INCORPORATING LEGUMES TO REJUVENATE PASTURES

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Productive pastures help reduce beef cow feed costs in the region. However, most old tame pastures in the four-state region are in bad condition due to overgrazing, lack of fertilization, weed infestation, and low species diversity. There are many ways pastures can be rejuvenated. The first and most important step in a successful pasture renovation program is to identify the cause of the problem. If a pasture has a higher proportion of weeds than desirable species then we need to identify why. A weed control approach may be appropriate and stocking rates should be evaluated. Pasture renovation techniques will range from oversowing some seed into existing pastures to tearing apart the paddock and starting over with desired plant species. Methods used are dependent on the extent of the problem. In most cases the worse the problem, the greater the benefits will be realized from renovation. This article focuses on incorporating legumes into existing pastures as a strategy to renovate pastures.

Interseeding forage legumes into grass pastures often rejuvenates them. Grass and legume mixed pastures have potential to supply more consistent yields and improve quality across a wide range of environments compared with grass monocultures. Improved forage quality includes increases in palatability, intake, digestibility and nutrient content. Legumes in the pasture form a symbiotic relationship with bacteria to fix biological nitrogen, reducing fertilizer needs. Other benefits include soil erosion control and minimizing weed invasion.

Several legumes have potential for use in pastures but have limitations. Alfalfa, which is primarily used as a hay crop requires elaborate seedbed preparation, deep soils, can cause bloating and has low persistence under grazing. Lack of persistence is due to insufficient rest periods for alfalfa to recharge crown with non-structural carbohydrates required for overwintering. Kura clover, a legume with potential for use in grazing, is slow to establish and may not be sufficiently competitive in the seeding year and has potential to cause bloat. Birdsfoot trefoil contains condensed tannins that prevent bloating and can support short term gains in pastures but lacks persistence. Sainfoin is another bloat safe perennial legume with good drought tolerance and is adapted to areas where alfalfa grows but lacks persistence and is very slow to regrow after grazing. Red clover is a short lived, acid tolerant perennial legume but is not persistent in pastures and hay is slow-drying due to high water content in the foliage.

The suppression of existing vegetation with herbicides and the development of new planting methods have greatly increased the success of inter-seeding legumes into pastures. However, establishment success is still limited by seedling vigor, lack of moisture, high temperatures, low soil fertility, low pH, diseases, and winter-killing among other factors. Interseeding as early as possible into existing sod is desirable but competition from existing plants will increase in spring and must be reduced by grazing or clipping. Table 1shows the frequency of occurrence of legume plants counted 41 days after planting using four different sod suppression techniques at Brookings, SD June 2003. Table 2 shows the frequency of occurrence of alfalfa, birdsfoot trefoil, and kura clover counted 41 days after planting averaged over four different sod suppression techniques at Brookings, SD in June 2003.

Researchers have noted that limitations and persistence of legumes in pastures differ by two phases; an early phase termed *pioneering* and a later phase described as the *maintenance* phase. During the pioneering phase, establishment and persistence will most likely be under environmental controls. Pests and disease factors will likely determine long-term persistence in the maintenance phase. In addition to establishment, the quantity and persistence of legumes in pastures are important keys to their productivity and economic value. The initial quantity of legumes in a pasture is determined by the seeding rate and stand establishment success. Maintaining a desired legume percentage in a grass-legume pasture is complex and dependent on many factors because:

> "Legumes are unnatural plant species in grassland. Where in the world does one find solid stands in nature where legumes are the dominant species? Legumes have to be cultured as a crop. They lack the tolerance and adversity that is characteristic of grasses. Thus, it should be expected that it is difficult to grow legumes in a pasture grazed by animals." (Hoveland, 1989)

Environmental factors, outside the control of the producer, that influence the shift in species composition in a pasture are temperature stresses, water-logging, and soil type (and/or soil moisture). Therefore, factors such as fertilizing, stocking rate, stock density, timing of grazing and recovery periods are tools that a producer has control over. These management factors can have a big influence on legume persistence in grass pastures through direct and indirect effects. Monitoring and understanding of pasture legume growth can be useful in helping producers make good management decisions for enhancing survival. Matching the right legume with the proper grass can be beneficial. For example, birdsfoot trefoil and crownvetch are easier to establish in Kentucky bluegrass and orchardgrass than in smooth bromegrass, tall fescue or reed canarygrass. Alfalfa and red clover are more vigorous and better established in smooth bromegrass, tall fescue, and reed canarygrass.

The benefits of interseeding legumes in pastures can be great. There are some risks (i.e. weather) we can not control, but paying attention to the management tools (i.e. fertility, grazing management, competition during establishment) we can control is an important part of using legumes successfully in pastures.

Table 1. Frequency of occurrence of legume plants counted 41 days after planting using four different sod suppression techniques at Brookings, SD in June 2003.

Treatment	Frequency of occurrence (%)
None	38
Burn	45
Field cultivate	55
Fall/spring grazing	64
Round-up	39

Unpublished data from Smart, 2003

Table 2. Frequency of occurrence of alfalfa, birdsfoot trefoil, and kura clover counted 41 days after planting using four different sod suppression techniques at Brookings, SD in June 2003.

Treatment	Frequency of occurrence (%)
Alfalfa	77
Birdsfoot trefoil	54
Kura clover	13

Unpublished data from Smart, 2003