

ROLE OF LEGUMES IN PASTURE SYSTEMS

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Successful livestock programs are dependent on forage programs which supply large quantities of adequate quality, homegrown feed. A major percentage of the feed units for beef (83%) and dairy (61%) cattle come from forages. In addition, forages supply an estimated 91%, 72%, 15% and 99% of the nutrients consumed by sheep and goats, horses, swine and ruminant wildlife, respectively. These values can be put in perspective when we consider that 63% of Kentucky's Agricultural Cash Receipts are from livestock and livestock products. Cash hay accounts for approximately 28% of the total crop value. Hay ranks second only to tobacco in crop value. Add to this any value you want to put on forages role in soil conservation, seed production, aesthetics, etc.

Kentucky's forage base is composed of cool-season grasses and legumes. Four grasses occupy the vast majority of our forage land with Kentucky 31 tall fescue occupying the largest number of acres (Figure 1). Clovers (red, ladino, white) (Figure 2) are, by far, the dominant legumes found in Kentucky hay/pasture fields. Pasture production from the cool-season species varies greatly during the growing season (Figure 3).

Figure 1. Forage Grasses

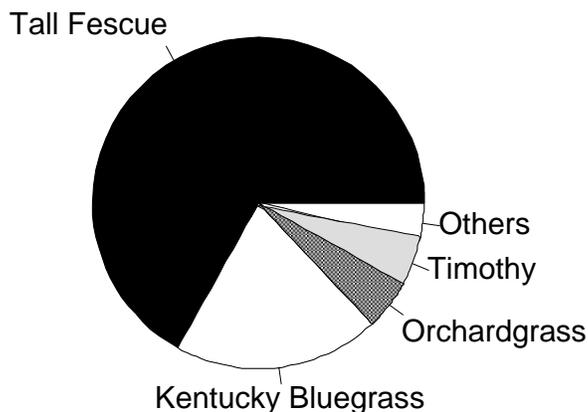


Figure 2. Forage Legumes

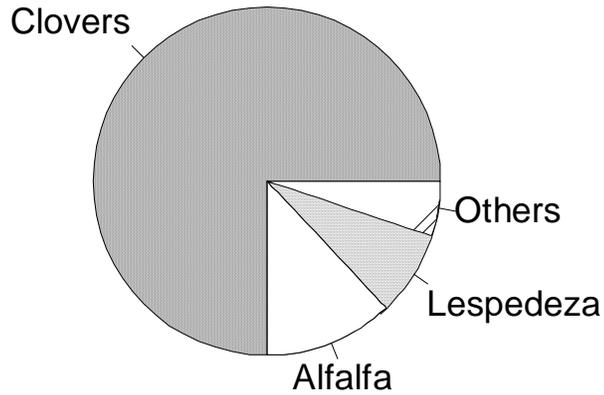
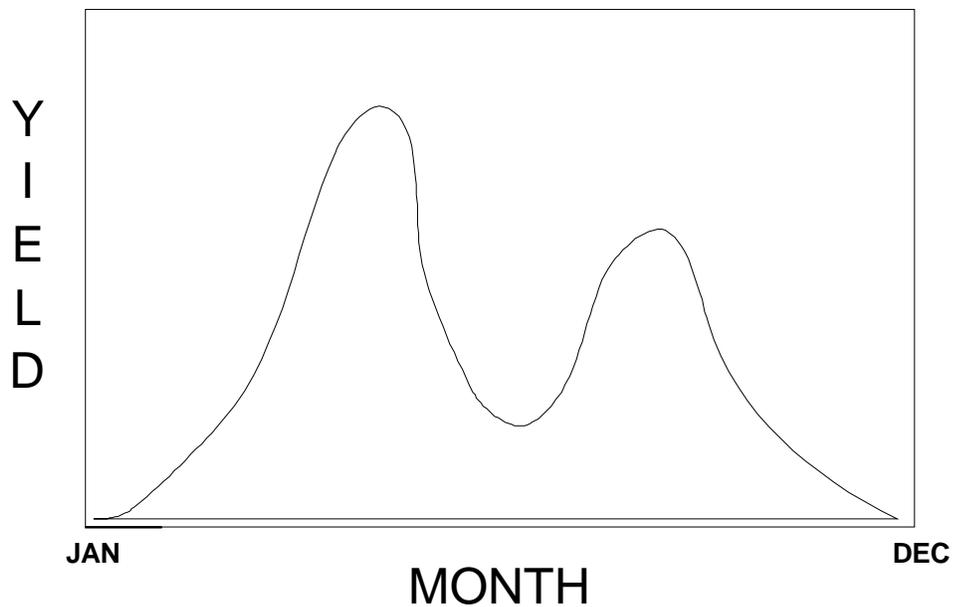


