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PRINCIPLES OF FORAGE LEGUME MANAGEMENT

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COOL-SEASON FORAGE LEGUME ESTABLISHMENT

Cool-season forage legumes are seldom planted in pure stands but usually in mixtures with annual ryegrass and/or small grains. Legume establishment practices for both pure legume stands and grass mixtures will be discussed. Grazing of winter pastures can extend from late November through early June depending on location, species used, planting method and planting date. The type and amount of winter pasture should be carefully planned because of the expense associated with land preparation, seed, and fertilizer. The class of animal (lactating dairy cows, stockers, replacement heifers, cows nursing calves, or dry cows) utilizing the pasture will determine which type of winter pasture will be the most profitable.

Types of Winter Pasture

There are three categories of winter pasture: prepared seedbed, light disking, and sod seeding or overseeding. Prepared seedbed provides the earliest grazing, is the most productive, but is also the most expensive. One to two months before planting, the land is disked 4 to 6 in. deep to destroy all existing vegetation. In southeast Texas where winters are mild, annual ryegrass is the main grass used with legumes. Small grains or small grain-ryegrass mixtures are used in northeast Texas because of colder temperatures. Optimum planting dates are mid-September to mid-October. If a grass is mixed with the legume, grazing can usually begin by December 1.

Light disked winter pastures are those in which the grass sod is disked about 1 to 2 in. deep to reduce the summer grass competition and provide some loose soil for planting the winter pasture. The disk blades can be turned almost straight where only a 4 to 5 in. wide strip is disturbed, leaving undisturbed sod in between to improve summer grass recovery the following spring. Light disking will not work well on heavy clay soils because the disking will turn up clods and leave the pasture surface rough. Small grains can be used if the seed are drilled into the soil. If planting ryegrass with the legumes, the seed can be broadcast before or after disking. If seed are broadcast after disking, the pasture should be dragged to help cover the seed. Optimum planting date would be from mid-September to mid-October. Forage from a legume-grass mixture is usually available for grazing in late December to January which is about 4 to 6 weeks later than a prepared seedbed pasture.

Sod seeded or overseeded pastures provide the shortest grazing season and are generally the least productive because of a later planting date of mid-October to mid-November. Planting is delayed because of competition from the warm-season perennial grass for light, moisture, and

nutrients. A later planting date also means grazing is delayed until about February for a legume-grass mixture depending on the location. Cutting or grazing the warm-season grass to a 2 to 3 in. height before planting is very important. Emerging winter pasture seedlings require sunlight for survival and good growth. This is especially true for small seeded legumes. Carbohydrates stored in the seed provide the energy for seedling emergence and growth of the first true leaf. From this point seedling survival and growth is dependent on the cotyledons, unifoliate leaf, and the first trifoliate leaf receiving sunlight to carry on photosynthesis.

Selecting the Best Legume Species

Selecting forage species adapted to the soil on your property is critical for obtaining a good stand and a profitable pasture system. Soils vary in texture (sand, loam, and clay), slope, internal drainage, nutrient content, pH, water holding capacity, and pests such as nematodes. Producers have some influence over the nutrient level and pH, but very little control over the other soil characteristics. We cannot change the soil, at least not economically. The best soils are generally used for food and grain production. Marginal soils not suited for row crop production because of slope, rocks, low nutrient and water holding capacity or poor drainage are usually planted to forages. Identification and description of soils on your farm or ranch should be available at the county office of the USDA Natural Resource and Conservation Service.

Temperature and rainfall amount and distribution are the main climate factors influencing plant adaptability. Temperature extremes such as the minimum winter temperature are more likely to determine forage species adaptability than temperature averages. Rainfall distribution is more critical than total rainfall for the growing season. The previous paper discussed where the various legume species are best adapted. Additional information can be obtained from the local County Agricultural Extension Service, Natural Resource Conservation Service, or nearby Agricultural Research and Extension Centers.

Caution should be exercised in planting forage species developed in other countries or areas of the US. Varieties developed locally are usually better adapted and more productive than those from other regions. It is best to plant only a small acreage of a new forage variety the first year to observe how well it performs before making a large investment in seed, land preparation, and labor.

How Many Acres to Plant

Estimating how many acres to establish is dependent on the number and size of animals, management level, and local climate. A general rule of thumb is a good winter pasture can be

stocked with approximately 600 pounds of body weight per acre (1.5 - 400 lb calves/acre, 1 - 600 lb calf/acre) in the fall and winter after the pasture has reached a height of 6 to 8 in. A stocking rate of about four pair per acre should be used in estimating number of acres for limit grazing (2 hr/day, 4 hr every other day) for beef cows with calves. If grazing full time, about 1.5 acres are needed per cow-calf pair.

Forage production will increase 2 to 3-fold during the spring. Proper stocking for fall and winter will result in excess forage in the spring. A producer needs to use this extra forage wisely. Additional livestock must be added in the spring or the excess growth can be harvested for hay. In any case, excess spring growth on overseeded pastures should be utilized so as not to hinder the recovery of the warm-season perennial grass.

Site Selection

Wet, cloudy weather during the winter months usually results in bogging problems when winter pasture is planted on a well prepared seedbed (disked 4 to 6 in. deep). This is a major problem in southeast Texas where the level soils have poor surface and sometimes internal drainage. The best drained pasture on the property should always be selected for winter pasture. Overseeding winter pasture on a summer grass sod (bermudagrass, bahiagrass, dallisgrass, etc.) will help provide firm footing for livestock and reduce bogging. However, overseeded winter pasture is usually one to two months later than that planted in a well-prepared seedbed.

