



Renovation- Plant Clovers in Grass Pastures

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A goal of cattle producers should be to provide the nutrients their cattle require as economically as possible. Allowing the cattle to acquire their own feed through grazing is the most efficient way to provide these nutrients. The majority of cattle in Tennessee graze tall fescue or orchardgrass pastures. While these pastures provide good quality forage over a long portion of the year, they can be improved. One of the best and easiest ways for improvement is to add legumes such as red or white clover and annual lespedeza to these pastures.

Benefits of clovers

Adding clovers to pastures or hay fields can produce benefits in four ways:

- (1) Increased yield
- (2) Improved animal performance
- (3) Nitrogen fixation
- (4) More summer production

(1) Increased yield

Research in Tennessee has shown that tall fescue overseeded with white clover, or a combination of white clover, red clover and annual lespedeza, will produce more forage than a pure tall fescue pasture fertilized with 60

pounds of nitrogen per acre (Table 1).

(2) Improved animal performance

Research has shown that clovers improve animal gains and conception rates (Table 2). High quality feed is important for a calf to gain well and for a cow to rebreed after calving. Clovers are more digestible and contain more nutrients than grasses. Their presence in a pasture improves the palatability of the forage, which will increase the amount and quality of the forage the animal consumes. Research has also shown that including clovers in an endophyte-infected tall fescue pasture helps decrease fescue toxicosis (see

Table 1. Yield and composition of tall fescue pastures with and without legumes.

Forage species	Yield (lb DM/acre)
tall fescue + 60 lbs N/acre	2975
tall fescue + white clover	3155
tall fescue + white clover + red clover + annual lespedeza	3860

Adapted from: H. Fribourg. 1978. Tennessee Farm and Home Science. 107:16.

SP439-A, Tall fescue: endophyte-infected vs. endophyte-free). The result is an increase in weaning weights, milk production and conception rates.

(3) Nitrogen fixation

Another characteristic that makes legumes a desirable component of a pasture is their ability to provide nitrogen. *Rhizobium* is a group of bacteria which enter the roots of legumes and form nodules, or knots (Fig. 1). The bacteria inside these nodules take nitrogen from the atmosphere and put it into a form that the plant can use. Not only is the nitrogen available to the legume, but the surrounding grass plants can use a portion of this nitrogen. The ability of legumes to "fix" nitrogen is actually the result of this mutualistic relationship (beneficial to both) between the legume and the bacteria. The bacteria get energy from the legume, while the legume gets nitrogen from the bacteria.

The amount of nitrogen fixed can differ according to the legume used. The amount can range from approximately 50 pounds of nitrogen per acre each year for annual legumes such as crimson clover and annual lespedeza, to more than 150 pounds per acre each year for alfalfa. Research has repeatedly shown that including a clover in a grass pasture can replace about 60 pounds of

nitrogen per acre. If at least 30 percent of the ground area in a pasture is covered by clover, there will be no need to apply any nitrogen in the spring. If nitrogen costs 25 cents per pound, this would be a savings of 15 dollars per acre each year.

(4) More summer growth

The majority of the growth from cool-season grasses such as tall fescue and orchardgrass occurs during the spring and fall. During the summer, high temperatures and drought cause these grasses to slow or stop production. Several legumes such as red clover and annual lespedeza can extend the grazing season and provide high quality pasture that is otherwise unavailable during this summer forage slump with pure tall fescue or orchardgrass pastures.

Steps for renovation:

(1) Remove excess pasture growth prior to renovation.

This is best done by grazing down to a 1-inch stubble in late fall or winter. Removing the excess forage will help ensure the legume seeds will come in contact with the soil.

(2) Fertilize and lime according to soil test.

Legumes require a higher soil pH and fertility level than do grasses.

Fertilizing by soil test will ensure that legume establishment will not be limited by low pH, potash or phosphate levels. DO NOT APPLY NITROGEN. Nitrogen will stimulate grass growth,

Table 2. Effect of white clover on animal performance.

Performance Measurement	Tall fescue ¹	Tall fescue/white clover	Improvement (%)
cows in study	38	38	---
conception rate (%)	71	92	30
calf daily gain (lbs)	1.28	1.82	42
weaning weight (lbs)	351	426	21
pounds weaned/cow	249	395	59

¹ fertilized with 150 lbs of nitrogen per acre.
Adapted from: Lechtenberg and co-workers.1975. Indiana Beef-Forage Research. p. 3.

thereby increasing the competition with the legume seedlings.

(3) Select the proper legumes.

The major legumes used in grass hay fields and pastures in Tennessee are white clover, red clover and annual lespedeza. White clover is the most tolerant of grazing. Red clover provides greater forage yields and will be productive later into the summer than white clover. Annual lespedeza will provide more production during mid to late summer, especially on droughty hillsides. See Table 3 for recommended seeding rates.

