

PASTURE PLANTS *and* COMBINATIONS

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Guideposts to Good Pasture

On most farms, good pasture is unequalled when it comes to supplying the best feed at the lowest cost. Luxuriant pasture is appetizing and succulent, rich in protein, minerals, and vitamins.

Four inches or more of dense, leafy growth, including legume and grass plants, makes a choice pasture.

Animals on pasture gather their own feed, produce milk and meat at the lowest cost, and can take advantage of sunshine and open air.

Pasture often yields greater net returns than other field crops while at the same time the risk from hail, lodging, plant diseases, and other causes is greatly reduced.

Supplementary pastures will provide an abundant growth of green feed through the summer months when permanent pastures are usually dormant. Sudan grass, winter rye, and small grains are good supplementary pasture crops.

Combinations of legumes and grasses are usually better than legumes or grasses alone. Mixtures usually result in better stands and afford a greater variety of forage for the animals.

Three important types of pasture are discussed in this bulletin—permanent, rotation, and supplementary pastures. Most farms should include all three.

Overgrazing, turning out too early in the spring, and pasturing late in the fall are important factors in causing low-producing pastures. *Alfalfa* especially will not stand close grazing.

A well-prepared seedbed saves seed and helps obtain a good catch. The seedbed should be smooth, firm, and mellow.

Permanent pastures may be improved by moderate grazing, the application of barnyard manure, cutting weeds, and by re-seeding thin spots very early in the spring.

Thin stands of grasses or legumes can be improved for one year by seeding in winter rye in the fall or small grains early in the spring. This will permit the use of the pasture for one year without plowing.

Pasture Plants and Combinations

Ralph F. Crim and A. C. Army

ON most farms, good pasture is unequalled when it comes to supplying the best feed at the lowest cost. Besides being palatable and succulent, luxurious pasture is unexcelled in food nutrients, rich in digestible protein, mineral matter, and vitamins.

An ideal pasture is one with four inches or more of dense, leafy growth, about half legumes and half desirable grass plants. On this kind of pasture, an animal can gather plenty of feed by grazing 8 or 10 hours and have the remainder of the 24 hours for rest. On such a pasture, a good dairy cow will maintain her body weight and produce a pound of butterfat a day without additional feeding. A beef animal will gain a pound or more a day. Sheep and lambs and other livestock make very satisfactory gains on pasture alone.



FIG. 1. A sweet clover pasture in southwestern Minnesota in July—abundant feed, contented cattle, economical gains

Animals on pasture gather their own feed, produce meat or milk at a low cost, and enjoy the most favorable conditions for maintaining health. Pasture gives the farmer little concern about the occurrence of a hail storm, plant diseases, lodging, and other problems connected with crop production. The net returns from good pasture and good livestock will usually exceed the returns from land growing other crops.

GREEN FEED FOR THE WHOLE GROWING SEASON

Few farmers take full advantage of the benefits obtainable by having abundant pasture throughout the growing season. Through lack of planning, many farms are short of good feed at various times during the growing season, especially during July and August. Adequate planning along the line suggested by the accompanying chart would insure liberal pasturage at all times.

A well-planned pasture program should include permanent, rotation, and supplementary pastures planned to meet the livestock requirements of the farm. The rotation and supplementary pasture should be planned around the permanent pasture taken as a base. The farmer can arrange to have supplementary pastures to provide additional feed, furnish pasture early and late in the season, and fill in when the permanent pastures become dormant in hot, dry weather.

The chart on the opposite page indicates the periods when the different pasture crops or combinations are most productive and should be an aid in planning for green feed throughout the growing season. All of the crops and mixtures are discussed later in this bulletin.

The heavy bars indicate the periods of heavy growth when the best grazing is obtained. The slender bars indicate periods of low production. Most of the legume grass mixtures given make their heaviest growth early in the season. Sudan grass, reed canary grass, second-crop alfalfa, and spring-seeded sweet clover produce well during July and August when permanent pastures are dormant. Winter rye can be utilized in the early spring and fall, and small grains can be used from late May to July or whenever they are most needed. (See figure 2.)

GRASSES SUITABLE FOR PASTURE

Kentucky Bluegrass

Kentucky bluegrass, *Poa pratensis*, commonly known as June grass, is a long-lived perennial widely used in Minnesota under varied conditions of soil and rainfall as a pasture and lawn grass. This grass spreads both by seed and creeping underground stems. It blooms but once each season. In Minnesota, it blooms the latter part of May and early June. Kentucky bluegrass is markedly resistant to cold but usually does not produce much growth during the hot, dry months of July and August. It does best on productive soils where rainfall is liberal. In pastures that have stood for a few years, it is usually the predominating grass. A small amount of Kentucky bluegrass seed forms a valuable part of permanent pasture mixtures.

