Status of soil pH, nitrate-nitrogen, phosphorus, and potassium in overseeded ryegrass or clover bermudagrass pastures after 33 years of stocking

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Application: Fertilization of bermudagrass in the Pineywoods vegetation region of Texas has been used to increase dry matter production in hay meadows and pastures.

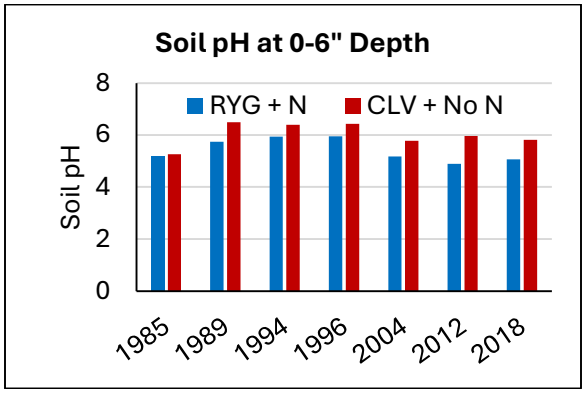
Introduction: The primary objectives of this project were to document the changes in soil fertility nutrients in overseeded bermudagrass pastures during 33 years under grazing conditions.

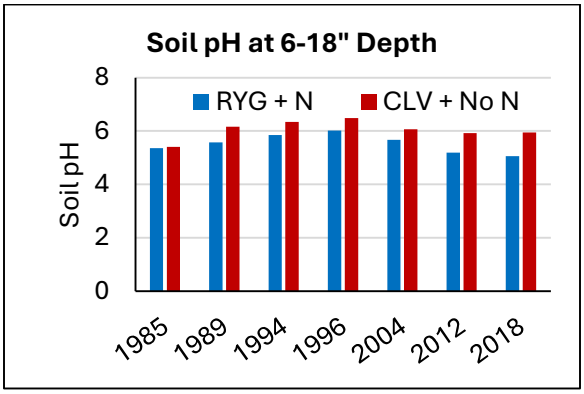
Materials and Methods: 'Coastal' and common bermudagrass (BG) were established in different sized pastures at the Overton Center in 1968. Three different stocking rates of each BG were initiated in 1969 using cow-calf pairs. From 1969 through 1984, annual fertilization was 200-44-83 (N-P-K) with split applications of N. The BG pastures were grazed as pure stands through 1974. In fall 1974, all pastures were overseeded with mixtures of annual ryegrass plus clover and stocked starting in Feb-Mar to Oct each year through 1984. In fall 1984, all pastures were subdivided with one half overseeded with ryegrass + N fertilizer (RYG + N) and the other half overseeded with clover without N fertilizer (CLV + No N). From spring 1985 to 2018, these overseeding and stocking rate regimens have been in place. Fertilization with N has been split-applied with a single application of P and K (Table 1).

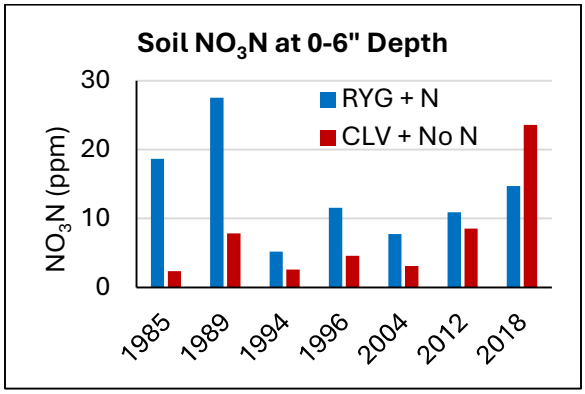
Table 1. Annual fertilizer[1,2] applications on bermudagrass pastures during various periods.

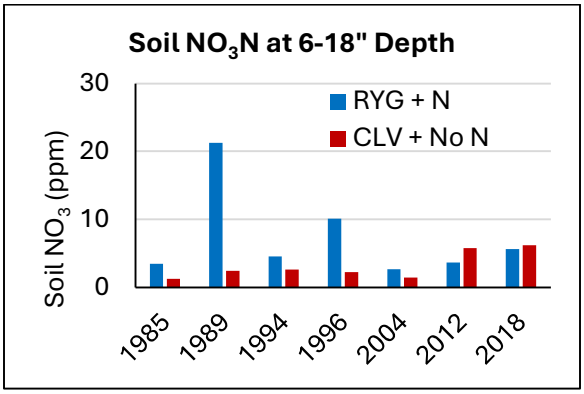
		Ryegrass + N			Clover + No N		
Period	**No Years**	**N**	**P**	**K**	**N**	**P**	**K**
			lb/ac			lb/ac	
1985-1989	5	410	0	0	0	0	85
1990-1997	8	250	0	0	0	0	85
1998-2004[3]	7	303	46	85	0	46	85
2005-2018[4]	14	278	30	54	0	30	54

