds per acre. Date: From April 20 to May 5. Method: Cultivate ground about two to three inches deep and seed to firm soil with press drill.

**Irrigated Wheat.—Varieties:** Marquis for market, Federation or Baraart for feed. Treatment: Same as for dry land. Rate of Seeding: One and one-half to two bushels. Date of Seeding: April 20 to May 5. Method: Plant to moisture in well prepared seed bed with disc type drill. See general discussion on Grain Under Irrigation.

**Winter Wheat.—Varieties:** Karmont, Newturf and Montana No. 36. Treatment: Use the 50 per cent copper carbonate dry treatment. Rate of Seeding: Seed 45 pounds to the acre. Date of Seeding: Seed from September 15 to October 15. Method: Seed on summer fallow with a furrow drill.

The growing of winter wheat in northern Montana is still in the experimental stage and not recommended as a standard practice except in districts where it has proved successful.

**Barley**

**Non-Irrigated Barley.—Varieties:** Horn for grain; Faust, a blue hullless and beardless variety, for hay and pasture. Seed Treatment: One pint of 40 per cent formaldehyde to 30 gallons of water, temperature 60 degrees Fahrenheit. Soak the seed in loosely filled burlap or gunny sacks for two hours. Drain on slats over the barrels to avoid wasting the solution. Dry by spreading on a clean floor or canvas, stirring occasionally with a rake or shovel. It will dry faster if the wind can blow over the wet grain. Sow as soon as the seed will run freely or dry thoroughly and store in clean bags or bins until it is planted. Barley requires a two-hour soak to kill the leaf stripe and loose smut diseases. Rate of Seeding: 50 pounds per acre. Date of Seeding: April 15 to April 25. Method: Cultivate the ground from two and one-half to three inches deep and seed immediately. Press drill preferred.

**Irrigated Barley.—Variety:** Trebi for grain. Seed Treatment: Same as for dry land. Rate of Seeding: Two bushels per acre. Date of Seeding: April 15 to April 25. Method of Seeding: Plant two to three inches deep in well prepared seed bed with disc drill. Irrigation: The growing crop usually requires one or two irrigations applied about the boot and bloom states. Do not allow water to pond on grain.

**Oats**

**Non-Irrigated Oats.—Varieties:** Markton and Victory. Seed Treatment: Markton is smut proof. For all other varieties mix one pint of 40 per cent formaldehyde and ten gallons of water. Sprinkle the ten gallons over 40 bushels of oats, meanwhile shoveling, causing uniform distribution; ef-
fective as soon as the oats and solution are thoroughly mixed. Seed the next day. Rate of Seeding: One to one and a quarter bushels per acre. Date of Seeding: April 15 to April 25. Method: Cultivate the ground three inches deep and seed immediately. Press drill preferred.

**Irrigated Oats.**—Varieties: Markton and Victory. Seed Treatment: Same as for dry land. Rate of Seeding: Two bushels per acre. Date of Seeding: April 15 to April 25. Method of Seeding: Plant two to three inches deep in well prepared seed bed with disc drill. Irrigation: Irrigate before crop shows indications of drouth. One or two irrigations while the crop is growing are usually sufficient. Apply at boot and bloom stages. Do not allow water to pond on crop.

Certain mercuric compounds sold under different trade names are being successfully used for treating wheat, barley and oats.

**Flax**

**Dry Land Flax.**—Varieties: Newland, Reserve and Bison. Treating: Not practiced. Rate of Seeding: Seed 14 to 17 pounds per acre except Bison which requires 20 to 25 pounds. Date: Seed from May 5 to May 20. Method: On breaking, work down to a good firm seed bed and drill from one to one and one-half inches deep. On absolutely clean burned-over land or summer fallow, work the ground shallow and seed immediately. A clean seed bed is necessary because flax cannot compete with weeds.

**Irrigated Flax.**—Variety: Reserve. Rate of Seeding: Flax alone, 30 to 40 pounds per acre. Flax-wheat mixture—flax 15 pounds, wheat 45 pounds. Set drill to sow about three and one-half pecks of wheat. Date of Seeding: Flax alone—work seed bed early and cultivate to control weeds. Plant from May 5 to 20 about one inch deep with disc drill. Flax-wheat mixture—plant from May 1 to 10, or at the best date for planting spring wheat. Mix flax and wheat thoroughly and seed from one to two inches deep. Irrigation: One good irrigation at about the same time spring wheat is in the boot is usually sufficient. Do not allow water to pond on flax.

**Rye**

Varieties: Rosen for fall planting, Prolific for spring planting. Seed Treatment: Sow ergot-free seed. Rate of Seeding: Three to four pecks. Date of Seeding: Spring rye from March 25 to April 15. First crop to be seeded in spring. Fall rye from August 1 to October 5, early seeding recommended if fall pasture is desired. Method of Seeding: Seed spring rye without preworking the soil. Seed fall rye in clean stubble or preferably on fallow. Harvesting: Cut for hay when kernels are forming but still in the milk stage and when the lower leaves still are green. Cut for grain before it gets too ripe.

(Ergot: Over one-half of one per cent of ergot in rye is poisonous to both humans and livestock and may cause abortion in livestock.)
Registered Grain

Every farmer should secure enough registered grain to produce his own seed every three or four years. The average farmer does not have time and is not qualified to give the time and attention necessary to raise registered seed. Registered fields must be free from wild oats, grain mixtures and off-type plants of the same variety. Combines and threshing machines must be cleaned before threshing.

Pure seed of adapted varieties will yield approximately 20 per cent more than the common seed that many farmers are still using.

No grain can be sold as registered unless it is cleaned, sacked and tagged with tags from the Montana Seed Growers' Association.

A seed grower must receive from 50 cents to $1.00 a bushel over the market price to profitably raise registered grain. It takes the average farmer from three to five years to become an efficient registered seed grower.


Corn

Non-Irrigated.—Varieties: Gehu Yellow Flint, Dakota White Flint, Northwestern Dent, Falconer, Pioneer White Dent, Brown County Dent, Minnesota 13—International Strain. Seed Testing: Test all seed corn for germination. Place 100 kernels from tips, centers and butts of ears be-
tween two layers of thin cloth. Place cloth in shallow box or pan. In a
pan partly filled with sand, place 100 kernels from tips, centers and butts
of ears between two thin cloths, cover with an inch of sand, keep moist
and in a warm room. After four to six days remove top cloth. The num-
ber of sprouted kernels will be the per cent germination.

**Planting:** Plow four inches deep, May 5 to 15. Work down seed bed
immediately and plant two or three inches deep in check rows. One
bushel of good seed corn will plant from seven to eight acres. Cultiva-
tion: Drag once or twice with spike-tooth harrow before corn is up to
check weed growth. Drag again in heat of day only, when corn is from
two to three inches high. Avoid dragging when corn is just coming through
ground. Cultivate shallow to control weeds.

**Utilization:** The most practical use of corn is to pasture it off in the
field with hogs, sheep or cattle. Turn in when crop is mature. For win-
ter use surplus corn may be cut, shocked and stacked with alternating
layers of straw.