Kentucky bluegrass should not be confused with Canada bluegrass which is inferior as a pasture plant. Canada bluegrass stems are wiry and flat, the leaves are shorter, broader, and more bluish-green in color than those of Kentucky bluegrass. It is difficult to

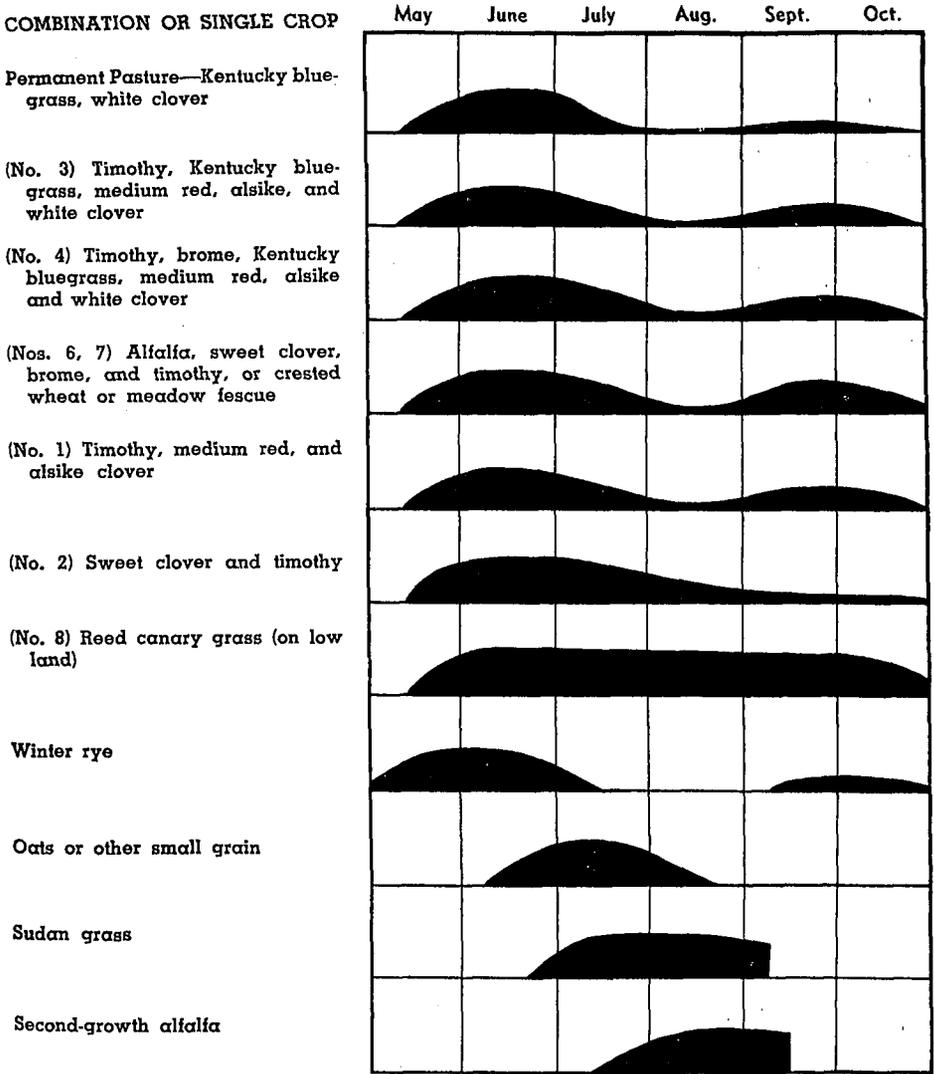


FIG. 2. Pasture combinations and approximate production through the growing season
 Combinations and crops listed in the above chart are discussed and seeding rates are given on page 13.

distinguish seed of the two kinds, so Kentucky bluegrass seed is frequently adulterated with Canada bluegrass, which is cheaper.

Brome Grass

Brome grass, *Bromus inermis*, is a long-lived perennial highly resistant to cold and drouth. Adapted to regions of moderate and heavy rainfall, it prefers rich clay loam but succeeds well on sandy soils. As a pasture plant, it stands tramping and grazing well, is very palatable, and grows early in the spring and late in the fall, going through a dormant period during July and August. It is valuable for mixing with suitable legumes and other grasses for use as a permanent or rotation pasture. Brome grass develops an extensive root system that penetrates the soil deeply. When seeded alone, after three or four years, it usually becomes sodbound. This condition may be delayed materially by seeding a legume with it.