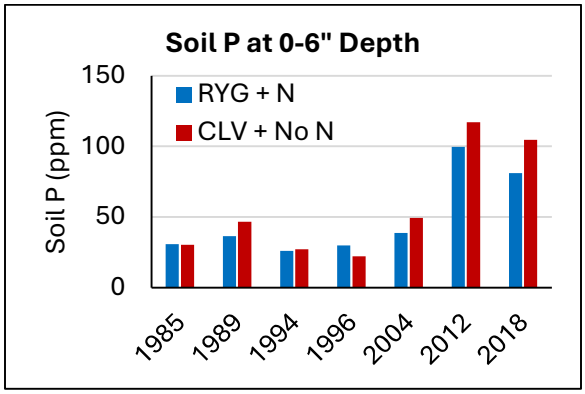
[1] Fertilizer P_2O_5 x 0.46 = P; K_2O x 0.83=K.
[2] Limestone was applied to all pastures at 6 t/ac from 1968-1984; 8 t/ac from 1985-2005; 3.5 t/ac from 2006-2013.
[3] From 1998-2004, all pastures received S, Mg, and B at 50, 27, and 1.0 lb/ac, respectively.
[4] From 2005-2018, all pastures received S, Mg, and B at 28, 15, and 0.7 lb/ac, respectively.

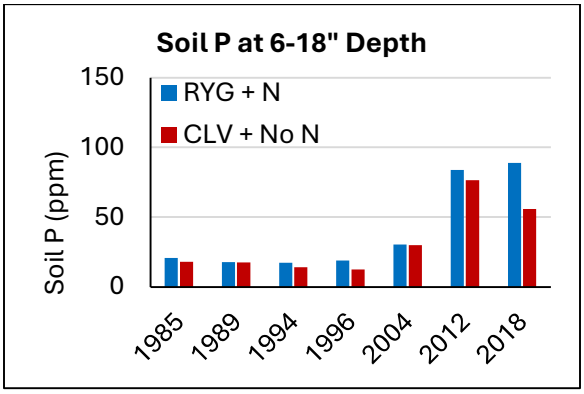


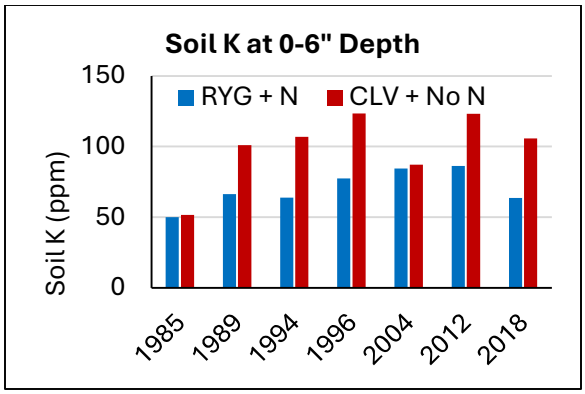


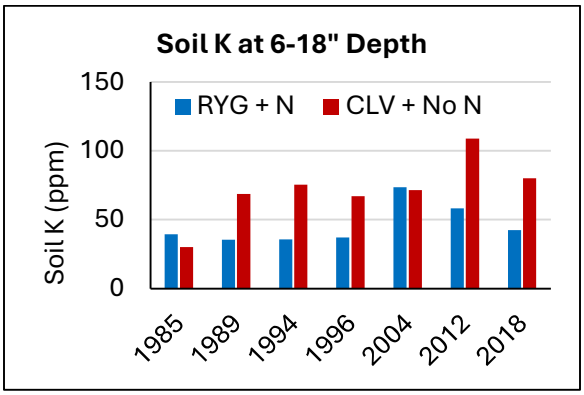












***Results*:**
Soil pH at 0-6” and 6-18” depths documented the effects of N fertilization, with lower soil pH occurring on these pastures with added N compared to those overseeded with clover and without added N. At the 0-6” and 6-18” depths, levels of soil nitrate-N were greater on the ryegrass + N pastures. Soil P increased from 2012 to 2018 at both 0-6” and 6-18” depths, which may be attributed to limestone additions in 2007 and 2013. With continued annual applications of K fertilizer from 1968, soil K was greater on non-N fertilized pastures at both 0-6” and 6-18” depths.

***Conclusions and Implications*:**
Nitrogen fertilization on sandy, low fertility soils is required for increased production of hay and for stocking rates. Since N fertilization increases soil acidity, routine soil sampling is recommended for appropriate limestone applications. Soil data in pastures receiving no N fertilizer provided positive documentation of effective nutrient cycling under stocking.