**Listed Corn.—**Listing is most practical for large power farming units.
Land should be worked early with drag or spring-tooth harrow and shallow
duckfooted again just before planting. Seed May 15 to May 30 in order
that the subsoil may get warm enough to insure rapid germination. For
the first cultivation the discs are set to throw the dirt away from the
corn, destroying the fringe of weeds on each side. In the second and
succeeding cultivations the discs are set to throw dirt toward the corn
covering the second crop of weeds while the shovels cultivate the ridges.
Reference: Montana Agricultural Experiment Station Bulletin 171.

**Corn Under Irrigation.—**Varieties and Germination: (Same as for non-
irrigated land.) Planting: Plant on light soils. Does best after fall
plowed alfalfa. Drag and disc and drag with box float as early as pos-
sible. Cultivate to control weeds. Plant two to three inches deep in check
rows May 1 to 15. Cultivating and Irrigating: Early cultivation same as
for non-irrigated land. Furrow out and irrigate just before leaves begin
to curl for lack of moisture. Cultivate shallow after each irrigation as
soon as soil can be worked. Utilization: (Same as non-irrigated.)

**Alfalfa**

**Irrigated Alfalfa.—**Soil: Alfalfa may be grown on any Milk River
Valley Soil that can be properly irrigated and drained and that contains
less than one-half of one per cent alkali.

Seed Bed: Where possible manure heavy soils before plowing. Fall
plow and leave rough over winter. Beet and potato land does not need
plowing before alfalfa. Land should be properly leveled and prepared for
irrigation before planting. Level and drag land as soon as it can be
worked in the spring. Cultivate shallow and work down firm seed bed after
three or four weeks have elapsed for weeds to sprout. Kill the weeds
before crop is planted.
Figure 21.—Alfalfa in Rows on Dry Land for Hay or Seed

Variety: Use Montana grown Grimm and Cossack, or Ladak for hay only on poorer type soils. Rate of Seeding: Seed 10 pounds pedigreed seed or 15 pounds or more of ordinary seed per acre, depending upon amount of dockage. If sown with nurse crop use one to one and one-half bushels of barley, wheat or oats. Date of Seeding: Plant with grain nurse crop from April 25 to May 10 or seed alone from May 15 to June 10 in clean fallow that has ample surface moisture for germination, preferably just after a shower. Method of Seeding: Use grass seeder attachment on regular grain drill, allowing alfalfa seed to fall directly on the ground in front of the discs and not down the grain spout. A spike-tooth harrow usually follows the drill.

The Growing Crop: Alfalfa should not be planted unless the soil contains enough moisture to start the crop. Young alfalfa, especially on heavy soils, is best irrigated by the furrow method. The land should be furrowed out parallel with the slope immediately after planting, making the furrows about two feet apart and three or four inches deep. Irrigate soon after the seedlings break through the ground. They may die of drouth long before the nurse crop indicates the need of water, especially on heavy soils. If baking occurs, frequent light irrigations will keep the surface crust soft enough to permit growth. Standing water will kill alfalfa. Drain promptly after each irrigation. Cut nurse crop for hay rather than for grain because the young alfalfa may suffer drouth while the grain is ripening. Irrigate before removing nurse crop and again immediately after. Young alfalfa should go into winter with at least six inches top growth to reduce the danger of winter killing. If stand is thin drill or broadcast five pounds seed per acre early in the spring and cover with spike-tooth harrow.

Cultivation: Cultivate young stands with spike-tooth harrow. The spring-tooth harrow or disc is used on old stands on gravelly or light
soils while the subsoil harrow may be used on heavy soils. Cultivate thoroughly in early spring before irrigation and again after the second crop is removed if time permits.

Irrigation: Alfalfa requires one or more irrigations per cutting or approximately two acre feet of moisture during the growing season. Irrigate as near cutting as possible depending on how long it takes the ground to dry so the hay will cure properly. This will permit rapid growth of the following crop as soon as the hay is cut. In dry years two irrigations may be necessary between cuttings. Early spring irrigation is essential following a dry fall and winter.

Haying: Cut alfalfa when in early bloom or when new shoots are from one to two inches long. Cure in windrow or bunch. Stack so as to retain the leaves and prevent bleaching. Two crops and sometimes three are produced each year.

Breaking Alfalfa Sod: Plow under the second crop in midsummer about four or five inches deep, using full size, sharp plowshares. Disc with straight discs. Irrigate. Plow eight inches deep in late fall or early the following spring.

Growing Alfalfa on Bluejoint Sod: Well, drained, easily irrigated, bluejoint fields may be seeded to alfalfa without plowing. Plant alfalfa seed one inch deep in bluejoint sod in early spring with single disc drill. Irrigate at once and drain. Irrigate frequently the first season but do not allow water to pond. Irrigate like other alfalfa fields the following years.

Pasturing Alfalfa: Alfalfa is unsurpassed for hog pasture and is a partial substitute for tankage. Well established fields may pasture four sows and their pigs per acre during the season. Divide pasture to permit alternate irrigation and grazing. The risk of bloat makes alfalfa pasture undesirable for cattle and sheep. It is not a good practice to allow horses or sheep to pasture alfalfa fields in winter as they cause injury.

Irrigated Alfalfa for Hay and Seed.—Varieties: Pedigreed Grimm for seed and Ladak for hay.

Seed Bed: Patches of good soil that subirrigate along creeks or flat areas that can be irrigated with spring flood waters have been made to produce good yields of alfalfa hay. Wide contour dykes that will hold from six inches to one foot of water should be built to flood irrigate favorable areas before seeding alfalfa. A good drainage system should be provided to quickly remove the water from the land after flooding. Fallow the land the year before seeding and establish a firm seed bed free from weeds. Good stands of alfalfa have been secured on creek beds by just seeding the alfalfa and dragging afterward.

Seeding: Drag the fallow with a spike or spring-tooth harrow. Sow three pounds per acre for seed production or six to eight pounds for hay only. Seed before April 20 with 25 pounds of oats as a nurse crop. Do not use rye. Seed the alfalfa first with a cyclone seeder if there is no grass attachment on the drill. Drill oats and follow with spike-tooth
harrow. If no nurse crop is used cultivate the ground and keep it free from weeds till the latter part of May. Seed the alfalfa after a rain and drag the ground after seeding.

Harvesting Nurse Crop: Cut the nurse crop for hay any time the alfalfa shows signs of suffering from drought.

Harvesting Alfalfa: Handle hay the same as irrigated alfalfa. If a seed crop is desired let the first crop go to seed where the stand is very thin. Cut thick stands for hay before June 10. If alfalfa is clipped before June 10 to bring it into bloom about July 1 the chances for a seed crop are the most favorable. Thin stands are necessary for securing large seed yields.

Non-Irrigated Alfalfa for Hay and Seed.—Varieties: Pedigreed Grimm for seed and Ladak for hay.

Seed Bed: Seed on summer fallow only. Cultivate and keep free from weeds up until seeding time.

Seeding: Sow in three- or three and one-half-foot rows for hay and in five to seven-foot rows for seed. There are a few places near the Little Rockies and Bear Paw Mountains where it can be seeded solid on non-irrigated land. A grain attachment or a drill with part of the holes plugged may be used for seeding alfalfa in rows. Some farmers have made a seeder out of one section of the grain grass seeder attached to a corn planter. Others have tied garden seeders to a corn planter and have done a good job of seeding.