Timothy

Timothy, *Phleum pratensis*, is a distinctly northern grass and does not spread by underground stems as do Kentucky bluegrass and brome grass. It has a wide range of adaptation, may be seeded for hay and pasture purposes, and fits well in rotations. It is very resistant to cold, produces well, and catches easily. Seed is usually available at low prices. Timothy can be used satisfactorily with other pasture and hay plants in mixtures, and it stands tramping and grazing very well. It thrives on moderately acid soil. Timothy is not usually long-lived and will gradually give way to Kentucky bluegrass and other grasses.

Reed Canary Grass

Reed canary grass, *Phalaris arundinacea*, is one of the common forage crops and will thrive well on highly productive, low, mucky, and properly fertilized peat soils. Reed canary grass



FIG. 3. A productive reed canary grass pasture

is a long-lived perennial, native in the state, and is most valuable for pasturing on low lands, where the soil is productive but too wet for tillage. This grass will also thrive on well-drained mineral soils, but may not excel brome grass on the drier mineral soils. A covering of water in the spring or for brief periods during other times of the year does not injure it. After it has formed a dense sod on wet bogs, animals will not break through. Growth begins early in the spring and continues until late in the fall. It produces abundant, nutritious pasture, and it stands grazing and tramping well but on most peat soils must be fertilized to produce palatable, nutritious feed. Unlike timothy, bluegrass, and brome grass, it produces an abundance of pasture during July and August largely because it is commonly grown on low lands. On land that is not extremely wet, reed canary grass may be used with legumes in pasture mixtures.

Crested Wheat Grass

Crested wheat grass, *Agropyron cristatum*, is a native of the plains of Russia and Siberia. Introduced into the United States as early as 1898, it is becoming popular in the Great Plains area of North America. It is a long-lived perennial, very hardy, and stands drouth well, being able to make quick recovery after rain comes on. Growth starts early and continues late, making an excellent early spring and late fall pasture. Like timothy and brome grass, it usually remains rather dormant during the summer months, especially when hot and dry. It stands grazing and tramping well and appears to have possibilities in mixtures with alfalfa and sweet clover in the drier areas of the state. The Fairway strain of crested

wheat grass has proved more satisfactory than commercial strains. Crested wheat grass is relatively new in Minnesota and its possibilities and behavior are still being studied by the Minnesota Experiment Station.

Meadow Fescue

Meadow fescue, *Festuca elatior*, is as well adapted for grazing in Minnesota as timothy. Like timothy, it is a perennial having no rhizomes. Meadow fescue plants are more leafy at their bases than timothy plants. This makes the crop well suited for pasture, although it is also a good hay and seed producer. When grown at the Crookston Experiment Station in the Red River Valley in combination with alfalfa, meadow fescue has proved more satisfactory as a pasture and hay plant than timothy. Northern-grown seed should be used in Minnesota.

Sudan Grass

Sudan grass, *Andropogon sorghum* var., is an annual plant belonging to the sorghum family that produces abundantly during the warmest and driest part of the growing season, a feature that makes Sudan grass outstanding as a supplementary pasture crop. This grass does best on fertile soil in good tilth, but even on poor soil it may do better than some other annual grass crops. The grass is well adapted to the corn-growing area of Minnesota when there is sufficient rainfall and favorable growing weather. Being a warm-weather crop, it is not well adapted in areas where corn does not make a satisfactory crop. Like other sorghum plants, Sudan grass has the ability to go into a semidormant stage during drouth and then revive quickly with sufficient rainfall.

