

Establishing Livestock Pastures and Hayfields (AGR-64)

Preprint version

S. Ray Smith, Jimmy Henning, Chris Teutsch, Stephanie Q. Smith
University of Kentucky Martin-Gatton College of Agriculture, Food, and Environment

Introduction

Profitable ruminant livestock operations depend on the production of high-quality forages. High yields can only be obtained from a dense, vigorous stand of an adapted forage species. The first step in obtaining such a stand is establishment. The establishment phase of forage production is critical because the response to all other management inputs depends on having a healthy and vigorous stand. Successful forage establishment requires careful planning and attention to detail.

Establishment principles detailed in this publication include proper fertilization, species and variety selection, seeding dates and rates, seeding methods, and managing weed competition. Management principles include grazing plans and rotations, paddock design and fencing, pest control, cultural practices, annual fertilization based on soil testing and weed management.

Basic Establishment Requirements

Whether you are seeding all or part of a pasture or hayfield, following these recommendations will increase your chances of success.

Control problem weeds prior to establishment. Weeds should be controlled during the season prior to establishment. Follow the reseeding restrictions found on the herbicide label(s) as this will prevent damage to new seedlings and reduce competition. Most herbicides have a waiting period between spraying and seeding, and the restriction likely will be different when seeding grasses compared to legumes. At least two well-timed applications of a non-selective herbicide will be needed for the elimination of toxic tall fescue and perennial weeds. Remember that herbicides must be applied to actively growing stands to work effectively; herbicide activity may be reduced if plants have recently been mowed or grazed, or if it is too cold or too dry. Consult *AGR-172: Weed Management in Grass Pastures, Hayfields, and Other Farmstead Sites* for specific information (<https://www2.ca.uky.edu/agcomm/pubs/agr/agr172/agr172.pdf>).

Apply needed lime and fertilizer amendments. A current soil test will indicate the needs for lime, phosphorus, and potassium and provide recommendations for nitrogen based on whether a hayfield or pasture is being established. Lime should be applied at least 6 months before establishment (Figure 1). More information on soil sampling can be found in *AGR-252: Soil Sampling Pastures and Hayfields*. For this publication and others on managing soil fertility go to the UK Forages Extension website (https://forages.ca.uky.edu/SOILS_FERTILITY).



Figure 1. Commercial truck spreading fertilizer.

Use high-quality seed of an improved variety. Use a variety that has been proven to be a top performer under Kentucky conditions. Both yield and persistence under grazing (if the field will be grazed) are considerations when selecting varieties. Consult the UK Forages Extension website for Variety Trial Report information when choosing forage varieties (https://forages.ca.uky.edu/variety_trials).

High-quality seed has high rates of germination and is free of contamination from seeds of other crops or weeds. This and additional information can be found on the seed tag (Figure 2). Most commercially available varieties are produced under Plant Variety Protection Act (PVP) that protects seed genetics for 20 years. Using varieties that are PVP protected (proprietary) or Certified (public) assures you that you are getting the variety stated on the bag. Certified seed of public varieties is indicated by a BLUE seed tag. ‘Kenland’ red clover is an example of a public variety. It is available both as certified and un-certified seed. Certified ‘Kenland’ seed significantly outperforms the un-certified seedlots.

When buying tall fescue seed for pastures/hayfields used for livestock avoid Kentucky 31 since it contains a toxic endophyte. Instead choose seed with packaging that clearly states that the variety is endophyte free or novel endophyte. KY-31 tall fescue will result in lower animal performance. The negative effects of the toxic endophyte, called fescue toxicosis, include reduced gain, heat stress, lower reproduction, and potentially more severe symptoms such as fescue foot and fat necrosis. The new “novel endophyte” tall fescue varieties contain a non-toxic endophyte which gives the plant insect resistance, grazing tolerance, and improved persistence without the toxic effects on grazing livestock.



Figure 2. Example of a seed tag showing germination and purity. Also, this seed is certified as an improved variety and has a blue certified seed tag. In addition, novel endophyte tall fescue varieties contain the Alliance for Grassland Renewal logo.

Warning: Turf-type tall fescue and perennial ryegrass varieties contain very high levels of toxic endophytes and the toxins produced by the endophyte. This enhances survival in yards and sports fields but can cause severe fescue toxicosis symptoms in livestock.

Inoculate legume seed. Inoculating legumes with the proper strain of nitrogen-fixing bacteria helps to ensure optimum nitrogen fixation. Lime-based seed coatings that contain inoculant are commonly present on most improved varieties of legume seed. Raw or uninoculated seeds should be treated with inoculant prior to seeding. In addition, inoculum has a shorter shelf life than legume seed, so check the expiration date on the seed tag. Make sure to reinoculate the seed if past this date.

