

Renovating Hay and Pasture Fields

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Red Clover

Renovate means to renew and improve. This publication discusses managing a pasture or hay field that has become less productive and renovating or “renewing” it so that it will become more productive. In Kentucky, this usually means adding lime and fertilizer, controlling weeds, and planting an adapted legume such as red clover and/or ladino white clover. The primary benefits of renovation come as a result of getting legumes established in grass-dominated fields.

Benefits of Legumes

Adding legumes to hay and pasture fields brings at least four benefits:

Higher yields. The total yield of forage per acre is increased. For example, a study conducted at Lexington compared renovating a tall fescue pasture using red clover to fertilizing the grass with nitrogen (Table 1). In this study, red clover growing with fescue produced higher yields than fescue fertilized with up to 180 lb N/acre.

Table 1. Dry matter yields of fescue-clover vs. fescue-nitrogen, Lexington, 2-year average.

Treatments	Yields, lb/ac
Tall fescue-red clover	
6 lb seed/ac	11,100
Tall fescue + nitrogen	
0 lb/ac	3,900
90 lb/ac	6,700
180 lb/ac	9,900

Taylor, T.H., et al. 1978, University of Kentucky

Improved quality. Adding legumes to grass fields improves forage quality over grass alone. This added quality includes increases in palatability, intake, digestibility, and nutrient content. The result is improved animal performance. Research has shown that legumes improve animal growth rates, reproductive efficiency, and milk production. This is especially true when legumes are added to endophyte infected tall fescue pastures. The three studies summarized in Table 2 show improved growth rates of beef cows, calves, and steers when pastures are renovated with legumes. The study reported in Table 3 shows increased growth rates of beef steers grazing a tall fescue-ladino clover pasture. It also shows higher gains per acre as a result of improved forage quality and higher yields.

Table 2. Animal performance on grass vs. legume-grass mixtures.

Species	Length of trials (yrs)	Gain/head (lb/day)	Animal class	State
Tall fescue*	3	0.12	Cows	IN
Tall fescue* + red and ladino clover		0.74		
Tall fescue*	3	1.30	Calves	IN
Tall fescue* + red and ladino clover		1.80		
Orchard-grass	10	1.07	Steers	VA
Orchard-grass + ladino clover		1.28		

*The tall fescue used in each of these studies was endophyte infected.

Table 3. Average daily gain and gains/acre of steers grazing tall fescue and tall fescue-clover pastures.

Pastures	Daily gain (lb/steer)	Total gains	
		lb/steer	lb/ac
Tall fescue* + Ladino clover	1.53	307	582
Tall fescue* + 150 lb N/ac	1.06	203	374

Hoveland, C.S., et al. 1981. Bulletin 530. Auburn, AL

*The tall fescue used in this study was endophyte infected.



Tall Fescue

High quality feed is important in getting beef cows re-bred after calving. Research conducted in Illinois and Indiana (Table 4) compared conception rates of cows grazing endophyte infected tall fescue pastures with and without legumes. In both tests, the cows grazing legume-grass pastures had much higher conception rates.

Table 4. Conception rates on grass vs. grass-legume pastures.

Species	Conception rate (%)	State
Tall fescue*	75	IL
Tall fescue* + legume	89	
Tall fescue*	72	IN
Tall fescue* + clover	92	

*The tall fescue used in each of these studies was endophyte infected.

Nitrogen fixation. Legumes get their nitrogen needs from symbiotic bacteria that live in nodules on their roots. These bacteria are added when legume seed is inoculated or added by the seed company with pre-inoculated seed. This “fixed” nitrogen provides the nitrogen needed by the legumes and also by grasses growing with them. Different legumes are able to “fix” different amounts of nitrogen (Table 5). Alfalfa usually fixes the most; annual lespedeza is on the low side with about 75 lb N/acre/year.

Table 5. Value and amount of nitrogen fixed by different legumes.

