Planting Tame Pastures and Hayland

Cooperative Extension South Dakota State University

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Good stands of grass and legumes for pasture or hay don’t just happen. Their success depends on careful planning.

Specific practices can insure good stands. Some practices relate to seed: mixing legume and grass, selecting high quality seed, using proper seeding equipment, seed treatment, and inoculation of legumes. Other practices relate to soil management: proper preparation of seedbed, accurate time and rate of seeding, fertilization, use of companion crops, weed control, and land management by grazing or clipping in new pasture stands.

If you operate a farm in South Dakota, here is information about each of these practices that can help you plan good pasture stands or hay crops.

WHAT TO SEED

When seeding tame pasture or hayland, select the best species for the area, the best variety of the species, and high quality seed.

Grass-Legume Mixtures

Grass-legume pasture mixtures are recommended because (1) they usually produce more forage, (2) they contain a higher percentage of protein than grass alone, (3) the inclusion of a grass (at least 50%) with a legume may reduce bloat on pasture, (4) grasses reduce soil erosion and improve soil structure, and (5) such a seeding gives more assurance of a stand. A grass-alfalfa mixture should not contain more than 50% alfalfa if used for pasture and not less than 50% alfalfa if used for hay.

Research shows that adapted tame grasses produce more than twice as much pasturage or hay than native grasses, either under dryland or irrigation conditions. Land that is rough and highly erodible, stony, or low and wet should remain in the more permanent type grasses. Tillable land used for pasture or hayland should be seeded to a tame grass-legume mixture.

Use High Quality Seed

High quality seed is mature, plump, pure, and of high germination. Plump, high test weight seed produces larger and stronger seedlings. Seedling vigor is important in establishing successful stands.

So-called “bargain” seed is often the most expensive. Purchase seed on the basis of “pure live seed” (PLS). The percent of pure live seed is determined by multiplying purity times germination.

Example: Grass seed — Sample A has a purity of 60%, a germination of 80%, and a “bargain” price of 20 cents per pound. The percent of pure live seed is 48 (60% x 80%). On the basis of pure live seed, this seed costs about 42 cents a pound (20 cents divided by 48%). Sample B has a purity of 90%, a germination of 90%, and a price of 30 cents per pound. The percent of pure live seed is 81 (90% x 90%) and the pure live seed cost is 37 cents per pound (30 cents divided by 81%). On the basis of PLS sample A costs 5 cents more a pound than sample B.

Recommended Species

Some cool-season grasses start growth early in the spring and others start later. Most go dormant during July and August and resume growth in the fall if moisture conditions are favorable. Warm-season grasses start growth during late spring and produce maximum forage during July and August. Since greater production can be obtained by grazing green grass as rapidly as it grows, you should decide when you will want to use the pasture. Figure 1 shows which grasses are best for four different periods of grazing and lists the most productive grasses first.

Grasses listed for use as pasture during the late spring and early summer, except Russian wildrye, are the best grasses for hay crops.

Alfalfa is the best legume for pasture or hayland. A hay-type alfalfa recovers quickly after being mowed or grazed. As a result, two to four cuttings of hay can be obtained each year. Quick recovery after frequent grazing results in depletion of alfalfa root reserves and a hay-type alfalfa is killed by 3 to 5 years of grazing. A pasture-type alfalfa produces a good first cutting but does not recover quickly after being mowed or grazed. As a consequence, it does not produce as much forage as a hay-type alfalfa and is less satisfactory as a hay crop. On the other hand, it is more persistent and does not kill out as easily as a

Figure 1. Grasses for pasturing at different seasons of the year.

<table>
<thead>
<tr>
<th>Early Spring</th>
<th>Mid-April to mid-May</th>
<th>Late Spring and Summer</th>
<th>Mid-May to mid-July</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crested wheatgrass</td>
<td>Russian wildrye</td>
<td>Smooth bromegrass</td>
<td>Intermediate wheatgrass</td>
</tr>
<tr>
<td>Russian wildrye</td>
<td>Kentucky bluegrass</td>
<td>Pubescent wheatgrass</td>
<td>Tall wheatgrass</td>
</tr>
<tr>
<td>Crested wheatgrass</td>
<td>Russian wildrye</td>
<td>Western wheatgrass</td>
<td>Green needlegrass</td>
</tr>
<tr>
<td>Russian wildrye</td>
<td>Russian wildrye</td>
<td>Reed canarygrass</td>
<td>Creeping Foxtail</td>
</tr>
</tbody>
</table>

By Lyle A. Derscheid, Ralph A. Cline and Elmer E. Sanderson, Extension Agronomists
hay-type alfalfa. Teton alfalfa withstood 7 years of heavy grazing at Cottonwood, Highmore, and Brookings before experiments were discontinued. It has withstood 14 years of heavy grazing at Eureka in an experiment that is still in progress. Parents of Teton and Travois persisted in the plains of western South Dakota from 1914 to 1949 when they were used to make the first crosses that resulted in the development of Teton and Travois.

