

done lands without previous seeded preparation. On limited acreages and on unstable soils, hay that contains mature seed may be spread over the surface and disked or pressed into the soil to afford some covering.

Broadcasting the seed usually is not satisfactory, but in localities where the land is too rough for machinery, broadcasting is sometimes successful. Some method of covering the seed should be used if possible.

Unless they are needed to protect the soil, companion or nurse crops should not be used with grass or legume plantings in the Northern Great Plains. If nurse crops are used, they should be seeded at very low rates; otherwise competition for moisture and shading by the companion crop is likely to be too great for the survival of seedlings.

Newly established stands of grass ordinarily should not be grazed or cut for hay the first year. Occasionally, when seed is planted in the late summer on fertile soil that has a favorable moisture content, enough growth will

be made the next year so that a light crop of hay or seed can be harvested or a small amount of pasturage may be available.

Weed growth is generally rather heavy the first year, especially where late-fall or spring plantings have been made. Weeds should be clipped only when they are so tall and vigorous that the grass or legume seedlings are seriously hampered in their growth. Clipping, if it is necessary, should be done only in cool weather, and the weeds should be cut high to avoid injuring the seedlings. A high stubble also will provide protection to the seedlings and catch snow.

In early spring it is wise to mow and remove any old heavy vegetative or weed growth that has been allowed to remain over winter. It is best not to burn old growth because of the serious damage that may be done to tender grass or legume seedlings. Stands are usually well enough established by the second year so that weeds cease to be a serious problem.

MANAGEMENT OF SEEDED PASTURES

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The maintenance of stands or of high production of grasses and legumes depends greatly upon proper management. Pastures that do not have legumes generally show a marked reduction in yield the third or fourth year after establishment. This reduction is frequently caused by a lack of available nitrogen and may be as high as 50 to 75 percent. Alfalfa or sweetclover planted in mixture with grasses is the cheapest way to provide the nitrogen to maintain yield, but it may be difficult to keep those legumes in the mixture in dry seasons. Alfalfa may kill out because of drought. Sweetclover seedlings generally do not become established by natural means in old stands of grass.

Yields can often be increased some-

what by tearing up thoroughly the sod of old pastures, but the beneficial effects of the practice are usually short-lived. Seeding alfalfa or sweetclover into disturbed sod offers some possibilities in favorable years.

Application of commercial nitrogenous fertilizers often boosts yields sharply, but in dry periods they should be applied sparingly to guard against severe burning. Manure also will often increase yields.

The best way to get continuous high production of grass is to have the pastures in a crop-rotation system. When production falls off, the pasture can be broken and cropped for several years and then returned to grass. Old, low-producing grass stands can be broken and fallowed for a year and

then receded; this method, however, may not be practical on marginal land or crosive areas.

In the Northern Great Plains the most efficient and economical method of utilizing both seeded pastures and native range is to graze the seeded pastures in combination with (and as a supplement to) the native range. Experiments have shown that this combination system of grazing will provide a longer grazing season and give a higher production on fewer acres.

Pastures of cool-season grasses can be grazed 2 to 3 weeks earlier than native range, and on them livestock can be grazed at a rather high intensity for 60 to 75 days in the spring. During that time grazing on the native range can be deferred. By the time the livestock have fully utilized the grass in the pasture, or after it has become too mature for good grazing, the deferred native range is in excellent condition for livestock, and because it has been deferred for approximately 45 days, the intensity of grazing on it can be greater than if it had been grazed early in the season.

Cattle grazed on seeded pastures should be moved to native range while they are still making good gains. If pastures of cool-season grasses are grazed too late in the summer, the grass will mature and lose quality and livestock gains will often drop rapidly.

Native range grasses remain in good condition for grazing much later in the season and greater gains can be obtained on them during this period than on cool-season grass pastures. With favorable moisture in the fall, pastures may still make considerable growth. It is generally not advisable to graze this new growth heavily, because doing so will cut production the following spring.

When cattle or sheep are grazed on a combination of native range and cool-season grass pasture, it is advisable to fence the pasture separately so that the stock can be restricted to one or the other. Proper utilization will not be made unless the cultivated grass

and native range are separate. Livestock will graze the cultivated grass early in the spring, but will tend to leave it and graze the native grass as soon as it starts to grow. The cultivated grasses will then be underutilized and become coarse and stemmy. If this old growth is permitted to accumulate on the seeded pasture, grazing will become patchy in later years.