Crop	lb/ac/yr	Value of N* (\$)
Alfalfa	200 - 300	100 - 150
Red clover	100 - 200	50 - 100
Ladino clover	100 - 150	50 - 75
Vetch, lespedeza and other annual forage legumes	75 - 150	38 - 75

*Fertilizer nitrogen valued at \$0.50/lb.

The value of the nitrogen fixed by legumes depends on the cost of nitrogen fertilizer. The values in the right column of Table 5 are based on nitrogen priced at 50 cents/lb or ammonium nitrate fertilizer at \$340/ton. Price increases in nitrogen have provided an even greater cost savings from planting legumes.

More summer growth. Most of the growth of cool-season grasses occurs during the spring and fall. Legumes such as red clover, alfalfa, and lespedeza make more growth during the summer months than cool-season grasses. Growing grasses and legumes together improves the seasonal distribution of forages and provides more growth during summer.

How to Renovate

Follow these six important steps when renovating grass fields with legumes:

1. Have the soil tested and apply the needed lime and fertilizer. Legumes need a higher soil pH and fertility level than grasses. However, avoid using nitrogen if you have 25 percent or more legumes. Added nitrogen stimulates grasses, which then become more competitive with the legumes.
2. Reduce the vegetative cover on the soil. This is best done by heavy grazing in late fall and early winter. Removing the excess grass cover will make it easier to get the legume seed in contact with the soil. This can also be accomplished by low rates of herbicides containing paraquat (e.g. Gramoxone).
3. Select the legumes to be used. This will depend on the soil and the planned use of the forage. For hay, alfalfa or red clover is usually best. For both hay and grazing, a combination of red clover and ladino clover works well. For pasture, ladino clover, red clover and/or annual lespedeza all work well.

4. Use the right kind and amount of seed. Select varieties that perform well in your area. The only way to be sure of what you're planting is to use certified seed. Table 6 provides some seeding rate guidelines. Also be sure to use the right kind of high quality inoculant mixed with the seed just before planting. Use a sticking agent to be sure that the inoculant sticks to the seed. Much of the legume seed currently available is pre-inoculated. Check the seed tag or inoculum bag for the "plant by" date. Table 6 provides seedling rate guidelines.



Sericia lespedeza

Table 6. Legume seeding rates for renovating grass fields.

Mixture number	Legume(s)	Seeding rates* lb/ac
1	Ladino white clover	1 - 3
2	Red clover	6 - 12
3	Annual lespedeza	15 - 25
4	Alfalfa	12 - 20
5	Ladino white clover	1 - 2
	red clover	6 - 8
6	Alfalfa	8 - 10
	Ladino white clover	1/2 - 1
7	Birdsfoot trefoil	6 - 8

*If seeding is done at the proper time and under good conditions, the lower rates can be used. The higher rates may be needed for broadcast seedings or when conditions are not the best.

Plant the seed so that it makes good contact with the soil. One option is light cultivation using a disk, field cultivator or field tiller. Disturb 40 to 60 percent of the sod for planting clovers. Tillage helps control the grass growth and exposes the soil so the legumes have a better chance to germinate and grow. Broadcast the seed and pack the soil with a corrugated roller.

Another method is to use a no-till renovation seeder. These do a good job of placing the seed in the soil, but they don't reduce the competition from the grass. Close grazing, cutting, or herbicide suppression of the existing sod is recommended before no-till seeding.

A simple but effective method is to broadcast the legume seed on the soil surface in late winter (February 10 to March 10 or when there are 4 to 6 weeks of potential frost at night). As the soil freezes and thaws, the seeds become covered. This method does not work well with alfalfa. As described above, make sure the stand is grazed or cut closely so that nearly all plant residue is removed and the legume seed hits the soil surface.

Herbicides containing glyphosate or paraquat can be used to kill or suppress some of the grass and help control competition. Follow the label directions for rates and grazing restrictions when herbicides are used.