The first year after seeding a mixture of grass and a hay-type alfalfa, the mixture generally has more than 50% alfalfa and there is danger from bloat. Plants of a pasture-type alfalfa do not grow erect and recover more slowly after grazing. The forage contains a lower percentage of alfalfa, which reduces the hazard of bloat.

Since hay-type alfalfa is more productive, it should be used in hayland and may be used in short-term pastures—either on dryland or under irrigation. However, pasture-type alfalfa should be used in pastures that are expected to last for more than 3 years.

Birdsfoot trefoil may be used instead of alfalfa for pasture in areas where rainfall is favorable. It winter kills more readily than alfalfa. While birdsfoot eliminates the bloat problem in pastures, stands are more difficult to obtain and take longer to establish than alfalfa.

Sweetclover and red clover may be used in the mixture, especially in short pasture rotations. One way to use sweet clover is to plant it with an oat companion crop, harvest the oats, graze the second-year growth of sweet clover (June-August) and follow with a corn crop. This gives a good soil building 3-year rotation of oats, pasture, and corn.

**Recommended Varieties**

Varieties presently recommended for use in South Dakota are listed in the current issue of F.S. "Field Crops—Recommended Varieties." Most of the following varieties are on the list—all are adapted to South Dakota.

**Legumes.** Alfalfa is the most productive legume for pasture on hay production. Some alfalfa varieties are best adapted for hay production while others are better for use as pastures. Birdsfoot trefoil does not cause bloat. Seed of some of the varieties listed for trefoil or one of the clovers may be difficult to locate.

Hay-type alfalfa—Vernal, Ranger, Dawson, Agate, Ladak 65

Pasture-type alfalfa — Travois, Teton, Rambler, Drylander

Birdsfoot trefoil—Empire, Leo

Sweetclover—Denta, Goldtop, Madrid

Red clover—Dollard, Lakeland

**Cool-season grasses.** Some southern varieties lack winter hardiness, while some northern varieties may not be drought resistant or disease resistant. In either case they may be short-lived under pasture conditions. Adapted varieties of recommended species are:

Smooth bromegrass—Achenbach, Lincoln, Sac, Fox

Intermediate wheatgrass—Oahe

Crested wheatgrass—Nordan

Russian wildrye—Vinall

Reed canarygrass—Frontier, Ioreed, Rise

Creeping foxtail—Garrison

Tall wheatgrass—Alkar

Pubescent wheatgrass—Mandan 759

**Warm-season grasses.** There are no tame grasses in this group, however, improved strains have been developed and have become named varieties. Varieties that have performed satisfactorily in South Dakota and/or Nebraska are:

Switchgrass—Summer, Nebraska 28, Pathfinder

Big bluestem—Pawnee, Champ

Indian grass—Holt, Nebraska 54

Sudangrass—Piper

For native switchgrass, yellow indiangrass or bluestem, use seed that originated less than 200 miles north and not over 300 miles south of the area where the seeding is to be made. Seed should come from an area of similar rainfall, seed produced on sands should not be seeded on clay soils, nor should strains produced on moist lowlands be seeded on dry upland.

**Pasture and Hayland Mixtures**

Usually one or two grasses with a single legume is as good or better than a "shotgun" mixture. The rate of seeding will depend on the firmness of the seedbed, the type of seeding equipment used, and the amount of competition on seedlings. For example: 300,000 alfalfa plants per acre will give a full yield. Since 1 pound of alfalfa contains 200,000 seeds, 1.5 pounds of pure live seed could provide a full stand if they were planted so that each seed would produce a plant. Few people do a good enough job of seeding to obtain such results. As a general rule, a full stand can be obtained by planting 20 pure live seeds per square foot into a firm seedbed with good forage crop seeding equipment such as a grassland drill (or a cultipacker seeder for forage legumes or free-flowing grasses).

