Nitrogen fertility management for cool-season grass pastures

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Whether to apply nitrogen fertilizer and how much to apply are common questions asked by producers who want to get the most out of their cool-season grass pastures. Some principles should be used to determine whether there would be a financial pay back for applied nitrogen fertilizer on pastures. Nitrogen fertilizer should not be applied to pastures, which are comprised of 30 percent or more legumes since legumes will fix nitrogen from the atmosphere and some of that nitrogen will be utilized by grasses grown in association with the legumes. Grass species differ in their potential to utilize nitrogen. Festulolium, orchardgrass, and tall fescue will use applied nitrogen fertilizer somewhat more differently than perennial ryegrass, timothy, and smooth bromegrass due to differences in species response to the environment including dry, hot summer weather and cool fall weather. In an experiment established in 2001 at the Kellogg Biological Station in Michigan (Table 1), the average yield of cool season grasses grown with kura clover, red clover, or white clover was 4.0 tons/acre. The average yield of the grasses grown without clovers but with 200-lbs/acre actual nitrogen was 3.5 tons/acre. The average yield of the clovers was 3.2 tons/acre. These data point out the clear advantage of growing grasses and legumes together. By doing this practice properly, farmers may be able to save some chemical fertilizer costs. From an environmental standpoint, it is much better to utilize legumes in a pasture for increased production compared to chemical nitrogen fertilizer. If pastures contain less than 30% legumes, one should consider no-till seeding or frost seeding legumes such as red or white clovers.

In another study established in 2001 in East Lansing in Michigan, we evaluated the effect of increasing application rates of nitrogen fertilizer (Table 2) upon dry matter yields of grass grown without legumes. The results of this study (Figure 1) showed that species differ in their ability to use nitrogen. All species resulted in significantly higher yield over a three-year period with added fertilizer nitrogen up to 200 lbs/acre applied in split applications of 50 lbs/acre four times during the growing season. Additional fertilizer nitrogen applied above 200 lbs/acre resulted in no significant increases in yield. Both the tall fescue and tetraploid perennial ryegrass resulted in significant increases in yield with nitrogen rates up to 300 lbs/acre in year one only (Data not shown). The effect of increasing rates of nitrogen fertilizer on ground cover was not significantly different between species of grasses (Data not shown). However, the diploid perennial ryegrass generally had higher ground cover compared to the other species of grasses studied. Crude protein increased significantly with increasing nitrogen rates up to 200 lbs/acre. There was generally no effect of nitrogen fertilization upon fiber levels of grasses (Data not shown).

In summary, plant grass and legume mixtures for optimum performance and forage quality for pastures. If the legumes begin to decline below 30 percent consider renovating by planting no-till with clovers or frost seeding with clovers into the existing pasture. Pastures with less than 30 percent legume, which were not renovated, can use up to 150 to 200 lbs/acre nitrogen for optimum pasture production and forage quality.

Table 1. Forage dry matter yield comparing binary mixtures of grass/legume, monocultures of clover, and grass fertilized with 200 lbs/acre annually in Michigan.

Grass	Dry matter yield (Tons/Acre) Grass/Legume	Cry matter yield Average of kura clover, red clovera dn white clover (Tons/acre)	Dry matter yield (Tons/acare) Grass only (200 lbs/acre Nitrogen applied)
Festulolium	3.9	3.2	3.7
Orchardgrass	4.0	3.2	3.1
Perennial Ryegrass	3.8	3.2	3.6
Tall Fescue	4.2	3.2	3.6
Average	4.0	3.2	3.5

Figure 1. Response of Cool-Season Grasses to Increasing Nitrogen Fertilizer Rates in Michigan.

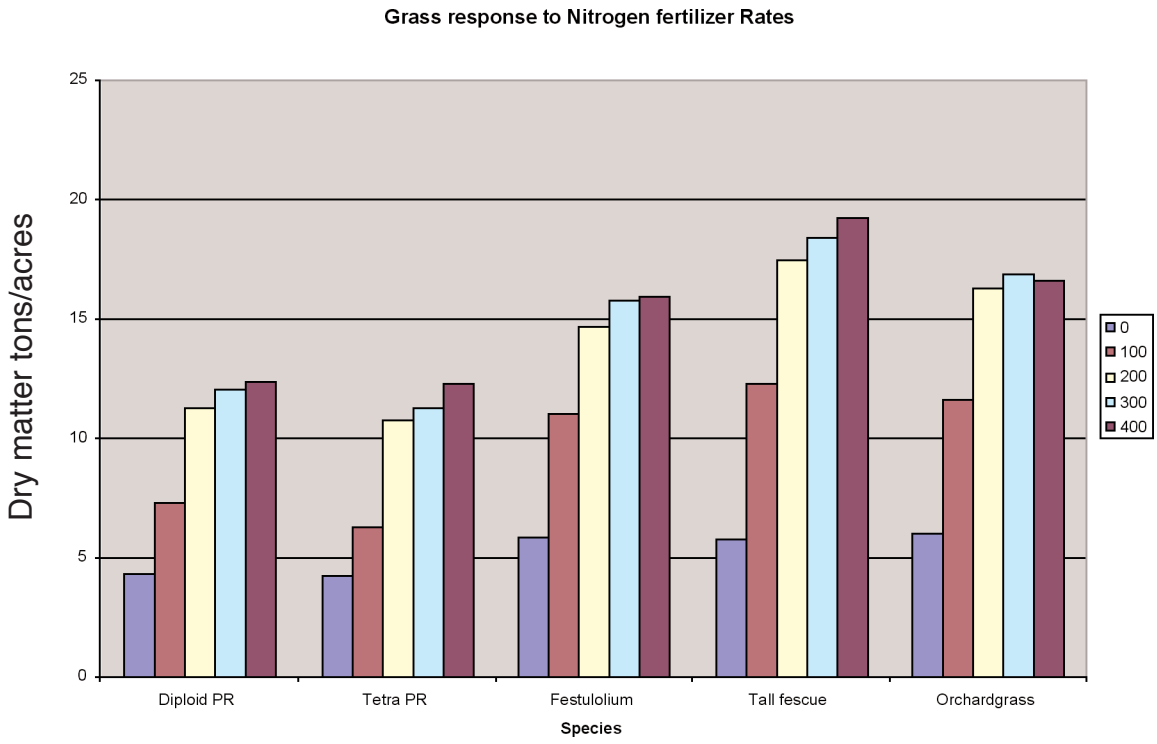

Table 2. Nitrogen application and timing Lb/acre at East Lansing, MI.

Rate	Timing
o	0
100	50 green up, 50 after 1st cut
200	50 green up, 50 after 1st cut, 50 after 2nd, 50 after 4th
300	100 green up, 75 after 1st 1st cut, 100 after 2nd, 50 after 4th
400	100 green up, 100 after 1st cut, 100 after 2nd, 50 after 3rd, 50 after 4th