5. Control grass and weed competition after legumes start to grow. This step is one of the most critical. Many attempts at renovation have failed simply because the grass was allowed to grow and reduce the light, nutrients, and water available to the young legume plants. The grass must be kept short by grazing or mowing until the new legume plants are 3 to 4 inches tall. Stop grazing if the animals begin biting off the young legume leaves. Grazing and mowing should be stopped for several weeks to allow the legumes to become well established. After this, the field should be mowed or grazed on a schedule that will help keep the legumes in good condition. A rotational grazing system is highly recommended to maintain legumes in pastures.

Managing Renovated Fields

Once legumes have been established in grass fields, maintaining them is important. To do so, the following management factors need to be addressed:

- Follow an annual fertility program based on University of Kentucky soil test recommendations (AGR-1) to be sure that phosphorus and potassium are available. Maintain pH at recommended levels by timely lime applications (pH>6.0 white clover, 6.2 to 6.5 for red clover, 6.4 to 6.8 for alfalfa). Take a soil sample at least every other year to be sure enough fertilizer is being used and to see if more lime is needed. Again, to avoid too much competition from the grass, DO NOT use any nitrogen as long as you want to keep legumes in the field. For this reason, the ideal phosphorus fertilizer is triple superphosphate (0-46-0). However, 0-46-0 is often not available or priced higher than other P sources. In these situations, some N applications may be unavoidable to supply the P needed by the legume. If 0-46-0 is not available, then the alternative P sources

are 11-52-0 (monoammonium phosphate) and 18-46-0 (diammonium phosphate). If these alternative sources are used, they should be applied after the first cutting and at the lowest recommended rate to minimize grass competition. Because of its lower nitrogen and higher phosphorus analysis 11-52-0 is the preferred alternate P source. The likelihood of successfully establishing a legume decreases as soil test levels decrease. If soil test levels (or soil pH) are very low, then it is probably better to apply fertilizer and lime and wait a year before attempting to establish legumes.

- Mow pastures as needed to remove grass seed heads and control weeds and woody vegetation.
- Harvest hay or manage grazing to favor the legume being used. Grass-clover pastures may be grazed all season, but take care to avoid overgrazing. Ideally, leave 3 to 4 inches of top growth at all times. A good rotation plan helps (see UK Cooperative Extension publication ID-143). When annual lespedeza is used, pastures should be grazed heavily in April and May to control the grass and give the lespedeza a chance to get started. It should be given a rest then, until the lespedeza is 5 to 8 inches tall before grazing again. Alfalfa-grass fields can be grazed successfully, but a good rotation system must be used. A good plan is to use enough livestock to graze it down in 5 to 10 days. Then give it 4 or 5 weeks to re-grow before repeating the cycle.
- Observe renovated fields often to be sure insect damage is discovered early. If damage is observed, consult with your county Agricultural Extension agent for recommendations.

Other Information

More detailed information on many of the recommendations discussed in this publication is available from the University of Kentucky College of Agriculture Cooperative Extension Service. Check with your local county agent or go to the UK Forage Website (www.uky.edu/Ag/Forage) for these and additional publications.

Lime and Nutrient Recommendations (AGR-1)

When to Apply Lime and Fertilizer (AGR-5)

Taking Soil Test Samples (AGR-16)

Soil Testing: What It Is and What It Does (AGR-57)

Grain and Forage Crop Guide for Kentucky (AGR-18)

Growing Red Clover in Kentucky (AGR-33)

Growing Lespedeza in Kentucky (AGR-86)

Growing White Clover in Kentucky (AGR-93)

Quality Hay Production (AGR-62)

Inoculation of Forage Legumes (AGR-90)

Weed Management in Grass Pastures, Hayfields, and Fencerows (AGR-172)

Forage Identification and Use Guide (AGR-175)

Rotational Grazing (ID-143)

Insecticide Recommendations for Alfalfa and Clover and Pastures (ENT-17)

2008 Long-term Summary of Kentucky Forage Variety Trials (PR-584)