Soil Fertility Influences Forage Species in Sward

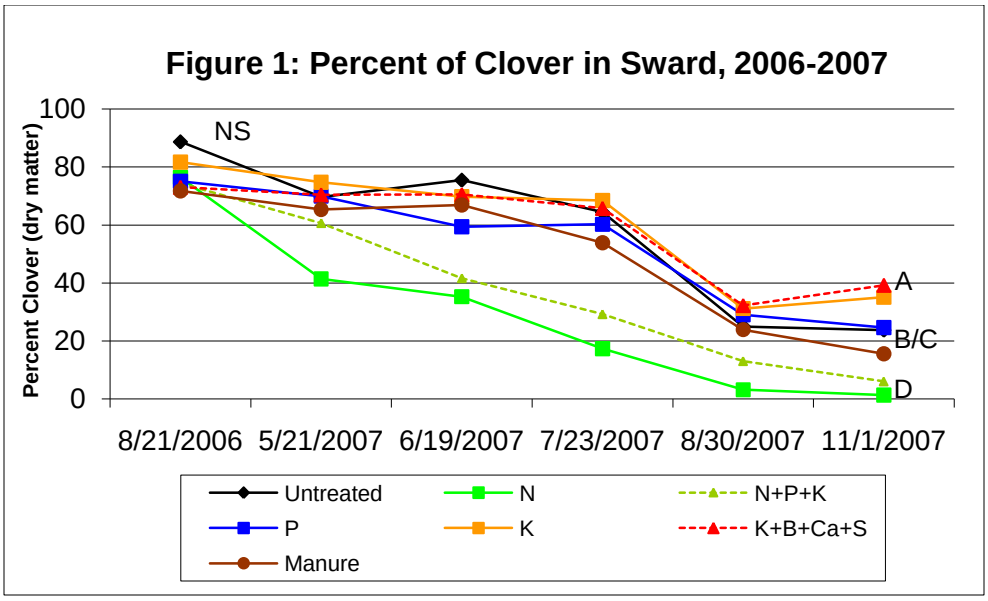
Nick Schneider, Winnebago County Agriculture Agent, August 2009

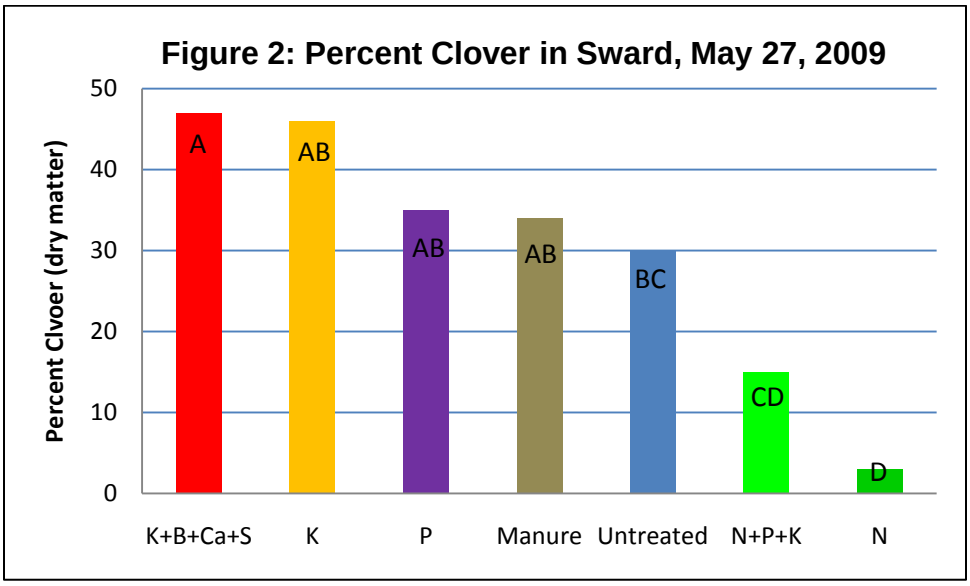
A study was performed at the Marshfield (WI) Agriculture Research Station starting in 2006 and continued to 2009 to better understand the influence of fertility on forage species diversity, yield, and quality. Fertility treatments were based on recommendations from 'Nutrient application guidelines for field, vegetable, and fruit crops in Wisconsin'. Treatments consisted of an untreated check, nitrogen (N) alone, N + phosphorus (P) + potassium (K), P alone, K alone, K + boron (B) + calcium (Ca) + sulfur (S), and manure. Forage species established were red clover, white clover, orchardgrass, and Kentucky bluegrass; however, red clover and orchardgrass dominated the sward throughout the study.

Changes in species diversity are presented as the percent of clover (dry matter) in Figure 1. In fall of 2006, the establishment year, all treatments had similar percentages of clover containing between 72 to 89%. A sharp decline in clover was measured from July 23, 2007 to August 30, 2007 in all treatments. During this period of time, rainfall was much below normal. The untreated check, phosphorus, potassium, potassium with micronutrients, and manure had similar percentages of clover from August 2006 through August 2007. However, in the fall of 2007, treatment differences were more apparent. Potassium based treatments had the highest proportion of clover with 35 to 39% of the sward derived from clover. The phosphorus and untreated check treatments consisted of 25 and 24% clover, respectively. Clover in the manure only treatment dropped to 16% of the sward. Starting in the spring of 2007 and throughout 2007, there was a decline in clover percentage when nitrogen fertilizer was applied. This trend supports the widespread assumption that applications of commercial sources of nitrogen can contribute to displacement of clover through robust growth of grasses. Less than 7% clover remained in the two nitrogen based treatments at the conclusion of 2007.

Nutrient treatments were continued through 2008 and 2009. In late May of 2009, a final forage sward species separation was performed (Figure 2). Treatments with nitrogen continued to have a low percentage of clover at 3% for N alone and 15% for the N+P+K treatments. Treatments with K and K+B+S+Ca had clover that persisted at over 40% of the sward. The untreated, manure, and P treatment still maintained clover at 30-35% of the sward.

Soil fertility has the ability to influence the prevalence of grasses and legumes in pasture and other mixed species forage stands. It is important for the grazing farm manager to decide if predominantly grass pasture or mixed grass-legume stands are preferred. Managing a pasture specifically for grass by adding nitrogen fertilizer will displace some clover, both seasonally and over the life of the stand. Including potassium and micronutrients may aid the persistence of clovers; however, there appears to be some variation in seasonal growth patterns. If the grazing farm manager is satisfied with 1/3 legumes, at 35% clover, swards with only manure supplying nutrients, appeared to contain a sufficient quantity of clover at the end of this study.





Note: Treatments with the same letter indicate similarity at LSD (0.05).