Be sure to plant certified seed of a recommended variety. Using certified seed is the only way to be sure of what you are planting. Check with your local Extension office for recommended varieties. Also be sure to inoculate the seed with the proper *Rhizobium* bacteria, or purchase pre-inoculated seed. This will ensure that the bacteria needed for nitrogen fixation are present during seed germination and seedling development.

(4) Plant the seed February 20 to March 31, making sure the seed makes good contact with the soil.

The seed is dependent upon moisture from the soil for germination and establishment. Good seed-to-soil contact is essential for obtaining a strong legume stand. There are several methods of planting. A simple but effective method is to broadcast the seed during the last two weeks of February. As the soil freezes and thaws, the seed will be worked into the ground. Allowing cattle to trample the seeds into the ground will help ensure the seeds are covered.

If the grass sod is thick, it may be necessary to use a disk to open areas for the seeds to contact the soil and become established. Use the disk to disturb about 50 percent of the sod. Not only will this improve seed-to-soil contact, but will also help reduce the competition from grasses. Drill or

broadcast the seed after disking.

Competition may also be decreased chemically. The objective is to kill or suppress 50 percent of the grass sod with the herbicide. Spraying in alternating bands with a herbicide labeled for pasture renovation, such as Gramoxone Extra®, has been successful. Spraying alternating bands can be accomplished by either turning nozzles so areas between nozzles are left unsprayed, or by lowering the boom so the spray patterns do not overlap but leave a 5- to 10-inch area unsprayed. For example, if a boom-type sprayer has nozzles spaced 20 inches apart, the boom could be lowered to the point where only 10-inch bands are sprayed by each nozzle. If the boom cannot be lowered, the nozzle tips can be turned to produce alternating 10-inch sprayed and unsprayed bands. Use Gramoxone Extra at the rate of 2 pints per sprayed acre. Since only 50 percent of the ground area in an acre will be sprayed, the amount of Gramoxone Extra needed to renovate 1 acre will be 1 pint. Use a non-ionic surfactant at 2 pints per 100 gallons of spray mix, and apply 15 to 20 gallons of water per acre (30 to 40 gallons per sprayed acre). The seed can be drilled or broadcast after spraying.

Advantages of using disk renovation:

1. Thin stands need little disking.
2. Most farmers own a disk and can use their own equipment.
3. Disking can be done in the winter when the tall fescue is dormant, while herbicides must be sprayed when the grass is green and actively growing.

Advantages of herbicide renovation:

1. Thick sods can be renovated without disturbing the soil, keeping the surface smooth. Rocks remain undisturbed.
2. Wet soils can be sprayed before they are dry enough to disk.
3. Grass plants in the unsprayed areas will produce more forage than the plants that have been disked.

Table 3. Recommended seeding rates for legumes used in renovation.

legume(s) used	seeding rate (lb/acre)
white clover	2
red clover	8
annual lespedeza	25-35
white clover + red clover + annual lespedeza	2 4 8

Managing renovated fields

Once the legumes have been established in the pasture, management will be one of the key factors influencing the maintenance of the legume component of the field. The following steps will help keep the clovers in the pasture:

(1). Keep fertility levels high.

Follow an annual fertility program based on soil test recommendations. Take a soil sample at least every third year to be sure enough fertilizer and lime are being used. DO NOT APPLY NITROGEN. Nitrogen will not kill legumes, but it stimulates grass growth, which will increase the competition with the legume and the likelihood of legume loss due to shading.

(2) Mow or graze pastures to favor the legume.

Do not allow the grass in the field to grow tall and get too mature. Not only will this result in poor quality pasture or hay, but will result in the shading of the legumes. If the pastures reach 6 to 8 inches tall, either

graze them down to 2 to 3 inches or mow them for hay. This will prevent the spring flush of growth from shading the clovers. A good rotational grazing plan will help maintain the clovers. If annual lespedeza is used, graze the pastures hard in April and May. This will allow light to penetrate down into the plant canopy where the lespedeza seedlings are.

Summary

Legumes are a valuable component of a pasture or hay field because they result in improved animal performance and a decreased need for nitrogen. Either of these benefits alone is enough to make the legumes profitable. Having both makes legumes a component of the pasture that we should focus on constantly. The steps listed in this publication should help establish and maintain the legumes in our fields.

Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label.

Pesticides recommended in this publication were registered for the prescribed uses when printed. Pesticide registrations are continuously being reviewed. Should registration of a recommended pesticide be canceled, it would no longer be recommended by The University of Tennessee.

Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product.

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