Use proper seeding rate. Seeding rates will vary by species and whether sown alone or in a mixture. When sowing a mixture, less seed of each component is used than when sown alone. The seeding rates in Table 1 show a range of rates needed to produce a good stand. Higher seeding rates are used to increase the probability of achieving a good stand. For a full listing of forage crops and their seeding rates and dates see *AGR-18: Grain, Forage, and Cover Crop*

Guide for Kentucky under the Forage Species section of the UK Forage website (<https://forages.ca.uky.edu/>).

Plant at the right time. Grasses and clovers can be seeded in either spring or fall (Table 1). However, cool-season grasses (Kentucky bluegrass, orchardgrass, timothy, and tall fescue) are most easily established in the late summer and early fall. While spring seedings of these species can be successful given adequate moisture and mild temperatures, the failure rate is greater than fall seedings due to heat and weed competition. If seeding in the spring in Kentucky, plant early (early to mid-March) to increase the chance for success.

Prepare seedbed and use proper seeding method.

Proper establishment requires that seed be planted at the correct depth, which will vary depending on seed size, and be in good contact with the soil. Many seeding methods will work if they accomplish these. For seedings following conventional tillage (Figure 3), prepare a fine but firm seedbed.

When planting hay crops like alfalfa, teff or bermudagrass, a conventionally tilled seedbed may be a preferred method of establishment, especially when a cultipacker or corrugated heavy roller is used to firm the seedbed before and after seeding. Brillion® and Trillion® seeders combine packing and seeding into one operation. For more information on seeding alfalfa and alfalfa-grass mixtures, see *FSA-15 Establishing Alfalfa for Forage* from the University of Arkansas (https://forages.ca.uky.edu/files/alfalfa_establishment_from_ar_fsa-15-1.pdf).

No-till seeding is preferred on sloping land where erosion potential is high and when improved forages are being interseeded into established stands (Figure 4). Close grazing or hay harvest prior to no-till seeding removes plant residue and reduces “hair pinning”. This occurs when plant residue is pushed into a slit made by the no-till coulter, reducing good seed-to-soil contact. Lower germination and non-uniform emergence can result.

Although less common and less accurate, minimum tillage followed by broadcast seeding can be used to establish forage stands. In this method, pastures or hayfields are harrowed to result in approximately 40-60% disturbance. A variety of implements can be used for this physical disturbance, including a traditional disc as well as a rigid spike-tooth harrow. Seed is then broadcast on the soil surface and the field is lightly harrowed to incorporate the seed. Success will be enhanced by cultipacking the field. This firms the soil, enhancing seed-to-soil contact.

Red and white clovers may be established by frost seeding. Frost seeding refers to the practice of broadcasting seed on top of the ground during late winter and relying on the freeze/thaw cycle of late winter to work the seed into the soil. Frost seeding is not recommended for alfalfa or grasses. The optimal time for frost seeding is late January to mid-February. Pastures

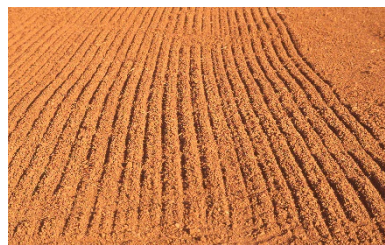


Figure 3. Establishing forages on a seedbed prepared with conventional tillage in Lincoln county, Kentucky.



Figure 4. Using a no-till seeder to reestablish forages on a field that has been treated with non-selective herbicide.

should be closely grazed and hayfields clipped which allows seed to reach the soil surface. For more information on frost seeding, see *AGR-271: Frost Seeding Clover: A Recipe for Success* (<http://www2.ca.uky.edu/agcomm/pubs/AGR/AGR271/AGR271.pdf>).

Manage post-seeding sod and weed competition. New seedlings often fail due to competition from existing vegetation and newly emerged weeds as the desired seedlings are emerging and establishing. When interseeding into existing pastures or hayfields, it is important to control competition from the existing stand by grazing or clipping. This allows sunlight to reach the developing seedlings. In some cases, herbicides can be used to control weeds. However, there are a limited number of herbicides that can be used in stands that contain both grasses and legumes. Always read and follow label directions as the rate will vary depending on weed species and on new vs. established stands. For more information on grass pasture weed control see *AGR-172: Weed Management in Grass Pastures, Hayfields, and Other Farmstead Sites* (<http://www2.ca.uky.edu/agcomm/pubs/agr/agr172/agr172.pdf>). Another valuable resource is *AGR-207: Broadleaf Weeds of Kentucky Pastures* (<http://www2.ca.uky.edu/agcomm/pubs/AGR/AGR207/AGR207.pdf>). This publication contains photos of the most common pasture weeds in Kentucky with guidance on herbicide usage and optimum timing.