Rate of Seeding: One pound of alfalfa per acre in seven-foot rows and two pounds in three and one-half-foot rows. For solid seeding, five to six pounds per acre.

Date of Seeding: Last of May or first of June, after a rain if possible.

Cultivation: If the ground bakes after seeding the crust should be broken with a light roller, prior to alfalfa coming up. Cultivate clean between the rows the first year. Weeds in the rows help protect the young seedlings from grasshoppers, jack rabbits, winds, and help to hold the snow the following winter. Old stands may be cultivated three to four inches deep between the rows early in the spring and shallowly after that. Weeds and alfalfa cannot be grown on the same ground. Alfalfa seeded solid should be cultivated each spring, preferably with a spring-tooth harrow. The spring-tooth harrow may be used to cultivate rows where soils are light.

Harvesting Hay: Cut the alfalfa for hay when in one-fourth bloom or when new shoots are one to two inches long. Use the bloom as a guide in dry weather and the new shoots when it is wet. Too early cutting reduces the stand. Too late cutting reduces feeding value. Bunch and stack before it gets too dry. From one to two tons of hay can be produced with alfalfa in rows if kept clean and handled properly.

Seed: Let the first crop go to seed. Keep free from weeds. Cut for seed when from 50 to 60 per cent of the pods have turned brown. Bunch
immediately after cutting and stack as soon as possible. A binder with pans attached for catching the pods has been used successfully in cutting row alfalfa for seed. In a dry year seed has been harvested with a combine. Many good seed crops have been blown away by strong winds when cut with a mower and not bunched and stacked immediately.

Stacking: If the seed crop is stacked on a board platform covered with burlap or canvas much seed will be saved.

Threshing: Combines or threshing machines can be set to thresh alfalfa seed, but a clover seed huller is more desirable.

Marketing: Alfalfa seed may be sold in the dirt to a seed house or sent to the Northern Montana Alfalfa Growers' Association at Glasgow, Montana, for cleaning, grading and marketing.

Pedigree Seed.—Farmers who wish to produce pedigreed seed must sow only Blue or Red Tag seed that is sold in sealed bags. Save the tags for a record of the origin of the seed. Pedigree alfalfa must be seeded on ground free from any other alfalfa. Sweet clover and dodder must be removed from the field before the alfalfa is cut. Copies of the rules of the Montana Seed Growers' Association for producing pedigreed seed may be secured from the county agent. Read and follow them.


Permanent Pasture

Every irrigated farm needs a few acres of permanent pasture close to the farm buildings. A good mixed pasture with proper management will carry two cows per acre all summer and there is little danger of bloat.

Soil: The Huntley Permanent Pasture Mixture will grow on any soil that will grow alfalfa or sweet clover providing it can be easily irrigated and drained. A good stand if properly managed will last indefinitely.

THE HUNTLEY PASTURE MIXTURE

<table>
<thead>
<tr>
<th>Varieties</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 seed can be purchased from state seed dealers at a cost of $3 to $6 per acre and may be mixed at home. Buy only inspected seed that is guaranteed free from quack grass or other noxious weeds.
Seed Bed: Prepare the land carefully for irrigation. A fine, firm seed bed is required the same as for alfalfa or sweet clover. Cultivate to kill weeds after they have been allowed to sprout.

When and How to Seed: Plant in May or June without a nurse crop in ground free from weeds. Mix grass seed thoroughly and seed through grain hopper. The clover should be seeded through the alfalfa seed attachment. Run all seed down grain spout and set drill to plant as shallow as possible. For heavier soils plant about 25 pounds of grain for nurse crop and remove for hay.

Irrigation: Proper irrigation is the most important factor in securing a good stand. Furrow out as soon as planted and irrigate immediately. Frequent light irrigations are necessary since most grasses are shallow rooted and cannot use subsoil moisture.

Weed Control: Frequent clipping may be necessary to prevent weed growth.

Management: Do not overstock the pasture or allow it to be grazed too closely before the sod is well established. Divide pastures for alternate grazing and irrigation to secure highest carrying capacity. Apply barnyard manure every few years, harrowing it in the spring to secure even distribution.

Sweet Clover

Irrigated Sweet Clover.—Sweet clover requirements as to soil, seed bed preparation, time and method of seeding, irrigation and nurse crop removal, are practically the same as for alfalfa. It can usually be grown

Figure 22.—Sweet Clover and Dairy Cows Have a Place on Rough Land
on heavier soil that contains more alkali and will stand more drought and excess water than alfalfa.

Varieties: Use Montana grown White or Yellow Blossom varieties. Yellow Blossom is preferred for pasture because it is finer stemmed, more leafy and more apt to reseed itself. White Blossom will yield more hay per acre but it is coarser and less leafy. It is preferred for short rotations where persistent seeding would be undesirable.

Rate of Seeding: Plant 10 to 15 pounds of clean seed per acre. Barley, wheat or oats may be planted as a nurse crop at the rate of one to one and one-half bushels per acre. In short rotations, such as grain, sweet clover, beets, use scarified seed to insure uniform germination. Unscarified seed is satisfactory for pasture plantings.

Sweet Clover on Bluejoint: Sweet clover may be disc drilled on well drained bluejoint sod in early spring the same as alfalfa.

Special Method on Heavy Soil: Apply manure to land in fall if possible and plow under. Plow in summer or fall and work down seed bed. Furrow out with beet cultivator or lister. Plant sweet clover broadcast as soon as snow is off in spring and apply frequent light irrigations. Do not work soil in spring.

Sweet Clover Hay.—Cut before bloom appears to save leaves and prevent stalks getting too coarse. For small fields, cut with grain binder and cure in long narrow shocks the same as oats. Large fields require regular haying methods. Sweet clover takes longer to cure than alfalfa because of a higher water content. Rake in windrows when partially wilted in the swath and cure in small bunches in order to save the leaves. One cannot be too careful in curing sweet clover hay. Second crop sweet clover grows from buds on the stem and not from the crown as does alfalfa. Therefore leave stubble six to ten inches high, depending on height of branches for producing second growth. Mouldy hay is dangerous to feed. In some instances the feeding of sweet clover hay has caused losses due to bleeding from the nose and internal hemorrhages. In such cases a change to other feeds should be made immediately. Calves should not be castrated or dehorned during the time sweet clover hay is fed or for a month or more after.

Plowing Sweet Clover.—A common practice is to plow the second crop under six to eight inches deep. Irrigate after plowing to supply moisture to insure decay of the crop.

Sweet Clover Pasture.—Do not pasture too closely the first year after the nurse crop is removed. Livestock may be turned in as soon as a good growth is established in the spring. Keep enough stock in the field to keep the growth in check. As a precaution against bloat, cattle and sheep should be given a full feed of dry roughage just before turning them on sweet clover the first time. There is less danger of bloat if the stock are pastured on sweet clover continuously. Salt and water should always be available. Any grains or grasses seeded with sweet clover helps to prevent bloat.
Sweet Clover for Seed.—When seed is desired the first crop usually is allowed to ripen. The crop should be harvested when about two-thirds of the seed pods have turned brown. A grain binder with pan attachments to catch the seed that shatters out is generally used in harvesting the seed crop.

