

# Guidelines for Pasture Establishment

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## Introduction

Pastures must be well established to be highly productive. Before establishing new pastures or renovating existing pastures, producers must evaluate the farm's forage needs. It is important to consider whether the forage will be used for grazing or hay, what forage species are best suited for the area, and what resources are available in terms of equipment, money, and time. The decision of whether or not to renovate a pasture should be based on existing percentages of the desirable species present in the pasture. The following criteria could be used in such a decision:

- If the pasture contains 75 percent or more desirable species, consider not renovating and instead concentrating on management.
- If the pasture contains 40 to 75 percent desirable species, consider overseeding and concentrating on management.
- If the pasture contains less than 40 percent desirable species, consider reestablishing.

Establishing a new pasture or renovating an existing pasture usually requires some management to get the forage growing quickly and vigorously. Here are some of the steps involved in establishing or renovating a pasture:

1. soil testing and correcting soil nutrient deficiencies,
2. selecting species adapted to the specific area,
3. implementing the correct seeding method and rate,
4. implementing a weed control program, and

5. using proper management to maintain a productive stand.

## Soil Fertility

Planning for a successful pasture establishment or renovation should begin well in advance, often 6 to 12 months before the actual pasture establishment or renovation. If possible, adjust soil fertility before seeding. With today's high fertilizer prices, you cannot afford to guess how much fertilizer to apply. The first step is to obtain an accurate soil sample. Contact your county extension agent to find out how to take a proper soil sample, or refer to MSU Extension information sheet IS0346. If you plan to apply manure, it is important to note that fact in the soil sample sheet so the recommendations will reflect the nutrient contributions from manure.

Using soil test recommendations, incorporate necessary fertilizer during seedbed preparation. Avoid applying fertilizer to drought-stressed seedlings, as the application could cause burning injury to young seedlings already under stress.

Soil acidity often limits forage production in Mississippi. Acidic conditions reduce nutrient availability, root growth, and nitrogen fixation of legumes. For forages to be productive, grass pastures should be maintained at a pH of 5.8 to 6.2. Legume pastures should have a pH of 6.0 to 6.8. To maintain the ideal pH, lime application might be necessary. It could take years to correct severe soil acidity. If lime is needed, it should be applied 6 to 12 months before seeding to allow for the pH to adjust in the root zone, which will max-



imize the use of nutrients. Wherever it is practical, incorporate the lime into the soil rather than leaving it on the soil surface.

Lime not only corrects soil acidity, but also supplies calcium and magnesium. It reduces the availability of toxic nutrients such as aluminum and manganese. Lime affects the availability of most of the other essential elements needed for forage production. For example, phosphorus availability increases as the pH increases. New seedlings in particular require sufficient levels of available phosphorus and potassium to get established. Any nutrient deficiencies will compromise the success of the stand.

Proper phosphorous (P) application at seeding time is the key element in establishing grasses and legumes. Phosphorus encourages root development, particularly lateral and fibrous root formation. Quick root development is especially important when establishing forages in the fall. Well-developed root growth will minimize winter injury and allow rapid growth in the spring.

Potassium is essential for plants to cope with heat and water stress. It also is essential for plant growth and reproduction. Legumes require high potassium levels; low potassium levels can contribute to legume loss.

Nitrogen is best applied in small, frequent applications when plants are actively growing. Nitrogen, along with proper defoliation management, stimulates tillering in grasses.

## Seedbed Preparation

Good seed-to-soil contact is essential to maintain adequate moisture near the seeds. This moisture is necessary for germination and for the small root systems of young grass seedlings. The best type of seedbed preparation depends on the type of equipment available and whether a new pasture is being established (conventional tillage) or an existing pasture is being renovated (no-till drill).

### *Conventional Tillage*

A properly prepared seedbed is a key step in pasture establishment. Conventional tillage should be used when a uniform seedbed is needed. Large soil clods and excess sod impact seed germination. For conventional seeding, prepare a fine and firm seedbed by disking. Roll the field with a cultipacker after the final disking. A firm seedbed will allow capillary action to draw water to the soil surface, where moisture helps to germinate seeds and sustain small seedlings during periods of dry weather. A firm seedbed may help ensure that seed is not planted too deeply, which usually results in poor seedling emergence and weak pasture establishment. A general rule is that if you walk across the seedbed and you sink past the sole of your shoe more than  $\frac{1}{4}$  inch, the seedbed is too soft and should be cultipacked.