The rates of seeding for the pasture and hayland mixtures suggested here are the rates needed for planting in a firm seedbed with good seeding equipment. Higher rates will be needed if less precise equipment is used, if the seedbed is not firm, or if a companion crop or weeds are allowed to exert undue competition on seedlings.
A legume is ordinarily considered to be desirable in a pasture or hayland mixture, however, very little is known about the advisability of mixing a legume with the warm-season grasses, Reed canarygrass or Russian wildrye. Although other mixtures will be satisfactory, the pasture mixtures in Table 1 are thought to be the best for use in a 7-month pasture program. For example, sweetclover and crested wheatgrass may be a desirable mixture for western counties and birdsfoot trefoil or red clover and smooth bromegrass may be useful in southeastern counties. However, all three legumes are shortlived and must depend on natural reseeding in order to have either one present for more than 1 to 3 years. The density of stand will then depend on moisture conditions.

Mixtures I, II, III, and IV will be good hayland mixtures if the seeding rate of alfalfa is doubled and the seeding rate of grasses reduced 50%.

### SEEDING

The three essentials to a good stand establishment are: (1) seed at a uniformly shallow depth, (2) seed in a firm seedbed, and (3) remove competition from new seedlings for 30 to 60 days after emergence.

#### Time of Seeding

Early spring (before April 15) is the common seeding time and is better than late spring for forage legumes and cool season grasses. It takes about 30 days for a grass or a legume to germinate and become well established. The cool, moist conditions of early spring are favorable for germination and seedling growth.

Cool season grasses can be seeded from August 15 to September 20 if good moisture conditions prevail. Early fall or late summer planting on summer fallow ed land is satisfactory because of the conservation of moisture. A light seeding of oats may serve as a cover crop to prevent soil erosion. Late August plantings allow the grass and legumes to become established before the soil freezes and the seedlings have a much better chance of surviving the winter. Grasses are much less risky to establish at this time than legumes as they must have ample time to build-up root reserves for the winter.

Very late fall seeding (after November 15) of cool season grasses may be made after probability of germination is passed. The seed is then ready to germinate when spring growing conditions arrive.

Warm-season grasses do not germinate until the soil becomes relatively warm, therefore, seedings made during late fall or early spring are generally unsatisfactory. The best seeding date has not been determined for South Dakota. However, in the date-of-planting tests, best stands were obtained by planting between June 15 and July 7 at Brookings and Eureka and early June at Norbeck. Weeds hampered stand establishment from seedings made on earlier dates and dry weather prevented germination from seedings made in July. The best date seems to be about May 10 at Lincoln, Nebraska.

#### Seedbed Preparation

Prepare a firm (hard) seedbed so that the small seeds may be planted at a uniform, shallow depth. The seedbed should be firm enough for a man to walk across it without sinking into the soil more than the thickness of the sole of his shoe (Figure 2). Use of a cultipacker seeder or a drill with packer wheels generally leaves a firm seedbed. If these implements are not available, a disk can be used before seeding and a spike-tooth harrow or rotary hoe may be used either before or after seeding. The rotary hoe works best if pulled backwards. If used after seeding, these implements help cover the seed.

There are several satisfactory methods of preparing a seedbed:

1. Plow, disk, harrow and pack to break down large clods and work out air pockets. Plant with a seeder that has depth controls.
2. Fallow throughout the summer. If stubble mulch was maintained, pack it thoroughly. Poor stands of alfalfa frequently result from planting in stubble mulch.

![Figure 2. This is a firm seedbed. An old rule is that a seedbed is firm when you can walk over it and not sink in deeper than the soles of your shoes.](image-url)
3. Use a clean undisturbed stubble from small grain, sudangrass or close-drilled sorghum that is practically free of weeds or volunteer grain.

4. Plant a cover crop, susceptible to winter-killing, during early fall on fields that have been fallowed without maintaining a cover of crop residue. Seed with a drill during late fall after cover crop has winter-killed.

**Depth of Planting**

Seedlings do not emerge if seed is planted too deep. Seed shallow, yet be sure the seed is covered. Seed germinating on top of the ground has a poor chance of survival. Several tests indicate that best stands are obtained if small-seeded grasses and legumes are planted less than ½-inch deep and if chaffy or larger seeded grasses (smooth bromegrass or wheatgrasses) are seeded ½- to 1-inch deep. The shallower depth is for heavier soils.

**Equipment for Seeding**

Proper equipment for seeding small seeds is the first essential in establishing stands. Use equipment that packs the soil around the seed after it is planted. Packing puts the seed in contact with soil, prevents soil from drying out, and facilitates capillary rise of soil moisture near the soil surface for the germinating seedling.