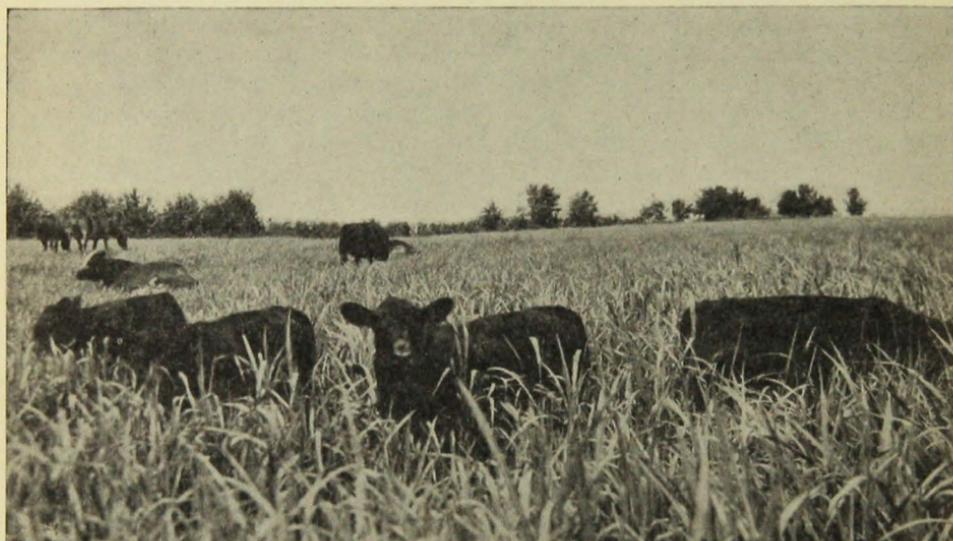


FIG. 4. A Sudan grass pasture produces abundantly during July and August

A good Sudan grass pasture will usually carry two cows per acre. Seeding should be done on a well-prepared seedbed from the middle of May to early June. The rate of seeding should range from 25 to 30 pounds per acre. It is not advisable to seed in Minnesota ahead of corn-planting time as this crop does not thrive in cold soil. Under certain conditions, animals pastured on Sudan grass may be poisoned by the presence of prussic acid. Since this is most likely to happen in the early stages of growth, pasturing should not begin until the plants have reached a height of 16 to 18 inches. It is also wise to avoid pasturing Sudan grass that is stunted by drouth or frost, and particularly the new growth following.

Less Important Pasture Grasses

Redtop, *Agrostis alba*, occurs in Minnesota as a volunteer crop on wet lands and on well-drained soils deficient in lime. However, very little redtop should be sown in Minnesota since

reed canary grass is so satisfactory for wet soils, and at present no land in this state is too short of lime to grow Kentucky bluegrass for pasture uses.

Canada bluegrass, *Poa compressa*, is more stemmy than Kentucky bluegrass and less desirable for pasture, though it will grow on land too poor to produce satisfactory Kentucky bluegrass pasture. There is very little if any land in Minnesota where this grass should be recommended.

LEGUMES SUITABLE FOR PASTURE

Alfalfa

Alfalfa, *Medicago sativa*, is very nutritious, makes excellent growth during the summer months, and can be utilized to excellent advantage in pasture mixtures with timothy, brome grass, or other grasses and legumes. Since alfalfa does not stand close grazing well, pasture mixtures containing alfalfa should not be grazed too closely. If the mixture is not grazed shorter than

five to six inches at any time during the season and not at all during the last half of September and all of October, alfalfa will make excellent growth and may remain in the pasture for several years. To avoid too close grazing on alfalfa stands, farmers may well divide the pasture by running a temporary fence through the field. One half of the field may be grazed while the other is making a new growth. The practice will prolong the life of the alfalfa. Heavy grazing may kill a good stand in one season. Alfalfa alone may be used as pasture, but there is greater risk of bloat. When a stand of alfalfa has become heavily infested with bluegrass, it is an excellent practice to use it for pasture. The grass mixed with the alfalfa lessens the danger from bloat and affords an excellent pasture until it should be plowed up.

Sweet Clover

Sweet clover is very hardy, is drouth-resistant, and stands tramping and grazing well. The plant thrives best on soils rich in lime. On lime-deficient soils, it will be necessary to apply lime in order to secure satisfactory stands. Sweet clover seeded in the spring may be grazed throughout the fall if not wanted for use the second year. The Biennial White, *Melilotus alba*, appears to be preferable to most other types because it yields heavier and has a longer growing season. Seed of Biennial White is usually cheaper than that of other varieties which include the Biennial Yellow, Arctic, Grundy County White, and Albotrea. Biennial White is a vigorous-growing type, starts as early as other forms in the spring, yields more, and continues to produce through a longer pasture season. There is some danger from bloat.

Medium Red Clover

Medium red clover, *Trifolium pratense*, is a biennial that fits well into short rotations of pasture when mixed with timothy, alsike clover, and other suitable plants. It cannot be expected to last more than two years from the time of seeding and is especially well adapted to a short rotation for one year. Red clover is best adapted to the southeastern, east central, central, and northeastern parts of the state where rainfall is heaviest. It is not so well adapted to west central Minnesota and the Red River Valley sections and the light, sandy lands where alfalfa and sweet clover largely take its place. Red clover does best on rich clay and dark loam soil not too deficient in lime.

Alsike Clover

Alsike clover, *Trifolium hybridum*, is frequently called Swedish clover. This is a short-lived perennial with a wider range of adaptation than red clover, especially where the soil is inclined to be acid and where it is rather low and wet. In a mixture with timothy and medium red, alsike makes a valuable addition inasmuch as it may live longer than red clover which will permit the pasture to continue more than one year. The seeds are small, one pound containing approximately as many seeds as three pounds of medium red clover. Therefore, a smaller quantity of seed is required than of larger-seeded legumes.