Non-Irrigated Sweet Clover.—Follow same methods of seeding and handling crop as under irrigation with the following exceptions. Nurse Crop: Use only 20 to 30 pounds of wheat, oats or barley. Rate of Seeding: Seed five to seven pounds of scarified seed per acre and 10 to 12 pounds of unscarified seed. For spring seeding with a nurse crop use scarified seed. Unscarified seed is preferable for fall seeding.

Sweet Clover for Dry Land Pasture.—A good dry land pasture may be secured by seeding six pounds of yellow blossom sweet clover and four pounds of slender wheat grass.

Mix sweet clover and grass seed and plant with grain drill either with nurse crop or without. Seed early with nurse crop or after early June rains without nurse crop.

Bloat: There is some danger of bloat from pasturing sweet clover. In cases of bloat give cows one cup of kerosene mixed with one pint of milk; sheep one-fourth cup kerosene with one pint of milk. As a last resort cattle suffering from bloat may be given relief by making an opening in the pouch with a trocar.


Sugar Beets

Sugar beet production was started in Milk River Valley in 1925 and has now developed into one of the major farming enterprises of the irrigated farms. Sugar beets grown in rotation with alfalfa are not only a good cash crop but the beet by-products when fed to livestock as supplements to other feeds bring substantial returns. Only a comparatively small acreage of the land suitable for beet production is now under cultivation and a great opportunity awaits the farmers who desire a diversified type of agriculture where livestock can be produced and profitably fattened for market.

Selection of Land.—Select land that will grow potatoes, corn or alfalfa; that is fertile, level, well drained and which can be irrigated easily.

Rotation.—Sugar beets should be grown in rotations. Every rotation should include alfalfa or sweet clover and provide for the use of manure. The most desirable order of cropping is to follow alfalfa with one year of potatoes, corn or beans; then beets may be grown two or three years. Follow beets with wheat, oats or barley as a nurse crop for the new alfalfa which is to be left in four or five years.
Seed Bed Preparation.—Manure is best applied directly preceding beets at the rate of 10 tons per acre, preferably in the fall, and plowed under. If alfalfa or sweet clover is to be followed by beets plow under the second crop in August, pack firmly and irrigate. Work down in October and plow again eight to ten inches deep before freezing up. Leave land rough through the winter. Plow corn ground eight to ten inches deep in the fall after the crop is harvested. Leave rough for winter and, if dry, irrigate in fall or early spring. Duckfoot bean, potato or fallow ground to go into winter rough. Level with box float as soon as land can be worked in spring, drag with spike-tooth harrow, level and drag alternately once or twice more before seeding.

Seeding.—Adjust the drill so that the seed will be covered with approximately one and one-half inches of pressed soil. Plant 20 pounds seed per acre in rows 22 inches apart, using ditcher attachment. Plant beets April 15 to 30.

Irrigation.—Irrigate beets up if necessary. If a crust forms use a light home-made spike-harrow to bring the beets up. Clean out ditches and construct field laterals early so the beets may be irrigated promptly when recommended by the field man. Irrigate beets in furrows 35 to 40 rods long, allowing water to run in them two to three hours. Do not flood irrigate beets. Keep ground uniformly moist until harvest. Better irrigate too early than too late.
Thinning and Cultivation.—Cultivate beets as soon as they are up and at least once again before thinning. Thin beets to a 12-inch space between plants in the row when they reach the four-leaf stage. Select and leave the largest and most thrifty plants. Cultivate a third time when plants are established after thinning and continue weekly until leaves are too large to allow further cultivation. Weed one week after thinning to eliminate double plants and weeds in the rows.

Harvesting.—Harvest when recommended by the sugar company. Cooperate with the company field man. He can help to secure the largest returns per acre.


Certified Seed Potatoes

Production of certified seed potatoes is most practical on somewhat sandy, dry land farms less than ten miles from a railroad loading point. Only farmers willing and able to spend considerable time in following recommended practices in improving seed stock, planting, roguing and grading should attempt to raise certified seed potatoes.

How to Begin.—Secure foundation seed stock in September of the best known strain for five acres or less. Make application for certification before June 1 through the county agent’s office. Treat your potatoes for scab, using the hot formaldehyde or corrosive sublimate treatment.

Planting and Cultivation.—Plant seed potatoes on summer fallow that was plowed eight inches deep. Duckfoot the fallow four inches deep the following spring and work it down about May 1. Plant the potatoes between May 15 and June 1, about four inches deep. Pack the ground immediately after planting. Cultivate the potatoes shallow and keep them free from weeds by hoeing if necessary. Avoid cultivating close to the plants after blossoms have formed.

“Bugging.”—Kill bugs by dusting three parts of flour and one part arsenate of lead or eight parts flour and one part Paris Green on infested plants.

Roguing.—Remove weak and diseased plants.

Harvesting and Marketing.—Harvest between September 15 and October 1 if possible. Avoid cutting, bruising and skinning by rough handling Grade carefully and have at loading point for December or January delivery. Any farmer without adequate storage facilities should not consider raising certified seed potatoes.

Seed Selection.—Hill select 200 hills or more each fall and keep the potatoes from each hill separate in paper bags. Secure a tuber test for mosaic in December or January through the county agent’s office. Plan the mosaic-free hills in an isolated plot, at least 200 feet away from other potatoes, for the following year’s seed.
Planting and Harvesting Seed.—Tuber unit and hill unit the potatoes in your foundation seed plot. Save the rest of the seed plot tubers for a larger seed plot where all potatoes are planted tuber unit. This plot also should be at least 200 feet from other potato plants. Rogue both seed plots heavily. Save the potatoes from the second seed plot for each year's field planting. Thus, the farmer with 10 acres of potatoes should have a one-eighth acre plot of foundation seed planted by the hill unit or tuber unit method. He should also have a tuber united one-acre seed plot planted with seed grown the previous year in the foundation plot. This one-acre field furnishes the seed for the ten-acre field.

Potatoes Under Irrigation

A rich sandy loam soil with a good supply of decaying organic matter is best adapted for potato culture.

Practice crop rotation. Do not raise more than one crop of potatoes on the same land every four or five years in order to keep soil diseases down to a minimum.

Include alfalfa or some other legume in the rotation. If alfalfa is used less trouble will be encountered from volunteer alfalfa if grain is planted on alfalfa breaking. The land then should be fallowed and planted to potatoes the following year.

Figure 24.—Commercial and Certified Seed Potatoes from Northern Montana Have Gained Wide Recognition
Fall plow heavy land and plow again in the spring. Plow at least ten inches deep if the depth of soil will permit. Work up a fine seed bed before planting. If the soil is dry, irrigate before preparing seed bed.

Treat seed with a standard treatment before cutting and if the treatment is applied at least three weeks before planting quicker germination will be secured.

Use certified seed. Plant a good sized seed piece. Large seed pieces are not so likely to dry out and rot as small seed pieces, and larger sets normally occur when large seed pieces are planted.

Cover seed with about three to four inches of soil and firm the soil around the seed with a light packer. Space rows about three and one-half feet apart, and drop the seed about 10 to 12 inches apart in the row if soil is of good fertility.