A **grassland seeder** (Figure 3) is the best all around implement for seeding grasses and forage legumes. It has depth bands that ensure a uniform shallow depth of seeding and packer wheels to give a firm seed bed (Figure 4). It has a large hopper (Figure 5) with agitators for seeding chaffy grasses and smaller hoppers for seeding legumes and/or free flowing grass seeds. Frequently the best stand establishment can be obtained by using this implement on small grain or sudangrass stubble without any seedbed preparation.

A **cultipacker** seeder is a superior type for seeding legumes or small-seeded grasses on crop-residue-free areas such as plowed or clean fallowed land. Light-weight seeds—smooth bromegrass or wheatgrasses—may not be covered on any type of seedbed and smaller seeds may not be covered on areas that have good crop residues.

A **press drill** is best to use on fields with considerable crop residue. A press drill is also excellent on plowed or clean fallowed land if depth bands are used to give uniform shallow seeding. Light weight grass seeds—smooth bromegrass or wheatgrasses—may "bridging-over" in the drill box and not feed down the spouts. Mix the grass seed with cracked corn or oats (½ oats and ½ grass) or use an agitator in the seed box to prevent "bridging-over."

A **grain drill** without press wheels can be used satisfactorily on plowed or clean fallowed land. However, it should be equipped with depth bands. Prevent "bridging-over" and pack the field after seeding, but remember that packing is often conducive to wind erosion.

A broadcast seeder is usually the poorest implement for seeding hayland or pasture mixtures. This includes a broadcast seeder, fertilizer spreader or grain drill that broadcasts from a grass seeding attachment without putting seed through the seeding spouts to the furrow openers. One of these broadcast seeders can be used for seeding forage legumes or small-seeded grasses on plowed land or clean fallow if the seed...
is covered with a harrow, rotary hoe or other suitable implement. However, it is seldom satisfactory for seeding smooth bromegrass or wheatgrasses because they are too difficult to cover at a uniform depth of ½ to 1 inch.

**Rates of Seeding**

Table 2 gives the minimum rates of seeding for several species of grasses and legumes.

**Companion Crop**

Use of a companion crop (nurse crop) helps remove weed competition from spring seedings and may reduce wind damage to fall seedings. However, it is essential that the companion crop not exert too much competition on the new grass and legume seedlings. Therefore, the best companion crop is flax or a half crop of small grain. Plant the companion crop first and then seed the grass by drilling at right angles to the direction in which the grain was seeded. A small grain crop should be cut for haylage or silage during late June.

**Weed Control**

Weeds are a more serious problem in late fall or early spring seedings than in summer or early fall seedings. Although a companion crop is useful for helping control annual weeds, there are several herbicides that can also be used. They are discussed more fully in a Fact Sheet entitled "Chemical Weed Control in Pasture, Range and Hayland."

Most broad-leaved weeds can be controlled with 2,4-D, MCPA or 4(2,4-DB). Use up to $\frac{3}{4}$ lb/A of 2,4-D or MCPA on cool-season grasses and up to $\frac{1}{2}$ lb/A on warm-season grasses. Spray any time after the grasses have reached the 4-leaf stage of growth. Use $\frac{3}{4}$ lb/A of an amine form of MCPA on alfalfa when companion crop has formed a canopy 10 to 15 inches high or use up to $\frac{3}{4}$ lb/A of 2,4-DB ester or 1 lb/A or 2,4-DB amine on alfalfa, clover, or birdsfoot trefoil after the crop is 2 inches tall and preferably before the weeds are more than 3 inches high. MCPA causes injury to legume seedlings, but 2,4-DB seldom causes damage.

In legumes, 1½ to 1½ pounds active ingredient per acre of benefin (tradename Balan) or 3 to 4 pounds active ingredient per acre of EPTC (tradename Eptam) can be used to control annual grassy weeds. Apply before seeding and immediately incorporate into the soil to a depth of 2 to 4 inches. Small grain companion crops will be killed by these chemicals.

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Table 2. Minimum Pounds (PLS) for Seeding Pastures and Hayland