White Clover

White clover, *Trifolium repens*, commonly known as white Dutch clover, is a perennial. It differs greatly from medium red and alsike clover in that it has a prostrate creeping habit of

growth, and the stems take root where they come in contact with the ground. White clover thrives best in a cool, moist climate and will grow on almost any soil of the state with sufficient moisture. This is a long-lived, shallow-rooted legume. It produces seed close to the ground, which enables the plant to reseed itself readily in pastures and meadows. The plant stands tramping and grazing well and is hardy.

White clover is especially adapted as a pasture plant and commonly grows along with Kentucky bluegrass. Owing to its low-growing habit, it is not suited for hay production and is primarily a pasture plant. Only a small amount of seed is required as the seeds are small and it spreads rapidly. The seeds may live in the soil for several years and grow under favorable conditions. It often appears as a volunteer crop, even when not seeded in mixtures.

Nonimportant Legumes

The various lespedezas now available have been tried at a number of locations in Minnesota and do not compare well for pasture purposes with alfalfa and the sweet, medium red, alsike, and white clovers.

A WELL-PLANNED PASTURE PROGRAM

On most farms, a well-planned pasture program that will provide ample green feed all through the growing season will require the use of rotation and supplementary pastures in addition to the permanent pasture already established. The chart on page 5 will be of material help in deciding these pasture requirements. Following are suggestions on the possibilities and use of these different types of pasture.

Permanent Pastures

Permanent pastures, as a rule, include the more unproductive areas and rough stony parts of the farm which are not well suited to the production of tillable crops.

Many permanent pastures of the state furnish fair to good grazing from the middle of May to early July and limited amounts during September and October. Through July and August, permanent pastures commonly are dormant and do not produce the forage necessary to take care of the livestock requirements. For this reason, the permanent pasture is usually overgrazed. Periods of drouth frequently occur during the summer months. During such periods pastures fail to produce sufficient feed, and animal production falls off.

Most of the permanent pastures in Minnesota include a mixture of Kentucky bluegrass, white clover, and other pasture plants. On good soil and under favorable moisture and climatic conditions, such a pasture may produce pasturage equivalent to one and one-half to two tons of cured hay per acre.

There are very few permanent pastures that produce two to three tons of the equivalent of cured feed per acre. The yield of most permanent pastures is much less than one and one-half tons per acre.

A dairy cow or two-year-old steer requires 100 to 150 pounds of green grass daily. This is equivalent to 25 to 30 pounds of dry hay. One acre of good pasture should support a mature cow or steer. Many pastures require from two to five acres to support a mature cow. Animals are usually turned out as early in the spring as possible and are allowed to graze until late in the fall. Weeds thrive on pastures treated in this manner, and the pro-

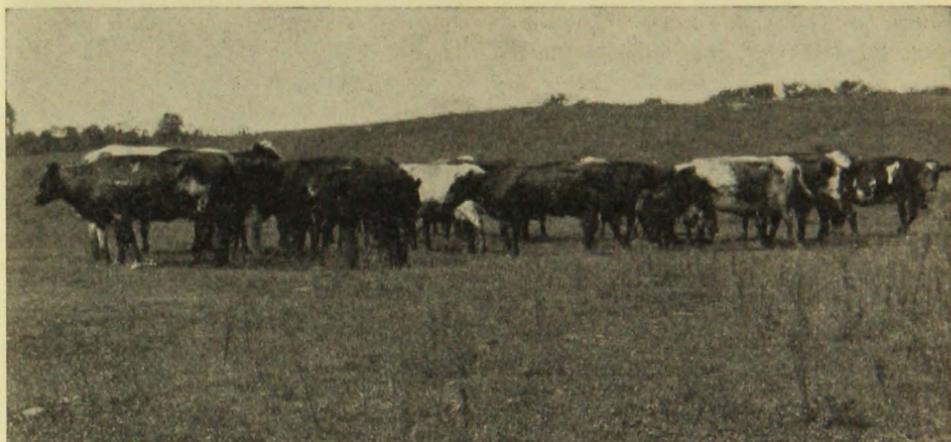


FIG. 5. Dormant, low-producing pasture, hungry cows, and low milk production. A familiar scene during July and August

duction of grasses and legumes is low. Weedy and overgrazed pastures are little better than exercising lots and are seldom profitable.

Rotation Pastures

Rotation pastures are included in the crop rotation system of the farm. The life of the rotation pasture may be one year, two years, or even five years, depending upon the length of the crop rotation and the mixture used. The use of rotation pastures is desirable because it enables the operator to get each field into pasture on a regular schedule, thereby increasing crop yields and also aiding greatly in the control of weeds. A mixture containing both grasses and legumes is nearly always to be preferred. See page 13 for recommended mixtures for rotation pastures.