Give at least one deep cultivation before the plants are up and level with a light spike-tooth harrow. Shallow cultivation should be practiced after the plants are a few inches high to avoid root pruning. Cultivate after each irrigation and after each rain of any consequence.

Furrow deeply enough and use a small enough stream to keep the water below the tuber set. Leave the water on long enough to soak the subsoil well. Keep soil moisture content as uniform as possible. Waiting until the plants begin to turn dark green before irrigating is delaying too long.

To irrigate up, furrow out so as to keep the water below the level of the seed piece. Avoid flooding at all times.

Build up a wide ridge to reduce sunburn and frost injury.

When harvesting, watch the digger and see that injuries are held to the minimum. Wooden crates and wooden stave baskets are preferable to wire baskets for picking purposes.

Build a well ventilated frost-proof storage cellar before time to harvest if good storage is lacking. Use small bins with ventilated sides and bottom. The ventilated false floor should be eight to ten inches above the main floor.

Thirty-six to thirty-eight degrees Fahrenheit is the right temperature for potatoes in storage throughout the winter months.

Store your own seed supply in crates.

Grade even more strictly than is required by grade standards.

Don't plunge, but hold to about the same acreage year after year if soil and other conditions are favorable for growing potatoes.

Field Beans

While field beans have not been grown extensively on the irrigated farms of the Milk River Valley or on the bench lands without irrigation, many farmers have grown them over a period of several years and it has
Figure 25.—Great Northern Beans Are a Promising Cash Crop

been found that they will ripen on an average of eight years out of ten. There are occasional years when early frost may injure the crop before the harvest season, especially on heavier soils.

Seed Bed.—Select a piece of good, medium sandy soil that is well drained and does not have too much alkali. Summer fallow on dry land is the best seed bed for beans. Early spring breaking, well cut up and packed, has given good results. Fall plow old land, leave it rough over winter, then work it down in the spring by diskimg and dragging with a spike-tooth harrow. Early spring plowing worked down immediately also makes a good seed bed for beans, especially if the moisture is down 18 inches or more when the land is plowed. Under irrigation fall or spring plowing may be irrigated, then worked down, after which no more irrigation is needed.

Seeding.—Beans should be planted about May 10. Plant beans in 22 to 32-inch rows and three inches apart in the rows under irrigation. Plant in 30 to 42-inch rows on dry land about 15 inches apart in the rows. An ordinary grain drill with some holes stopped up, or a corn planter may be used to plant beans. From 30 to 40 pounds of seed per acre are required on irrigated land and 14 pounds on dry land. The Great Northern bean is best adapted to northern Montana.

Cultivation.—Harrow beans before they are up, then shallow cultivate as needed to control weeds and prevent crusting of land. Do not culti-
rate when wet or after beans have started to blossom. Hoe weeds in rows and do not let the weeds get ahead of the beans. Irrigate beans once, if necessary, when in blossom to insure heavy set.

Harvesting.—Harvest when the majority of the pods have turned yellow. Do not wait till the pods are dry and mature. Harvest with a regular bean harvester or pull by hand. Bunch with forks after harvesting and leave in bunches till thoroughly dry. Stack by placing two feet of straw on the ground, and finish stack with straw. Thresh with regular bean huller or use threshing machine with half of cylinder teeth and with only one row of concave teeth. Run cylinder 300 to 400 revolutions per minute but the rest of the machine at normal speed. Do not run beans through the cylinder the second time. Clean, hand pick and sack in new clean sacks for market.

The Farm Garden

A good garden is necessary on every farm to furnish food for the family. Trees planted on the north, south and west sides of the garden will improve conditions. Trees on the north and west will catch snow in winter and those on the west and south will check the drying winds of summer. There should be at least two rows of trees.

Dry Land Garden.—Manure one-half of garden with well rotted manure and fallow each year. Make several plantings of each crop, when possible, to provide vegetables throughout the season. Plant a few radish seeds in rows of slow-growing plants to make cultivation possible. Shallow cultivate often to control weeds.

Irrigated Gardens.—Plant adapted varieties of berries and fruits where they will be protected. Vegetables may be planted near the fruit trees and bushes or with beets or other row crops. The advantage of planting in the field with row crops is that there are fewer weeds, the land is manured and fall plowed, and irrigated in the fall or spring with no extra labor. There will be some extra work to prepare a firm seed bed. The vegetables should be planted in rows the same distance apart as the other plants in the field so that all may be cultivated and furrow-out with the same implements. Frequent shallow cultivations will control weeds and retain moisture. Furrow-out and irrigate often enough to keep plants growing rapidly. Cultivate as soon as possible after each irrigation.

If a good well is available and land slopes away from the well, the garden may be given some irrigation even on dry land. A large tank should be built with a two to three-inch opening at the bottom. Fill the tank with water with a windmill or engine. Let the water get warm and irrigate the garden as often as possible. Strawberries, raspberries, celery, tomatoes and other crops should be irrigated frequently. Use plenty of well-rotted manure for all garden plots.

Garden on Sod.—Plow the sod six to eight inches deep in the spring, pack well by disk ing to cut up the sod immediately after breaking. This
is not very satisfactory in a dry year but half of the breaking can be left over for the following year. Select flood irrigated land if possible and break in the fall or early spring to get one good flooding before working down.

**Plant Diseases and Insect Pests**

*Potato Scab and Rhizoctonia.*—There are two methods of treating potatoes for scab and Rhizoctonia but in either case it is best to pre-soak tubers 48 hours before treating.

**Corrosive Sublimate Treatment.**—Use only wooden or earthenware containers. Dissolve four ounces of corrosive sublimate in several quarts hot water. Add enough water to bring the quantity up to 30 gallons. Soak potatoes in solution for 30 minutes if pre-soaked and one and one-half hours if not, and then spread out to dry. Add one-quarter to two-fifths ounce of dissolved corrosive sublimate after each six bushels treated and keep the volume up to 30 gallons. A fresh solution should be made after treating 50 bushels of potatoes. Keep treated tubers in disinfected or clean containers. Potatoes treated with corrosive sublimate are poisonous.

**Hot Formaldehyde Treatment.**—Use two pints formalin (40% formaldehyde) to 30 gallons water. Heat solution to from 122 degrees to 126 degrees Fahrenheit. Leave tubers in solution for four minutes.
Damping Off.—Plants in window boxes or hot beds often wilt and die. Cover soil with one-sixth inch of sand, thin out plants and do not use too much water.

Plant Lice.—Spray with nicotine sulphate, commercial kerosene emulsion or soap suds made from one cubic inch of laundry soap to one quart of hot rain water and then cooled. Use two quarts of water for young tender plants.

Cutworms.—Put paper collars around each plant. Poison with mixture of two level tablespoonsfuls of Paris Green, five pounds of bran, five quarts of water and one-half pint of syrup mixed. Let stand from morning till evening, then scatter lightly around plants. Keep poison away from poultry and livestock. The pale western cutworm cannot be controlled with poison bait.

Grasshoppers.—Use cutworm poison or get grasshopper poison from county agent’s office.

Leaf Hoppers and Flea Beetles.—Spray with Bordeaux mixture or nicotine sulphate. For flea beetles add arsenate of lead to the Bordeaux mixture.