Forages usually establish more quickly and uniformly in conventional seedbed than in no-till established pastures. Conventional tillage seedbeds also warm more quickly, allowing for better seed germination at cool temperatures. However, conventional tillage may cause soil erosion, changes in soil structure, and reduced moisture retention.

### *No-Till Seedbed*

No-tillage involves using herbicides to kill existing vegetation and then seeding directly into the residue. Surface residue must be reduced in no-till seedbeds by hard grazing or hay removal; most no-till seedbeds are prepared in late summer and planted in fall. No-tillage seedbeds require fewer passes over the field, reduce the possibility of soil erosion, and conserve moisture. On the other hand, seedlings in no-till seedbeds emerge more slowly and less uniformly. For more information regarding herbicides for sod suppression, see the Guidelines for Weed Control (MSU Extension publication P1532).

## Species Selection

Selecting the right species or species mixture is extremely important. When establishing or renovating a pasture, it is important to match forage species to the site, soil type, and type of operation (grazing or hay, animal species and class). Check soil survey maps to find out your soil types, soil composition, drainage, and forage capability. This information can be used to predict the success or failure of a potential forage species.

Seasonal yield distribution is another factor to consider when making species selections. It is important to try to match the forage yield distribution with the animals' daily requirements. Cool-season perennial species, such as tall fescue, grow best between 60 °F and 80 °F; production usually peaks in the spring, drops in the summer, and increases in the fall. Cool-season annuals, such as annual ryegrass and annual clovers, have some growth in the fall, followed by a period of dormancy or minimal growth in the winter and highest production in the spring. Warm-season annual species, such as sundangrass, millet, and sorghum, and perennial species, such as bahaiagrass, dallisgrass, and bermudagrass, grow best between 80 °F and 95 °F. Most warm-season grasses start growing in April and continue to grow until the first hard freeze in fall. Warm-season grass production generally peaks during midsummer.

Legumes are also an important part of the establishment process because they can provide nitrogen to the grasses, increase production during the spring, and increase pasture quality. For the most part, cool-season legumes are not very productive during the summer months in Mississippi; alfalfa is the exception. Make sure that the growth habit of the selected legume species is compatible with the grass species to help minimize species competition.

## Seeding Methods

The ideal seeding method depends on the type of equipment available and whether you plant on a no-till or a conventional seedbed. To ensure good soil-to-seed contact, seed germination, and timely emergence, different seeding methods are available. Some of these methods include drilling, cultipacking, and broadcasting. Drilling cuts a thin furrow in the soil, deposits the seed, then covers it and firms the soil with press wheels. A good rule is to plant the seed three to four times as deep as the diameter of the seed.

With a cultipack planter, the seed is dropped from a hopper onto the soil, where toothed rollers press the seed below the surface. When using a cultipacker, be careful not to bury the seed too deeply, decreasing germination. The Brillion limits seed depth by the depth of the teeth; seeding depth can be adjusted by the firmness of the soil. Broadcast seeding with a fertilizer spreader can result in an uneven seed distribution if the overlap is too wide. Less seed is distributed on the outer third so adjust your spacing to provide double coverage. Make sure the spreader is calibrated for the appropriate seeding rate. When broadcasting, increase recommended seeding rates by 20 percent. Roll with a cultipacker to establish a good soil-to-seed contact.

## Seeding Time

Seeding on the correct date is also very important. In Mississippi, cool-season grasses are established in August to November (see MSU information sheet IS1168). Warm-season grasses should be planted in late spring to early summer after the soil has reached a temperature of 65 °F or above. Seeds planted in spring usually have plenty of moisture for germination, but they sustain increased weed pressure. Spring seeding should be made at least 4 weeks after the last killing frost. Late summer seeding is recommended for wet areas because the soil is usually dry enough during the summer and has less weed pressure. Fall seeding

should be made at least 4 to 6 weeks before the first killing frost in the fall; this timing allows seed adequate growth before winter. No-till drill planting in late summer might provide adequate moisture for seed germination because organic matter provides cooler soil temperatures and higher moisture levels.

## Seeding Rates

Proper seeding rates depend on forage species and seeding method (MSU Extension publication P2459). To obtain a good establishment, use seed that is pure, has a high germination rate, and has not been stored for a long period of time. High quality, certified seed is recommended. Seed cost could be a major portion of the total establishment cost, especially with the new tall fescue varieties, but buying less expensive seed does not always translate into savings. If the seed is of poor quality, it must be applied at higher rates to obtain a desirable stand (Table 1), making the use of cheap seed with low quality neither agronomically nor economically sound.