As a general practice, farmers seed a pasture mixture along with the small grain as a companion crop. The customary procedure is to harvest the small grain, allowing the new seeding to make as much growth as possible that season, pasturing the following year.

Where the operator would like to get a rotation pasture the first season, small grain and the pasture mixture may be seeded at the same time early in the spring. After the small grain and the pasture plants have reached the height of six or eight inches, animals may be turned in for a while until the growth has been pretty well pastured down. Then the animals should be removed to allow the plants to make satisfactory growth before further pasturing. If handled carefully and rainfall is sufficient, the small grain, legume, and grass mixture should furnish considerable feed the first summer and provide a productive pasture for one or more years.

Choosing the Pasture Mixture

A good stand of mixed grasses is not as good as a mixture of legumes and grasses. Grass grows more vigorously with a dark green color as long as the legumes are alive and for some time following. The quality of forage is also improved because of the greater yield of digestible protein. Grasses grown

with legumes respond in the same manner as from the application of barnyard manure or nitrogen fertilizer. As a result the yield of the grasses is greater. The effect of the legume on the companion grass crop is marked.

The choice of a pasture mixture depends on a number of factors. Among these are the plan of crop rotation followed, the adaptability of certain legumes and grasses to the section of the state, the type of soil, and the number of livestock units kept on the farm.

Medium red alsike and sweet clover are short-lived legumes suitable for short rotation pastures. They can be pastured satisfactorily for one year. For that reason they would not be satisfactory for a three- or five-year rotation pasture. With either of these clovers the usual practice is to plow them up after one year in pasture. An excellent example of a short rotation pasture mixture is that of medium red alsike clover and timothy. A good example of a long rotation pasture mixture is that of alfalfa, brome grass, and timothy. This mixture or similar mixtures with alfalfa have produced high yields per acre of nutritious feed. With good care, the alfalfa in a grass mixture should remain alive from three to five years. The life of the alfalfa will depend largely on how closely the stand is grazed. It is very important not to graze the mixture with alfalfa closer than five or six inches during the season. Very close grazing of the alfalfa plants will generally kill the stand in one season. Close grazing has the same effect as cutting frequently with a lawn mower. Good legume grass mixtures can be expected to yield from two to two and one-half tons per acre with a moisture content similar to that of hay. An acre of this kind of pasture will usually provide ample feed for two

mature cows throughout the grazing season.

A combination of brome grass and sweet clover may be used satisfactorily where alfalfa is not available. Where brome grass and sweet clover are seeded in combination it is important not to graze the sweet clover so close that it cannot produce a volunteer seed crop. When a volunteer seed crop falls on the ground, new stands of sweet clover will be coming year after year making a fine supplement to the brome grass. This combination is relatively inexpensive and produces very well. Such a combination might easily be made a permanent pasture. It is difficult to get a stand of sweet clover on lime-deficient soils. Lime should be applied before seeding sweet clover.

Supplementary Pastures

When permanent and rotation pastures are inadequate, when they fail from drouth or other causes, or when the permanent pasture needs relief from heavy grazing, some short-time or supplementary pastures will be needed.

Special Supplementary Pastures

These may include aftermath of meadows where there is a good growth of clover, timothy, or other grasses following the cutting of the first crop for hay. In grain fields, low places too wet to plow may be pastured after the grain is cut. Second-growth alfalfa may be pastured satisfactorily during July and August. The second crop of reed canary grass may be pastured.

Annual and Emergency Pastures

The crops best suited for annual supplementary pastures or for emergency pastures include winter rye, spring-sown small grains, Sudan grass, rape, and spring-sown sweet clover. For

COMBINATIONS, RATES OF SEEDING, AND OTHER INFORMATION**Short Rotation Mixtures****No. 1**

Timothy 8 lbs.
 Medium red clover, 4 lbs.
 Alsike clover, 2 lbs.

1. An inexpensive mixture.
2. Recommended for southeastern, east central, and northeastern Minnesota.

No. 2

Biennial white sweet
 clover, 12 lbs.
 Timothy, 6 lbs.

1. Recommended for southwestern and west central Minnesota on soils abundant in lime where red clover does not thrive.
2. An inexpensive mixture.

No. 3

Timothy, 6 lbs.
 Kentucky bluegrass, 1 lb.
 Medium red clover, 4 lbs.
 Alsike clover, 2 lbs.
 White clover, 1 lb.

1. Adapted to heavier, productive soils of southeastern, central, and northeastern Minnesota where medium red clover thrives.
2. Bluegrass and white clover will predominate after 2 or 3 years.