Cabbage Worms and Potato Bugs.—Dust plants with one part lead arsenate mixed with three parts hydrated lime or five parts flour; or one part Paris Green with seven parts hydrated lime or flour.

Blossom End Rot in Tomatoes.—Keep ground well irrigated. Use lots of barnyard manure where tomatoes are to be planted.

Dandelions on Lawns.—Sprinkle lawns with ammonium sulphate in spring and fall for two or three years. Caution: Do not use more than the specified amount and keep uniformly moist. One pound to about 250 square feet usually is sufficient.

Insecticides.—Determine whether your plants are being injured by chewing insects or sucking insects. Two classes of insecticides are used for controlling insects, stomach poisons and contact poisons. Stomach poisons, such as lead arsenate, lime arsenate, and Paris Green, are used for all insects which injure plants by chewing the leaves or stems such as striped cucumber beetles and potato beetles. Contact poisons, such as kerosene emulsion and nicotine sulphate, which kill by touching the insects, are used for sucking insects like plant lice and squash bugs. Stomach poisons are of no value for sucking insects.

Shelterbelts for Every Farmstead

A shelterbelt not only adds beauty and value to a farm but is very necessary in establishing small fruit trees and gardens. Make an application for a government shelterbelt through the county agent’s office from one to two years before planting. Plant the shelterbelt to protect the buildings from the prevailing winds, leaving from 100 to 200 feet open
space for a garden, small fruits or a later planting of evergreens. Plow
old ground from seven to ten inches deep before May 25 the year before
planting trees. Cultivate three inches deep about June 15, July 1, August
1, and October 1. Keep the surface clean and cloddy. Break sod three
or four inches deep, disk and drag four to six times during the summer.
Backset seven to eight inches the following spring and fallow like old
ground. Sod must be cultivated and kept free of weeds two years before
trees are planted for the best results. Trees should be planted in rows
12 to 16 feet apart and from six to eight feet apart in the rows. Caragana
should be planted three feet apart in the row and placed along the outer
edge of the belt. Plant trees early in the spring as soon as the ground
is in good condition to work. Keep the roots of the trees moist at all
times until planted. When ready to plant, plow a furrow as deep as pos-
sible and plow back in the same furrow to have furrow 14 to 16 inches
deep. Take trees out of moist package and plant in bottom of furrow.
Pack ground firmly around roots. Plant one row at a time and do not
let soil or roots get dry when planting. Keep trees cultivated and clean.
Do not mulch trees except upon advice of county agent.

Recommended varieties.—The following varieties are recommended for
dry land planting: Caragana, Box Elder, American Elm, Green Ash, Chi-
inese Elm, Jack Pine, Yellow Pine, Scotch Pine, and Blue Spruce.

Recommended varieties for irrigated land include all of those sug-
gested for dry land plus Northwest Poplar, Native Poplar, Willows.

Adapted Bush and Tree Fruits.—The recommendations are for dry land
only where a shelterbelt has been planted on the west, north and south
sides of ground to catch snow and protect fruit from winds. Under irri-
gation a shelterbelt is not an essential but is desirable for a windbreak. The
varieties are listed in the order of their importance:

Apples: Wealthy, Duchess, Transparent, Tetofsky. Currants: Red
Dutch, Fay’s Prolific, Perfection, White Dutch, White Grape. Crab Ap-
Gooseberries: Houghton, Industry, Oregon. Grapes: Beta, Janesville,
Suelter, Alpha. Plums: Hanska, Waneta, Opata, Sapa. Raspberries:
Olta, Sunbeam, Latham, Herbert. Strawberries: Progressive Everbearer
(irrigated), Dunlap (dry land).

The Livestock Industry

Beef Cattle

Beef cattle production is one of the leading ranch enterprises in north-
ern Montana. The many irrigated valleys with adjacent ranges and pas-
tures of native grass offer excellent conditions for the production of grass-
fat two and three-year-old steers or the production of feeder calves or
yearlings. A large investment in buildings and equipment is not required. Corrals, chutes, “squeezes,” brush bottom winter lots, and some fences are practically all that are necessary for this enterprise. Range land may be purchased or leased.

The strictly beef cattle rancher should have a minimum of 100 head of cows together with his growing stock. Some of the larger outfits run from 500 to 1000 head of cows. These ranchers grow enough roughage to winter their cows and young stuff, or about one ton per head. Oat hay, alfalfa, and bluejoint are the most common feeds. It is not necessary to grow grain for this type of ranching. Whether the cattleman markets his surplus as two or three-year-olds, yearlings, or calves depends on the size of the outfit, the winter feed supply, and the type, amount, and value of the grazing land.

Many cattle ranchers who live in sections where the rainfall is higher than the average and where the topography and character of the soil permit, grow wheat as a cash crop. The straw is used to winter the cattle and is fed to advantage in combination with limited amounts of hay or cottonseed cake. These ranchers usually market their cattle as calves or yearlings. Smaller herds are the rule in this group and they are usually handled in large pastures or under semi-range conditions.

On the irrigated ranches in the valleys, beef cattle production has an important place in a diversified ranching program. Small herds of beef cows can produce calves for baby beef production.

On irrigated ranches where a surplus of feed crops are produced, the fattening of calves or yearling steers for market will afford a sale for feed crops at good prices. In the sugar beet districts beet tops, beet pulp and beet molasses can be fed profitably in combination with home grown feeds, provided correct feed combinations are used.

No large area in the Northwest offers greater opportunities for all phases of beef production than does northern Montana. Range beef cattle production, including grass-fat and feeder cattle, combination cattle and grain ranches for the production of feeder cattle, intensified beef production on irrigated ranches, and the fattening of cattle for market, all have their place in this area.

Information on the feeding and management of beef cattle is given in the following bulletins which may be obtained from your county agricultural agent or by writing to the Montana Agricultural Experiment Station, Bozeman, Montana, and the United States Department of Agriculture, Washington, D. C.:

Sheep Production

The sheep industry is the second largest livestock industry in Montana. The raising of beef cattle holds first place. Some idea as to how successfully sheep can be raised in Montana can be had by comparing the sheep industry of Montana with that of other states. Montana ranks third among the various states in numbers of sheep, second in wool production, and the United States Department of Agriculture gives a very high average value to Montana sheep as compared with those of other states.

The sheep industry of the state is divided into three distinct branches. The most important branch is the production of range sheep that are handled in bands of 1,200 head or over. The second is the handling of farm flocks, under fence. The third branch is the fattening of lambs for market.

In the range sheep business fine wooled sheep of Rambouillet breeding predominate. In northern Montana an average wool clip of nine pounds can be had together with a seventy-five per cent lamb crop of sixty-five pound feeder lambs. Range ewes last until about six years of age and are then sold for use in farm flocks or fattened for market on beet pulp. Feed requirements for range sheep in north central and northeastern Montana vary greatly. Where winter grazing is available, ewes can be wintered with a very limited amount of hay but with some cottonseed cake fed in addition to the grass. The following figures will give the prospective sheepmen some idea as to expense, income, and other interesting factors in connection with the range sheep business in northern Montana. These

Figure 28.—A Good Type of Lambing Shed in Northern Montana
figures are taken from a survey conducted by the Montana Experiment Station for the year 1928.

