Status of soil carbon, nitrogen, organic matter and related nutrients in Coastal and common bermudagrass pastures after 48 years of stocking

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Application: 'Coastal' and common bermudagrass have been used for pastures in East Texas for more than 80 years.

Introduction: The primary objectives of this project were to compare soil nutrient status of Coastal and common bermudagrass pastures under stocking.

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 and the other half overseeded with clover without N fertilizer. From spring 1985 to 2018, stocking rates from mid-February to late September averaged 0.95, 1.5, and 2.2 cow-calf pair/ac (1 pair = 1500 lb) for common BG, and 1.1, 1.7, and 2.8 cow-calf pair/ac for Coastal BG, respectively for low, medium, and high stocked pastures.

Table 1. Annual fertilizer ^{1,2}	² applications on	bermudagrass pas	tures during	various periods.
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		Ryegrass + N			Clover + No N		
Period	No Years	Ν	Р	K	Ν	Р	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
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¹ Fertilizer $P_2O_5 \ge 0.46 = P$; $K_2O \ge 0.83 = K$.

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:

At the 0-6" depth, percent soil organic matter (OM) carbon (C), and nitrogen (N) were greater in common compared to Coastal BG. These analyses showed a greater C:N ratio for common BG pastures. Common BG pastures had greater soil magnesium (Mg), sulfur (S), and calcium (Ca) at the 18-36" depths. This may be indicative of the greater soil depth of Coastal BG rooting dynamics. There was slightly higher soil electrical conductivity (EC) in common BG with higher levels in both bermudagrasses at 0-6" depth.

Conclusions and Implications:

The slightly greater % soil organic matter, %C, %N, and %C:N ratio for common BG pastures at 0-6" depth, but much less for both bermudagrasses at > 6" depth, indicates the need for fertilization for enhanced productivity.