Figure 3. Seasonal Yield Distribution of KY 31 Tall Fescue.



Legumes are present at a high enough level to significantly improve overall animal production on less than one-fourth of the acreage needed. Research, demonstration and farmer experience have clearly documented the positive contribution legumes can make when incorporated into grass pastures. Adding legumes to hay and pasture fields can bring at least four major benefits:

(1) **Higher Yields**

The total yield of forage per acre is increased. For example, a study conducted at Lexington compared renovating a 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/ac.

Table 1. Dry Matter Yields of Fescue-Clover vs. Fescue-Nitrogen—Lexington, 1978, 2 Yr. Average.	
Treatments	Yields, lb/ac
Fescue-Red Clover 6 lb Seed/ac	11,100
Fescue + Nitrogen	
0 lb/ac	3,900
90 lb/ac	6,700
180 lb/ac	9,900

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

(2) **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. The three studies summarized in Table 2 show improved growth rates of beef cows, calves, and steers when legumes are used. The study reported in Table 3 shows increased growth rates of beef steers grazing a fescue-ladino clover pasture. It also shows higher gains per acre as a result of improved forage quality and higher yields.

Species	Length of Trial (Yrs)	Gain/Head (lb/day)	Animal Class	State
Tall Fescue	3	0.12	Cows	IN
Tall Fescue + Red & Ladino Clover		0.74		
Tall Fescue	3	1.30	Calves	IN
Tall Fescue + Red & Ladino Clover		1.80		
Orchardgrass	10	1.07	Steers	VA
Orchardgrass + Ladino Clover		1.28		

Pastures	Daily Gain (lb/steer)	Total Gains	
		lb/steer	lb/ac
Fescue + Ladino Clover	1.53	307	582
Fescue + 150 lb N/ac	1.06	203	374

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

High quality feed is important in getting beef cows rebred after calving. Research conducted in Illinois and Indiana (Table 4) compared conception rates of cows grazing 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	

(3) **Nitrogen Fixation**

Legumes get their nitrogen needs from symbiotic bacteria that live in “knots” (nodules) on their roots. These bacteria are added when legume seed is inoculated. 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, while annual lespedeza is on the low side with about 75 pounds.

Crop	N fixed, lb/A/year	N value, \$, @		
		25¢/lb	35¢/lb	45¢/lb
Alfalfa	150-250	38-63	53-88	68-113
Red clover	75-200	19-50	26-70	34-90
White clover	75-150	19-38	26-53	34-68
Vetch, lespedeza, and other annual forage legumes	50-150	13-38	18-53	23-68

SOURCE: Southern Forages 2002

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 25 cents/lb or ammonium nitrate fertilizer at \$170/ton.

(4) **More Summer Growth**

Most of the growth of cool-season grasses occurs during the spring and fall. Legumes (alfalfa, lespedeza, red clover) 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.

Summary

Legumes have played an important role in Kentucky pasture and hay fields in the **PAST**. They are playing an important role at **PRESENT**; however, they must play a more important role in the **FUTURE** as we exploit these unique plants to improve the overall forage-livestock situation in the state.