The feed requirements per head were 235 pounds of hay, 8 pounds of cottonseed cake or 24 pounds of grain, and four acres of range that was leased at 15 cents per acre. The average death loss was five and one-half per cent. The lambs weighed an average of 65 pounds, and a 65 per cent lamb crop was marketed. The fleece weight was exactly nine pounds. Fifty-four per cent of the land used was leased.

The financial side of the range sheep business is told in the following story. The average total investment per head was $23.00. The average total expense was $5.15 and the gross income, $7.33, leaving a net income per head of $2.18.

On the small farms or irrigated places some sheep are run under fence, usually as a side line to some other major farming enterprise. Sheep in this way can be given extra care and feed and, of course, a larger lamb crop will result. In handling a farm flock of sheep, a good opportunity is afforded for feeding the lambs grain in creeps during the summer months and getting them finished and ready for the early market. Mutton-type rams are ordinarily used in farm flocks.

With the development of the sugar beet industry in Montana, the fattening of range lambs on beet pulp is practiced rather extensively. These lambs are put into the feed lot at an average weight of about 60 pounds, are fed about 90 days, and are sold weighing about 90 pounds. Beet pulp and alfalfa hay furnish the basis for a good fattening ration. Wheat is the best Montana-grown grain to use with this combination of feeds for producing fat lambs.

Figure 29.—Beet Pulp and Alfalfa Are Used in Rations for Fattening Old Ewes
The above discussion covers only the high spots of Montana's sheep industry. The following bulletins and circulars furnish valuable additional information and may be obtained from the Montana Agricultural Experiment Station, Bozeman, or from the county agent:


The cost of running range sheep in Montana and the income derived from them as well as the amount of feed fed, acres of range used, death loss, and many other interesting factors are discussed in two publications which may be obtained from the county agent or from the Montana Agricultural Experiment Station, Bozeman. These publications are a report on the range sheep industry for 1928 and tabulation of 70 sheep ranches.

**Dairying in Northern Montana**

The irrigated districts are very well adapted to the economical production of dairy products. Dairying should, therefore, occupy a large place on many of the smaller irrigated farms. It may be the major source of income together with the production of hogs, poultry, and sugar beets, or dairying may be secondary to other farm enterprises.

The greatest returns will be obtained from dairying if alfalfa hay and irrigated or sub-irrigated pasture furnish the basis of the dairy ration. Choice alfalfa hay, which may be produced in large quantities, together with the common small grains such as wheat, barley, corn, and oats, make excellent winter feeds for producing and growing animals. Beet tops and wet beet pulp also may be economically used in limited amounts with the hay and grains. Available home-grown feeds if properly used will give a very low cost of production. Good irrigated or sub-irrigated grass pastures give the best results in summer. These pastures, when well established and properly managed, will carry at the rate of one and one-half to two cows per acre most of the summer.

A herd of large, well-developed grade cows of any of the leading dairy breeds, under good farm conditions, when fed upon home-grown feeds, should produce an average of 250 to 300 pounds of butterfat annually.

Elaborate and expensive barns are not necessary. Comfortable, sanitary, and convenient barns often can be obtained by remodelling older buildings.
On the dry land farms conditions are not so favorable for dairying as far as the feed supply is concerned. Sweet clover hay or sweet clover hay supplemented with cereal hays, corn fodder, or prairie hay, will perhaps give the best results unless alfalfa hay is available. In most seasons sweet clover will also give good results if grown for pasture purposes. To insure against a year or drought it is well to carry over a feed supply from the more productive years. Dual purpose cattle are generally preferable on dry land farms where the feed supply and conditions are not conducive to maximum production. Steers and surplus stock can utilize the cheap grazing land and such cheap feeds as straw to better advantage than the specialized dairy cattle.

For details on the feeding, breeding, care and management of dairy cattle the following circulars and bulletins may be obtained through the county agent's office or by writing to the Montana Experiment Station, Bozeman, or from the United States Department of Agriculture:


Swine Management

Hogs are successfully raised and fattened in Montana as secondary enterprises on irrigated farms or wheat farms. When raised in small numbers cost of production can be kept at a minimum because by-products
such as skim milk or wheat in stubble can be utilized. Alfalfa or sweet clover pastures are maintained for growing spring pigs from weaning time until fall when they can be fattened on new grain or in flint corn fields. If good rations are fed, pigs can be forced from birth to market weight in six months.

The system recommended for the production of market hogs is to sell the sows each year, save gilts for breeding purposes, and raise one litter per year.

Wheat, frosted wheat, hull-less barley, rye, and hulled barley with alfalfa hay as a supplement, are the feeds best adapted for growing and fattening.

At the present time pork producers have the advantage of western markets which often pay higher prices for fat hogs than eastern markets.

Information on the feeding and management of hogs is presented in the following publications which may be obtained from your county agricultural agent or by writing to the Montana Agricultural Experiment Station, Bozeman, or the United States Department of Agriculture, Washington, D. C.:

Poultry Production

Poultry is essential on every farm as part of the family living. Fall and winter eggs are worth from three to five times as much as spring and summer eggs. Farmers ten miles or more from market will find the production of turkeys or capons more practical than the production of market eggs. Where turkeys are the main poultry income only enough early pullets should be kept to supply meat and eggs for home use. Where turkeys and chickens are raised the chickens should be kept in confinement and the turkeys given the range. Standard weight breeding stock of good vigor and vitality, early hatching, right care and feeding, sanitation and proper housing are the important factors.

Production of Market Eggs.—For successful poultry production the equipment should include brooder, Montana brooder house, Montana type poultry house, mash hoppers, grit and oyster shell shelf feeder, drinking fountains, alfalfa near the chicken and brooder houses for summer forage. Book orders for 300 good baby chicks December 1 for April or May delivery. Avoid cheap chicks of unknown breeding. Secure brooding and feeding chart from county agent's office before April 1 and follow instructions. Use a 500-chick stove pipe brooder for 250 chicks and 1,000-chick brooder for 400 chicks. Sell, can, or caponize cockerels before July 15. From 30 to 40 cents a pound for cockerels at this time is more profitable than 10 cents later. Push pullets for early maturity to produce fall and winter eggs. Cull the pullets and place the good ones in a Montana type poultry house September 1.

Feed the following ration for egg production: Ground grain mash; 200 pounds mill run or bran and shorts, 100 pounds ground barley, 100 pounds ground oats, 100 pounds meat scrap. If meat scrap is not included in the mash feed four gallons milk daily per 100 hens; whole grain—wheat 50 per cent, barley 25 per cent, oats 25 per cent; green feed; warm water; oyster shell, and grit.

Do not keep old hens, roosters, or cull pullets over winter. Produce infertile eggs and market them at least once a week. Cull the hens in June of the second year. Market the culls and, under some conditions, all the old hens.

Production of Hatching Eggs.—This enterprise should be undertaken only by those willing to make a specialty of producing breeding stock. The hatching egg flock should be handled the same as the market egg flock up to culling time except that a better grade of chicks should be used. After culling in June, save the good hens for the production of hatching eggs the next spring. Keep the hens separate from the pullets. Have the flock of hens inspected for quality and tested for white diarrhea before December 15. Make arrangements to sell hatching eggs to a hatchery.