Allow the immature seedlings to become established. Allow new stands to become fully established before putting them back into full use. For example, it can take over a year for a grass pasture to develop a strong dense sod. Overgrazing newly seeded areas is a major cause of seeding failures. However, light, managed grazing can enhance sod formation. For hayfields, it is best to allow them to grow to maturity (seed head or flowering stage) and then to harvest one cutting of hay before returning the field to full use. The stubble height remaining after a hay harvest should be 4 inches.

Table 1. Common seeding rates for pure stands and mixtures and optimum seeding dates for pasture and hay species.

Species	Rate lb/A (seeded alone)	Rate lb/A (in mixtures)	Optimum Seeding Dates
E- or Novel Tall Fescue	15- 25	10 - 15	8/25 - 9/25
Orchardgrass	15 - 20	10 - 15	8/25 - 9/25
Kentucky Bluegrass	12-15	4-8	8/15 - 9/15
E- Perennial Ryegrass	20 - 25	3 - 5**	8/25 - 9/25
Timothy	8 - 10	4 - 6	8/25 - 9/25
Bermudagrass	5 – 8	--	5/15 – 6/30
White Clover	---	1 - 3	2/15* - 4/15, 8/15 - 9/15
Red Clover	8 - 12	6 - 8	2/15* - 4/15, 8/15 - 9/15
Alfalfa	20	10-15	4/1 – 5/1, 8/10 – 8/31

*Winter seeding of clovers, often called frost seeding, can be made on closely grazed or mown pastures in late January or February.

**Never seed perennial ryegrass more than 25% of a seeding mixture. Ideally, only 10 to 15% is needed to provide quick cover without outcompeting the desirable long-term perennial grasses.

A recommended timeline for complete reestablishment of pastures and hayfields with a no-till drill

Spring Management

1. Soil sample pastures in May.
2. Apply lime and fertilizer according to soil test results.
3. Graze pastures in spring.
4. In mid-May, clip pastures or mow hayfields as seedheads emerge. Do NOT allow seeds to form. Especially important with endophyte infected KY-31. *Note: Clipping is important since viable seeds can form in as little as 15-20 days after pollination.*

Summer Management

1. Graze pastures heavily. If regrowth is sufficient, harvest hayfields for a second time in late June.
2. Stop grazing and allow pasture/hayfield to regrow to five to six inches in height.
3. Spray with glyphosate 4-6 weeks before planting – mid to late-July. To obtain a successful “kill” make sure that the existing plants are actively growing.
4. Allow weeds and toxic tall fescue not killed by the first spray to regrow.
5. Re-spray glyphosate just prior to planting in late August/early September.

Early Fall

1. In early to mid-September, just after the last glyphosate application, plant using a no-till seed drill.
2. Use planting rates and depths in Table 1. To achieve better ground cover, set drill to half the seeding rate and plant the field twice, the second pass perpendicular to the first pass.

Late Fall or early next Spring-New stand seedling management

1. Low rates of nitrogen can enhance stand establishment. Apply 40 lb N/A (90 lb urea/A) at or just following seeding.
2. After planting grass only stands, wait until seedlings reach the 4-leaf stage (4 to 5 inches tall) before applying herbicides for broadleaf weeds.
3. After planting legumes like alfalfa, closely follow herbicide label recommendations when spraying grass and broadleaf weeds.
4. Allow plants to become well anchored before grazing the spring following establishment. Ideally, wait until plants are 8 inches tall and flash graze (a large number of animals for a short time interval).
5. Hayfields should be harvested at the early seedhead stage of growth. Never mow closer than 4 inches.

Additional Considerations

This publication focused on the establishment of ruminant livestock pastures and hayfields, but there are a number of management considerations for maintaining healthy, productive stands. Management principles include weed control, harvest timing, stocking rate, periodic soil testing, paddock design, fencing, and other considerations.

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Forage Establishment at a Glance (Figure 5)

- Control problem weeds prior to establishment.
- Soil test and adjust fertility and pH.
- Use high quality seed of an improved variety. Be mindful of endophytes when seeding fescue.
- Inoculate legume seed prior to planting.
- Use proper seeding rate, check seeding depth, and plant at the correct time.
- Ensure good soil to seed contact.
- Control competition from weeds or existing sod immediately after seeding and during establishment.
- Prevent overgrazing of newly established pastures.



Figure 5. Successfully reestablished pasture in Central Kentucky