Planting a combination of prepared seedbed and overseeded pasture is a good option. The prepared seedbed can be grazed first since it will provide earlier grazing. Livestock can be moved to the overseeded pasture during wet periods when bogging is a problem on prepared seedbed pastures. Another consideration in site selection is to avoid areas sprayed with Grazon P+D the previous summer. The picloram component of Grazon P+D will persist in the soil and is very toxic to legumes.

A soil analysis is a profitable investment, especially for legumes. The soil pH needs to be at least 6.0 for most forage legumes for good establishment, growth, and N₂-fixation. If raising the soil pH is necessary, lime needs to be added 3 to 6 months before planting legumes to provide sufficient time for the lime to work. Ultra fine lime increases soil pH more rapidly than regular lime and is usually a better buy even though it costs \$5/ton more. A soil analysis will also determine if phosphorus, potassium, or other nutrients are limiting and how much should be applied. If any nutrient is deficient, legume growth, and N₂-fixation will be reduced.

Buying Seed

Seed quality and rates are an important part of having a successful winter pasture program. Good seed is always a good buy. Buying variety non-stated (VNS) seed has risk associated with it. When seed of a particular species is in short supply, varieties adapted to other areas of the U.S. may be shipped in. Seed that cannot be certified because of contamination by other varieties, species, or weeds is also sold as variety non-stated. Planting a named variety will help ensure that you plant the best adapted variety that will produce the most forage. All planting seed is required to have a seed tag by state law. Information on the seed tag will state the variety, where grown, germination percentage, weed seed content, and date of germination test. The Texas state seed law requires a germination test within nine months of sale date to prevent the seed retailer from selling last year's seed without an updated germination test.

A producer should determine what kind of seed and how much he will need early so prices can be compared from different sources. Most retail forage seed dealers will not have more than two or three legume species in stock. However, they are able to obtain seed of most legumes if given sufficient time. When planting a legume species for the first time, it is important to inoculate the legume seed with the appropriate bacterial strain. The inoculant should be purchased when the seed is bought. Be sure the name of the legume is stated on the package and that the expiration date has not passed.

Seeding Rates

Seeding rates for the various legume species are listed in the previous paper on legume species. Small grains are usually planted at 100 lb/acre and ryegrass at 25-30 lb/acre when planted in a pure stand. When mixing legumes with small grains or annual ryegrass, plant 2/3 of the recommended seeding rate for a pure stand. For example the seeding rate for a ryegrass (25-30 lb/acre) and crimson clover (16-20 lb/acre) mixture would be about 20 lb ryegrass and 12 lb crimson clover. Inoculation of legume seed within 24 to 48 hours of planting is recommended for good nodulation to maximize the amount of N₂ fixation by the legume.

Planting Methods and Equipment

Generally, the larger the seed, the deeper a seed can be planted. It is desirable to place seed as deep as possible without reducing emergence. The soil surface begins drying after a rain and progresses downward. The deeper the seed, the longer moisture is present to support germination, emergence, and seedling growth. Seed drills, if adjusted properly, place more of the seed at the desired depth than broadcasting the seed on the soil surface and covering by a light

disking or dragging. Shallow planted seed will germinate with moisture but may not be able to establish a root system before the soil surface dries out. This is especially true when rainfall of about 0.5 in. or less causes germination. Seed planted too deep will germinate but the shoot may not reach the soil surface so the seedling dies. Higher seeding rates are needed when broadcasting seed to obtain the same stand as drilling seed at the proper depth. All forage legumes described earlier except vetch should be planted from $\frac{1}{4}$ to $\frac{1}{2}$ in. deep, depending on seed size. Vetch should be seeded about $\frac{3}{4}$ in. deep. Optimum planting depth is $\frac{1}{2}$ in. for annual ryegrass and $\frac{3}{4}$ to 1 in. for small grains.

The best stands are obtained when planting in a prepared seedbed because all existing plants have been removed and a smooth, firm seedbed allows for good seed placement. Poorest stands occur when overseeding a grass sod because it is difficult to place the seed in the soil at the desired depth and the grass sod competes for limited soil moisture and nutrients and can shade emerging seedlings. Light disking is a compromise between the two that provides some loose soil, reduces competition from existing plants, but does not destroy the existing grass sod.

Planting equipment for legumes and cool-season annual grasses varies from a fertilizer spreader to expensive drills. Because clovers and annual ryegrass are planted at $\frac{1}{4}$ to $\frac{1}{2}$ in. depth, they can be mixed with the initial fertilizer application and broadcast on a prepared seedbed. It is important to drag the pasture after planting to cover the seed. Rolling will enhance seed to soil contact and seal in any available soil moisture. Broadcasting small seeded clovers and ryegrass on undisturbed grass sods results in thinner stands and must be delayed till late autumn when temperatures are cooler. If seed is mixed with fertilizer, it should be spread within 6 hours to avoid reduced seed germination and seedling vigor and death of the rhizobia bacteria applied to the legume seed. Planting with drills and sod seeders is more expensive and requires more time but better stands are obtained with less seed. This is especially important when planting clovers because clover seed is 5 to 10 times more expensive than ryegrass and small grain seed.