If you seed legumes, make sure the seed is inoculated with the proper bacterial strain. Legume seed is often preinoculated. If the seed is not preinoculated, mix packaged inoculum with the seed just before seeding. Visit <http://msucare.com/crops/forages/management/establishment/legumeinoculation.html> for inoculation methods. Make sure that the inoculants have been stored properly. Legumes form a symbiotic relationship with *Rhizobium* bacteria in which the bacteria fixes nitrogen from the air into a plant-available form. There is no need for nitrogen fertilizer when legumes make up more than 30 percent of the pasture. It is vital to have proper seeding depth and seed coverage. When drilling legumes, make sure to plant no deeper than ¼ to 2 inches, depending on the seed type and size. Planting depths greater than 2 inches will decrease seedling emergence as much as 50 percent in some forage species.

**Table 1. Determining the effect of lower quality seed in planting rates and seed cost<sup>1</sup>.**

Price (\$/lb)	Quality (purity x germination)	Pure live seed (%)	Planting rate (to equal planting rate of live seeds) (lb/ac)	Cost of live seed (\$/lb)
3.00	(80 x 40)/100	32	4	12.00
2.50	(70 x 20)/100	14	10	25.00
1.50	(60 x 10)/100	6	23	34.50

<sup>1</sup>Assume that the same forage species is used with different seed quality.

## Weed Control

A weed management plan will help ensure success in forage establishment. It is important to control weeds during establishment because newly emerged forage seedlings are extremely susceptible to weed competition. Weeds compete for water, nutrients, and sunlight. Broadleaf weed control is possible but may require multiple applications or applications at different times of the year. Applications at different times during the year will better control weeds that germinate during different seasons. Because new herbicides are constantly being developed and formulations of existing herbicides frequently change, consult with your county Extension office or the Weed Control Guidelines, MSU Extension publication P1532, for more information.

## Management

Do not allow animals to graze new stands too early or too frequently. Allow plants to become well established before heavy grazing or set stocking. Mow or lightly graze pastures when plants are 8 to 12 inches tall. Most forage crops should not be grazed shorter than 3 to 4 inches. Maintaining proper grazing height will help trigger new plants to tiller or producer runners. Allow plants to grow to 8 to 12 inches before grazing or mowing again. A rotational grazing approach could be beneficial in ensuring successful establishment.

## Summary

Proper forage establishment is a key step in having a thick, lush, profitable pasture. Many factors influence the success of a forage operation. No single program or system fits all situations. Take soil tests to determine fertilizer requirements and take steps to control weed problems. Soil type, drainage, moisture holding capacity, fertility, and pH all affect plant species selection. Evaluate how each factor impacts your forage system. Consider using improved forage varieties that are adapted to your geographical area and plant at the appropriate time. You can decrease the risk of planting too deeply and reducing the stand by preparing the soil properly and calibrating the drill to the correct rate and depth.

Well-planned management will help insure success for this potentially costly endeavor; failure or success often depends on adequate planning. To maximize quality and production, select those management practices that best fit your area, soil, climate, and forage crop. Use controlled grazing management strategies, such as rotational grazing, to protect new seedlings. When planning a new forage program or trying out new technology, it is best to begin on a small scale that is easily manageable and expand as you learn or see benefits from the system.

## References

- Arseneau, J.D. 1996. Pasture Management. Univ. of Minnesota Coop. Ext. Serv. Lesson 6.
- Henning, J.C. and H.N. Wheaton. 1996. Establishing Forages. Univ. of Missouri Coop. Ext. Serv. Pub. G4650.
- Henning, J.C., G.D. Lacefield, R.J. Coleman, L.M. Lawrence. 2000. Establishing and Managing Horse Pastures. Univ. of Kentucky Coop. Ext. Serv. Pub. ID-147.
- Majewski, C. 2004. Establishing Forage Seedings. Univ. of New Hampshire Coop. Ext. Serv.
- Newhall, R.L. 2005. Pasture Establishment and/or Renovation. May Agri-Hint Series # 2005-001.
- Selecting Legumes and Grasses for Hay and Pasture – 1996 MN Beef Cow/Calf Report C-127.
- Sellers, B., J. Ferrell, J. Vendramini, and Y. Newman. 2007. Weed Management During Pasture Establishment. Univ. of Florida Coop. Ext. Serv. Pub. SS AGR 287.
- Teutsch, C.D., and J.H. Fike. 2005. Virginia's Horse Pastures: Forage Establishment. Virginia Coop. Ext. Serv. Pub. 418-103.
- Meyer, D.W. 1999. Forage Establishment. North Dakota State Univ. Coop. Ext. Serv. Pub. R-563.

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