No. 4

Timothy, 2 lbs.
 Brome grass, 6 lbs.
 Kentucky bluegrass, 2 lbs.
 Medium red clover, 4 lbs.
 Alsike clover, 2 lbs.
 White clover, 1 lb.

1. Suitable for permanent or long-rotation pasture.
2. Recommended for the more productive sandy soils of central, northeastern, and east central Minnesota where the soil is not deficient in lime.
3. Brome grass, Kentucky bluegrass, and white clover will predominate after the second or third year.

No. 5

Brome grass, 6 lbs.
 Timothy, 4 lbs.
 Alfalfa, 5 lbs.
 Biennial sweet clover, 4 lbs.

1. Brome grass and alfalfa will predominate after the first year.
2. Very close grazing will kill alfalfa quickly.
3. Recommended for southwestern, west central, and south central Minnesota.
4. Under drouth conditions the Fairway strain of crested wheat grass may be substituted for brome grass.

No. 6

Brome grass, 5 lbs.
 Meadow fescue, 5 lbs.
 Alfalfa, 5 lbs.
 Sweet clover, 4 lbs.

1. Recommended for northwestern Minnesota.
2. Well adapted to the Red River Valley.

No. 7

Alfalfa, 6 lbs.
 Meadow fescue, 6 lbs.

1. Well adapted to northwestern Minnesota.
2. Meadow fescue does spread like brome grass.
3. Northern grown seed should be used.

No. 8

Reed canary grass, 6 lbs.

1. Especially adapted to peat or muck soils.
2. Will produce well through the season.
3. Lives long and produces abundantly.

Note: Brome grass does not pass through the grass-seed attachment of the grain drill or ordinary seeder readily and should be seeded separately.

Alfalfa and sweet clover should be inoculated if the land has not grown them before.

pasturing off, small grains should be seeded thickly in order to make a strong sod and produce an abundant fresh growth. Winter rye serves excellently for fall and early spring pasture. Seeding at the rate of one and one-half to two bushels per acre may be done during the early part of August. Oats alone makes a very satisfactory spring pasture, and seed is relatively cheap. The amount of seed required is three to three and one-half bushels per acre. Oats, barley, and spring wheat may be mixed and seeded at the rate of two bushels for oats, one bushel for barley, and one-half bushel for wheat. Small grain seeded early will follow after the rye has ceased growth in June and can be utilized to bridge the gap between winter rye pastured in the spring and Sudan grass which should be ready by July 1 to 15. A few acres of small grain may be sufficient until the Sudan grass is ready to be pastured. Rape is an excellent pasture for sheep and swine. The dwarf essex variety is recommended, seeded at the rate of four to six pounds per acre. Rape may be seeded in corn during the last cultivation for hogging off in the fall. Many farmers like this combination very well. The rape furnishes succulent green feed during the time the hogs are harvesting the corn.

In the corn-growing area of Minnesota, Sudan grass is admirably adapted as a supplementary pasture during July and August, and is becoming increasingly popular. This grass produces a heavy and rapid growth on productive soil. A good stand may carry one or two cows per acre, but caution must be used in pasturing this crop as explained earlier in this bulletin. Sweet clover alone or mixed with timothy may be seeded early in the spring without a companion crop (nurse crop) and

utilized for pasture during the summer months, but will not be so productive as Sudan grass.

GETTING GOOD STANDS

A good seedbed saves seed. The preparation of the seedbed plays an important part in securing stands of small-seeded legumes and grasses. Little plants or seedlings are unable to survive on dry, cloddy, loose soil that is in poor physical condition. The seedbed should be well worked until the land is smooth, firm, and mellow. A spike-toothed harrow, cultipacker, or roller may be used in smoothing and firming the soil. A poorly prepared seedbed will require more seed and is likely to result in failure or a thin, patchy stand. Seeding when the soil is very dry may cause failure. Most seedings of grasses and small-seeded legumes are made with small grain as a companion crop, and a little extra effort put on the preparation of the seedbed often pays big returns.