Because grasses differ as to maturity and the period when they can be grazed, a series of pastures of different grasses can be established and grazed in rotation. Good results have been obtained in experiments with sheep in Wyoming by grazing them first on crested wheatgrass very early, then on Russian wild-rye, which makes somewhat later growth, and then on warm-season grasses for the rest of the summer. Gains were much higher on these pastures than on native range alone.

Temporary Pastures

Temporary pastures are a possibility on farms that do not have sufficient native range or enough cultivated grass pasture for their livestock needs. The best crops for this purpose in the Northern Great Plains are winter rye, Sudangrass, and sweetclover. Individual farm needs will determine which of these crops can best be used for pasture purposes. Their use as supplements to native range and pastures will provide a full season of grazing.

Winter rye planted in late summer will usually provide considerable grazing later in the fall. It is very productive the following spring.

Sudangrass, if conditions are favorable, will give an abundance of pasture during the hot part of the summer. Care should be taken to use pure seed—it is generally wise to plant only certified seed in pastures.

Mixtures of cane with Sudangrass sometimes cause prussic acid poisoning. Precautions should be taken not to allow livestock to eat too much when they are first turned on the pasture even when grazing Sudangrass

that is thought to be pure. Poisoning can usually be avoided by feeding hay to livestock before turning them on the pasture. Another precaution is to turn only a few head of stock on the pasture until it is determined that there is no danger from poisoning.

Sweetclover also makes an excellent temporary pasture. Sufficient growth is usually made during the first season to provide some pasture during late

summer and fall. Second-year sweetclover will furnish an abundance of pasturage in midsummer. There is a danger of bloat, but it is not serious and can be avoided in most cases by feeding enough dry feed before turning the stock on sweetclover so that they will not immediately gorge themselves. Another way to avoid bloat is to have dry roughage available to stock while they are being pastured.

HAY, FODDER, AND SILAGE CROPS

L. C. NEWELL

ON THE BASIS of acreage, wild hay is the outstanding hay crop of the region. More than 9 million acres of it were harvested in 1946. Nebraska, South Dakota, and North Dakota lead the United States in the production of wild hay. It is the principal return from virgin, unbroken lands other than the grazing.

Wild hays, made up chiefly of the tall and mid-tall grasses of the prairie regions, are the prairie hays of commerce, although their most important use is within the region. On the market they are graded as Upland Prairie or Midland Prairie hays according to the kinds and qualities of the grasses they contain.

Prairie hays are composed of a large number of grasses and grasslike plants, with smaller admixtures of native and introduced species belonging to many different families. In any particular case, the large percentage of the grass in the hay will be of a few species.

The principal grasses found in Upland Prairie hays are the bluestems, needlegrasses, and wheatgrasses, with such grasses as junegrass, the grama grasses, the dropseeds, Indiangrass, and switchgrass contributing smaller amounts in different hays. The principal species of Midland Prairie hays are those adapted to growing in wet areas; among them are sloughgrass or cordgrass, bluejoint, and switchgrass.

Studies of the composition and nutritive value of native vegetation at Mandan, N. Dak., showed that western needlegrass comprises 50 to 75 percent of the total weight of the grasses. Fifty or more different kinds of plants were found. Since the droughts of 1934 and 1936, the needlegrass has largely been replaced by western wheatgrass.

Wheatgrass hay is produced on the fine-textured soils largely to the north and west of the Nebraska sand hills. It is especially important along river bottoms in northeastern Montana. This hay is frequently harvested from nearly pure stands of western wheatgrass. Feeding tests have shown it to be equal or superior to alfalfa hay for wintering cattle.

In the Nebraska sand hills, which are unique in ranching and haying operations, a good balance is achieved between range and hay land. Ranges of the sand hills or adjacent hard lands provide grazing. Meadows of the sub-irrigated valleys produce abundant hay crops in which the bluestems predominate. These hay lands are a post-climax development resulting from the westward extension of the tall grasses along the valleys. Studies of these hay meadows have shown that the relative amounts of the many kinds of grasses are closely associated with distances to the water table. The quality and yield of hay have been greatly im-