

# Warm-Season Grass Pasture Improvements with Legume Mixtures

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## Introduction

Pastures in Iowa consist mostly of cool-season grasses. A combination of warm-season grass and cool-season grass would improve overall efficiency of forage growth available for livestock production. The addition of legumes can improve the overall efficiency of pastures because the legumes in the warm-season grass mixtures can help to improve forage quality and reduce the nitrogen fertilizer needed.

## Materials and Methods

A complex mixture of 15 legumes was interseeded into existing switchgrass (*Panicum virgatum* L., cv. Cave-in-Rock) and big bluestem (*Andropogon gerardii* Vitman, cv. Rountree) pastures in late summer of 1998. Legumes in the mixture included various cultivars of alfalfa, berseem clover, birdsfoot trefoil, cicer milkvetch, crimson clover, crownvetch, hairy vetch, kura clover, red clover, sweet clover, and white clover. The legumes chosen represent species with varying life cycles and growth habits. Legume composition was identified using a dry-weight rank method. The experimental design is a split plot with half of each pasture consisting of a grass/legume combination and the other half of only grass. Grazing was delayed until summer of 1999 to allow the legumes to develop a seed bank. Animals were placed on the pastures mid-June and removed mid-August for 1999, 2000, 2001, and 2002. Cattle weights were determined

before and after each grazing season. Pasture samples were collected from paddocks to determine the quantity of available forage.

## Preliminary Results and Discussion

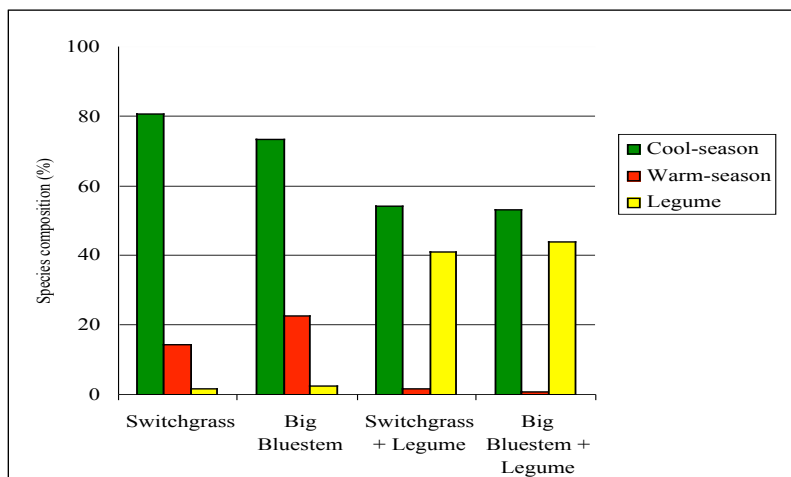
Preliminary data for mean cattle gains are shown in Table 1. For 1999 and 2000, big bluestem/legume pastures showed the highest gain. Overall gains in 2001 were less than in the other years. Data for 2002 showed the highest gains from the grass/legume mixtures. In general, cattle gains over the summer months provided evidence of the improved pasture productivity.

Legume composition was estimated for the pastures. Of the pastures containing legumes (Figure 1), over 40% was legumes, which indicates persistence of legumes in the grass/legume pastures. Legumes identified by species composition showed that only a few persisted for the duration of the project. The legumes included alfalfa, crownvetch, red clover, cicer milkvetch, sweet clover, white clover, and hairy vetch. However, cool-season grass made up over 50% of the total species composition in grass/legume and grass only pastures. Due to the high percentage of cool-season grass invasion into warm-season pastures, cool-season grass samples will be analyzed to help understand the variation in cattle gains for warm-season grass pastures.

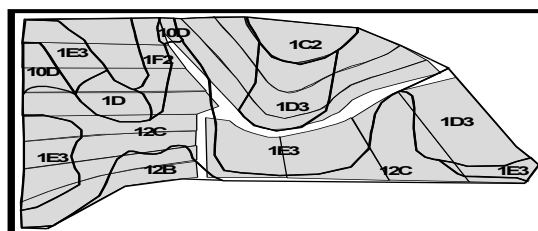
These findings should be considered preliminary. Additional research is being conducted on species composition, forage quality, and spatial relationships among legume recruitment and persistence, soil properties (detailed soil map shown in Figure 2), and landscape position, which may explain observed animal performance.

**Table 1. Means of cattle gains on various pasture treatments.**

Year	Treatment	Total gain (lb)	Average daily gain (lb/day)
1999	Big bluestem	57.50	1.47
	Big bluestem/legume	60.00	1.54
	Switchgrass	54.29	1.39
	Switchgrass/legume	51.25	1.31
2000	Big bluestem	90.63	1.68
	Big bluestem/legume	96.88	1.79
	Switchgrass	89.38	1.66
	Switchgrass/legume	95.00	1.76
2001	Big bluestem	38.13	0.61
	Big bluestem/legume	35.63	0.57
	Switchgrass	55.63	0.88
	Switchgrass/legume	52.50	0.83
2002	Big bluestem	63.75	1.01
	Big bluestem/legume	76.25	1.21
	Switchgrass	63.13	1.00
	Switchgrass/legume	75.00	1.19



**Figure 1. Species composition (%) of various pasture treatments.**



**Soil description**

- 1C2 Ida, 5-9% slopes
- 1D Ida, 9-14% slopes
- 1D3 Ida, 9-14% slopes
- 1E3 Ida, 14-18% slopes
- 1F2 Ida, 18-25% slopes
- 10D Monona, 9-14% slopes
- 12B Napier, 2-5% slopes
- 12C Napier, 5-9% slopes

**Figure 2. Detailed soil map of pastures (identified by Jim Gertsma).**