Method and Time of Seeding

Seeding of small-seeded legumes and grasses may be accomplished very satisfactorily by means of the grass-seed attachment on the grain drill, knapsack-type broadcast seeder, or wheelbarrow-type seeder. With the exception of brome grass, most of the common legume and grass seeds pass readily through the seeder either alone or mixed. Brome grass seed should not be mixed with other grass or legume seed because it tends to clog the openings of the seeder. It is difficult to force this light, bulky seed through. Brome grass can be seeded successfully by mixing with the wheat, oats, or barley in the grain box of the grain drill. The operator should watch in order to

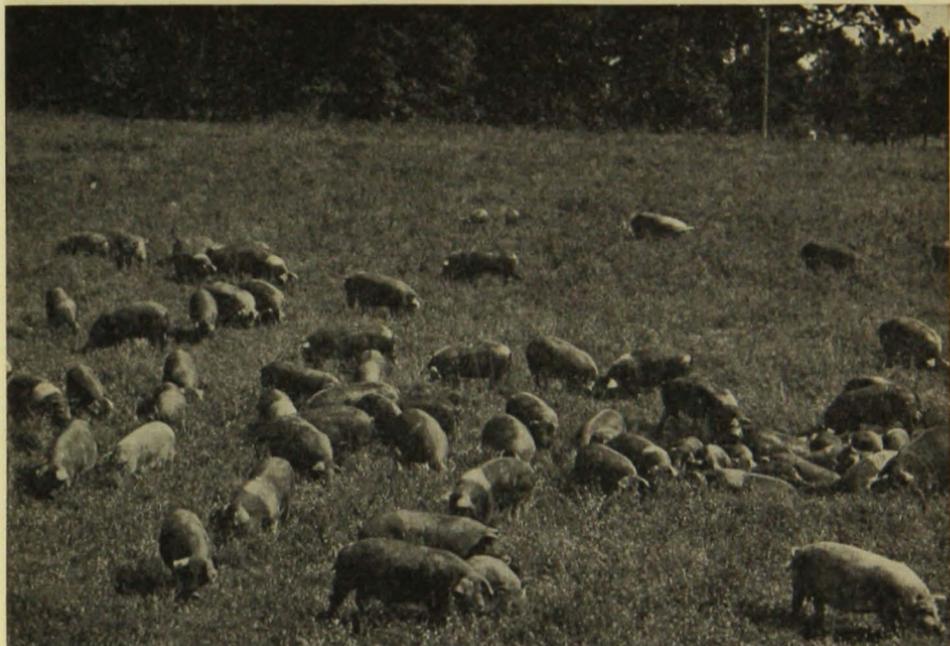


FIG. 6. Alfalfa is the pasture supreme for growing pigs

see that the seed is feeding out regularly. Light, bulky seed tends to work to the top if not mixed or stirred up occasionally. The endgate-type seeder has been used successfully for brome grass when not too windy.

Deep seeding is undesirable and results in poor and uneven stands. On a well-prepared seedbed, the small seed should be covered not to exceed from one-half inch deep on heavy soils to one inch deep on light soils. Brome grass will tolerate deeper seeding than many other grasses and will come through when seeded two inches deep.

Where alfalfa or sweet clover has not been grown on the land before, the seed should be properly inoculated. In pastures where sweet clover would be desirable the second year, it would be well to use unscarified seed.

Seeding is most commonly done in

the spring. The grasses can be seeded successfully in the fall during late August or early September, but the legumes—alfalfa, sweet clover, medium and alsike clover—should be seeded before August 1. The legumes must have time to grow and make satisfactory root growth before going into winter.

IMPROVING POOR STANDS

Where sweet clover or other legumes or grasses have failed to make a good catch, the production may be improved by drilling in winter rye at the rate of one to one and one-half bushels per acre during the early part of August. The rye will make a good growth in the fall and also furnish early spring grazing. If rye is not sown in the fall, small grain such as oats, wheat, or barley, or a mixture of them, may be

drilled early in the spring to thicken the stand. The rate of seeding should vary from one bushel to a full seeding, depending on the stand of sweet clover or other legumes and grasses sown. On high-lime soils unscarified sweet clover seed may be scattered in the fall on bare or thin spots in permanent pastures.

Many permanent pastures have become thin, weedy, and unproductive, principally as a result of continuous long-time grazing, without any application of soil fertility elements. Overgrazing, drouth, and weeds are contributing factors. Thin spots and low-producing areas may be renovated by thorough disking, or otherwise working the soil, and reseeding. The renovation should be done in the fall before freezing or early in the spring as soon as the frost is out of the surface soil,

and before spring seeding begins. Re-seeding should include legumes mostly which will add nitrogen to the soil and help thicken up the thin stand of grass already there. Sweet clover is best suited to this purpose because of its general adaptability, hardiness, growth habits, and the relatively low cost of seed. Other legume and grass seed may be used but it is not advisable to use an expensive mixture. If a good stand of legumes can be secured the grass will improve quickly. Sweet clover will not thrive in lime-deficient soils and lime should be applied before renovating. Animals should be kept off the renovated area until the new seeding has made a good start. The application of barnyard manure to the renovated area will tend to keep animals from grazing the treated area until the new seeding has a good start.

UNIVERSITY FARM, ST. PAUL, MINNESOTA

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