Production of Capons.—Use only dual purpose or meat breeds for capons. Caponize all cockerels in June and July. Purchase enough extra cockerels to have from two to three hundred. Keep capons separate from
other chickens. Feed them all the growing feeds they will eat until fully grown or until they weigh seven pounds or over. Feed fattening ration from two to four weeks before dressing. Dress and pack capons for market as outlined in F. B. 849 on Capons and Caponizing.

A Few Don'ts.—Do not attempt any of the above methods without the proper equipment and feed to raise chickens at a profit.

Do not waste feed on a bunch of overgrown cockerels, cull hens and poorly developed pullets but do not skimp on feed for the early, well matured pullets that will produce fall and winter eggs. Liberal feeding is not an expense but an investment.

Do not raise chickens and turkeys on the same ground.

For more detailed information on making poultry pay organize a women's poultry club or a 4-H poultry club and discuss each month the latest poultry information as outlined by county agents for use in clubs.

Turkey Production

Montana produces high quality turkeys that bring a premium on the market. Climatic conditions, high protein feed and reasonable freedom from disease make turkey raising desirable. The growing of good turkeys is a paying sideline for any farm but it must be borne in mind that farmers who are not equipped to handle turkeys and who raise mostly No. 2 birds lose money.

Successful turkey production requires healthy, vigorous breeding stock, plenty of good feed, and proper equipment. Turkeys do better where they have plenty of range and fresh water and where they do not come in contact with chickens. Where turkeys are grown in large numbers artificial incubation and brooding are practiced. The poults should not be kept on the same ground continuously but should be moved to clean grounds at least once each month. Brooder houses and roosting sheds should also be moved and kept clean.
Breeding Stock.—Have 10 to 12 old turkey hens weighing 18 to 20 pounds or pullets weighing over 15 pounds and one young tom weighing 25 pounds or over on January 1. An old tom may be mated with eight pullets or hens. Avoid inbreeding. Breed for early maturity as well as size. See bulletin, “Turkeys in Montana,” for standard weights of the different breeds.

Feeding Breeding Stock.—During the winter feed the grain and mash recommended for laying hens but omit the meat scrap. Feed lightly morning and evening to keep stock in growing condition without getting fat.

During the breeding season feed grain and the following laying mash or one of equal value: 20 pounds of ground yellow corn; 20 pounds of ground oats; 10 pounds of mineral mixture; 30 pounds of mill run or ground wheat; 20 pounds of meat scrap; 1 or 2 pints of cod liver oil (March and April); alfalfa in wire racks or steamed alfalfa leaves.

The mineral mixture is made as follows: 6.5 pounds of bone meal; 2 pounds of oyster shell, and 1.5 pounds of iodized salt.

Deworming.—Deworm turkey breeding stock as necessary and especially before the egg laying period in January or February. To remove tape worms feed one 10-grain Kamala tablet in the evening to each grown bird or a five-grain tablet to young birds. (Caution: Try the Kamala treatment on only one or two birds at first since badly tapeworm infested birds are killed with this treatment. Give half dose at different times to weak birds.)

Feed commercial nicotine sulphate capsules to remove round worms.

Hatching.—Gather the eggs before they chill and keep them at a temperature of 50 to 60 degrees, Fahrenheit. Turn eggs daily to prevent “stuck germs.” Do not hold eggs over ten days before incubating.

Early hatching is necessary to produce No. 1 birds. Hatch in incubator or set turkey hen on a nest made on the ground. Let the hen set on “dummy” eggs two or three days before giving her the turkey eggs.

Care of Poults.—Follow methods recommended in Montana Extension Service Bulletin 101 on “Turkeys in Montana,” which may be secured from the county agent’s office. Turkeys should be well fed and grown out in order that they may be finished by marketing time.

Fattening.—Do not start fattening turkeys before they are fully grown. For fattening feed a mixture of 75 per cent wheat and 25 per cent of other grains, such as oats, corn or barley, together with skim milk. In the absence of skim milk 20 per cent of the ration should consist of high grade meat scrap. If the grain in the ration is ground its efficiency will be increased. Do not confine turkeys when fattening. Feed at all times in troughs and feed several times each day.

Marketing.—Delay marketing until turkeys are of sufficient size and carry enough flesh to grade No. 1. Market through cooperative association or other reliable marketing organization.

Bee Keeping

Milk River Valley with its bountiful sweet clover offers good possibilities for commercial bee keeping. However, until the sweet clover acreage of the valley is increased, from 50 to 100 colonies is the maximum that any single apiary will support.

Backyard bee keeping is not practical because the average man lacks time, knowledge, enthusiasm and the incentive to attend to the little details which are so essential to success. Very few backyard bee keepers can produce honey as economically as it can be purchased from the large operator.

Prospective bee keepers should get in touch with the Northern Montana Bee Keepers’ Association, Malta, Montana, the county agent, or the State Apiarist at Bozeman, for information on possibilities and desirable locations for commercial apiaries.

Spring Handling.—Bees are taken out of the cellar when the first blossoms appear on the willows, usually about April 1 to 10, or sooner if the bees become restless. Hives are placed facing east or south.

On the first warm day examine each hive and see that there is a queen present and from four to five frames of honey to supply feed till nectar flow starts. Supply sugar syrup (half sugar, half water) when extra feed is needed. Unite queenless hives with weak colonies that have queens.

Adding Supers.—Arrange to have at least four extra supers ready for each hive of bees before the honey flow starts on June 20.
After June 1 each hive must be inspected at least every 10 days to ensure plenty of room for honey storage and brood rearing. Queen cells should be destroyed to reduce swarming. Also check for foul brood.

Add one super complete with frames above queen excluder of each hive as soon as bees require more room and add extra supers as needed. Any new supers added should go next to the queen excluder.

Increasing colonies.—Bee keepers desiring to start with package bees should have them arrive not later than the first week in May. Two pound packages are recommended. Follow instructions accompanying packages. To make increase from full colonies after the main flow has started, a simple method is to take two or three frames of young brood, with adhering bees from the old colony, being careful not to take the old queen. Set these frames of brood in a new hive and fill the remainder of space with foundation or comb. The bees will raise a young queen from the young brood. If this division is made a week after the main honey flow has well started the increase will build up for winter both in bees and honey with little or no attention.

Equipment.—Bee keepers should use standard equipment and must use hives with removable frames to comply with state laws. Everyone keeping bees must secure a certificate of registration by making application to the State Bee Inspector, Bozeman, Montana. It will take approximately $2,500 to equip and handle 100 hives of bees.

Honey Harvest and Storage.—Honey is removed about September 1 or when cells are three-quarters capped and taken to a sanitary honey house and extracted with modern equipment.

See that each colony has not less than 50 pounds of honey for winter feed. Store in a dark, dry, well ventilated cellar with a temperature of 40 to 45 degrees after they have ceased rearing brood, which is from November 5 to 15.

References: F. B. 447—Bees; F. B. No. 1014—Wintering Bees in Cellars; F. B. No. 1198—Swarm Control; F. B. No. 653—Honey and Its Uses in the Home.
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