<table>
<thead>
<tr>
<th>Species</th>
<th>Seeds per pound</th>
<th>20 seeds per sq ft</th>
<th>Optimum rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grasses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Big bluestem</td>
<td>153,000</td>
<td>5.3</td>
<td>8.0</td>
</tr>
<tr>
<td>Crested wheatgrass</td>
<td>175,000</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Creeping foxtail</td>
<td>613,000</td>
<td>1.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Green needlegrass</td>
<td>170,000</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Indiangrass</td>
<td>175,000</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Intermediate wheatgrass</td>
<td>88,000</td>
<td>10.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Orchardgrass</td>
<td>654,000</td>
<td>1.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Pubescent wheatgrass</td>
<td>100,000</td>
<td>8.7</td>
<td>12.0</td>
</tr>
<tr>
<td>Reed canarygrass</td>
<td>533,000</td>
<td>2.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Russian wildrye</td>
<td>175,000</td>
<td>5.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Smooth bromegrass</td>
<td>136,000</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Sudangrass</td>
<td>55,000</td>
<td>18.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Switchgrass</td>
<td>370,000</td>
<td>2.4</td>
<td>4.0</td>
</tr>
<tr>
<td>Tall wheatgrass</td>
<td>79,000</td>
<td>11.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Western wheatgrass</td>
<td>115,000</td>
<td>7.5</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Legumes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa</td>
<td>200,000</td>
<td>4.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Birdsfoot trefoil</td>
<td>375,000</td>
<td>2.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Red clover</td>
<td>275,000</td>
<td>3.2</td>
<td>5.0</td>
</tr>
<tr>
<td>Sweetclover</td>
<td>260,000</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td>White clover</td>
<td>800,000</td>
<td>1.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Fertilization
Stand, seedling vigor and eventual yield of grasses and legumes can be improved by using fertilizer at seeding time. Use of fertilizer may mean the difference between a good stand and a poor stand in areas where fertility levels are low. Apply nitrogen at one-fourth the phosphorus (P₂O₅) rate. Apply phosphorus and potassium as determined by a soil test. See Table 3.

Table 3. Recommended Dryland Fertilizer Rates for New Seedings in Hay and Pasture*

<table>
<thead>
<tr>
<th>Soil Test</th>
<th>P₂O₅ or P</th>
<th>K₂O or K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>60</td>
<td>26</td>
</tr>
<tr>
<td>Low</td>
<td>60</td>
<td>26</td>
</tr>
<tr>
<td>Medium</td>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*For new seedings, apply nitrogen at one-fourth the phosphorus application rate, regardless of the soil test for organic matter (nitrogen availability).

Legume Inoculation
Legume seed inoculation is always recommended. Inoculation assures that (1) nodulation will occur early in the life of the legume plant, (2) that all plants will have nitrogen-fixing bacteria available, and (3) that the most efficient strains of nitrogen-fixing bacteria are present. Inoculate seed just before planting.

Seed Treatment
Grasses: To control harmful disease organisms on grass seed, use one of the treatments listed in Table 4.

Legumes: Use one of the treatments listed in Table 4. Treat this seed about one week before planting to avoid injury to the bacterial inoculant applied at seeding time. Inoculate just enough of the treated seed to fill the drill box. Plant immediately. Do not treat previously inoculated seed.

Table 4. Seed Treatment for Grasses and Small Seeded Legumes

<table>
<thead>
<tr>
<th>Fungicide</th>
<th>Rate</th>
<th>Formulation</th>
<th>Application Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arasan 50-Red</td>
<td>8 oz./100 lbs.</td>
<td>Dust</td>
<td>Rotary or gravity</td>
</tr>
<tr>
<td>Arasan SF-X</td>
<td>3 lbs./gal. water*</td>
<td>Dust</td>
<td>Slurry</td>
</tr>
<tr>
<td>Captan 75</td>
<td>8 oz./100 lbs.</td>
<td>Dust</td>
<td>Rotary or gravity</td>
</tr>
<tr>
<td>Captan 75</td>
<td>5½ oz./100 lbs.</td>
<td>Dust</td>
<td>Slurry</td>
</tr>
</tbody>
</table>

*2½ lb. for grass seeds.
Use of a trade name does not imply endorsement of one product over another.

Management of New Seedings
Harvesting a companion crop for hay or silage is a good practice because this eliminates the competition for moisture, sunlight, and plant nutrients.
When a companion crop is not used, clipping any weed growth may be necessary. Do not let weeds make too much growth, as the excessive clippings may smother the young grass and legume seedlings. The height of the clipping will depend on the height of the seedlings. Do not cut off the small plants.
New seedings should never be pastured the first season. The new stand needs to develop its root system and store food reserves in the roots.

READ THESE FACT SHEETS FOR ADDITIONAL INFORMATION

Cool Season Grasses for Early Spring and Fall
Cool Season Grasses for May and June
Warm Season Grasses for July and August
Grasses for Special Purposes

Weed Control in Pasture, Range and Hayland
Interseeding for Pasture and Range Improvement
Grazing Management Based on How Grasses Grow
A Pasture System for You
Fertilizing Pasture, Range and Hayland

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