# CHANGES IN SOIL PHOSPHORUS IN COMMON AND COASTAL BERMUDAGRASS PASTURES DURING 35 YEARS OF VARIOUS STOCKING AND FERTILITY REGIMENS

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**Background.** A detailed description of stocking rates and fertility regimens from 1969 through 2005 are presented in a companion 2006 Field Day Report by Rouquette et al. The objective of this experiment was to evaluate changes in soil phosphorus (P) concentrations in continuous stocked bermudagrass pastures under different stocking rates.

**Research Findings.** Initial soil P concentrations in 1969 were very low (< 3 ppm). This is consistent with non-fertilized, P-deficient sandy Coastal Plain soils. Soil P concentrations in the 0-6 inch depth significantly increased (up to 10-fold) from 1975 to 1985 as result of P fertilizer application (~100 lbs $P_2O_5$/ac year) (Figure 1). Sixteen years (1969-1985) of P application (total P load of 1,500 lbs $P_2O_5$/ac) shifted soil P status from very low (0-5 pm) to high (21-40 ppm). This increased soil P level enhanced forage growth, especially ryegrass and clover.

During 1985 to 1996, bermudagrass pastures received no inorganic P fertilizer; thus, the major P contributions to the soil occurred via nutrient recycling as animal excreta. Average soil P concentrations in 1985 were approximately 33 ppm for common and 27 ppm for Coastal bermudagrass. In 1996, soil P concentrations were comparable to those in 1985 (31 ppm for common and 24 for Coastal), suggesting that P was not depleted during 11 years of continuous stocking with no P-fertilizer applied. Nutrient cycling through animal residues and prior history of P application sustained relatively constant P concentrations in the 0-6 inch depth of soils.

In general, soil P concentrations were similar in common and Coastal bermudagrass pastures with different fertility regimens (Figure 1). From 1985 to 1996 there was a slight decrease in soil P concentrations at low stocking rates (1 pair/ac) for both common and Coastal bermudagrass pastures. This suggested that animal excreta was playing an important role in P recycling. Relatively small increases in soil P concentrations were observed in common bermudagrass fertilized with N under high stocking rates (2 to 3 cow-calf pair/ac) from 1985 to 1996; however, this difference was not statistically significant.

From 1999 to 2004, P fertilizer was applied at 100 lbs/ac $P_2O_5$. Soil P concentrations increased across all treatments, except for common bermudagrass pastures under high and medium stocking rates (Figure 1). Increases in soil P due to fertilization during this 5-year period were more evident in pastures under low and medium stocking rates.

**Application.** Nutrient cycling through animal excreta can sustain adequate soil P concentrations for optimum bermudagrass production. Overseeded ryegrass and clover growth are especially favored by adequate soil P levels. Coastal plain soils previously fertilized with P sustained relatively constant soil P concentrations during 11 years of no-P fertilizer. Phosphorus fertilization, however, can considerably affect soil P concentrations, and, thus, adequate fertilization rates and intervals of application should be carefully managed to minimize potential environmental concerns associated with accumulation of P in soils and subsequent edge-of-field P losses.

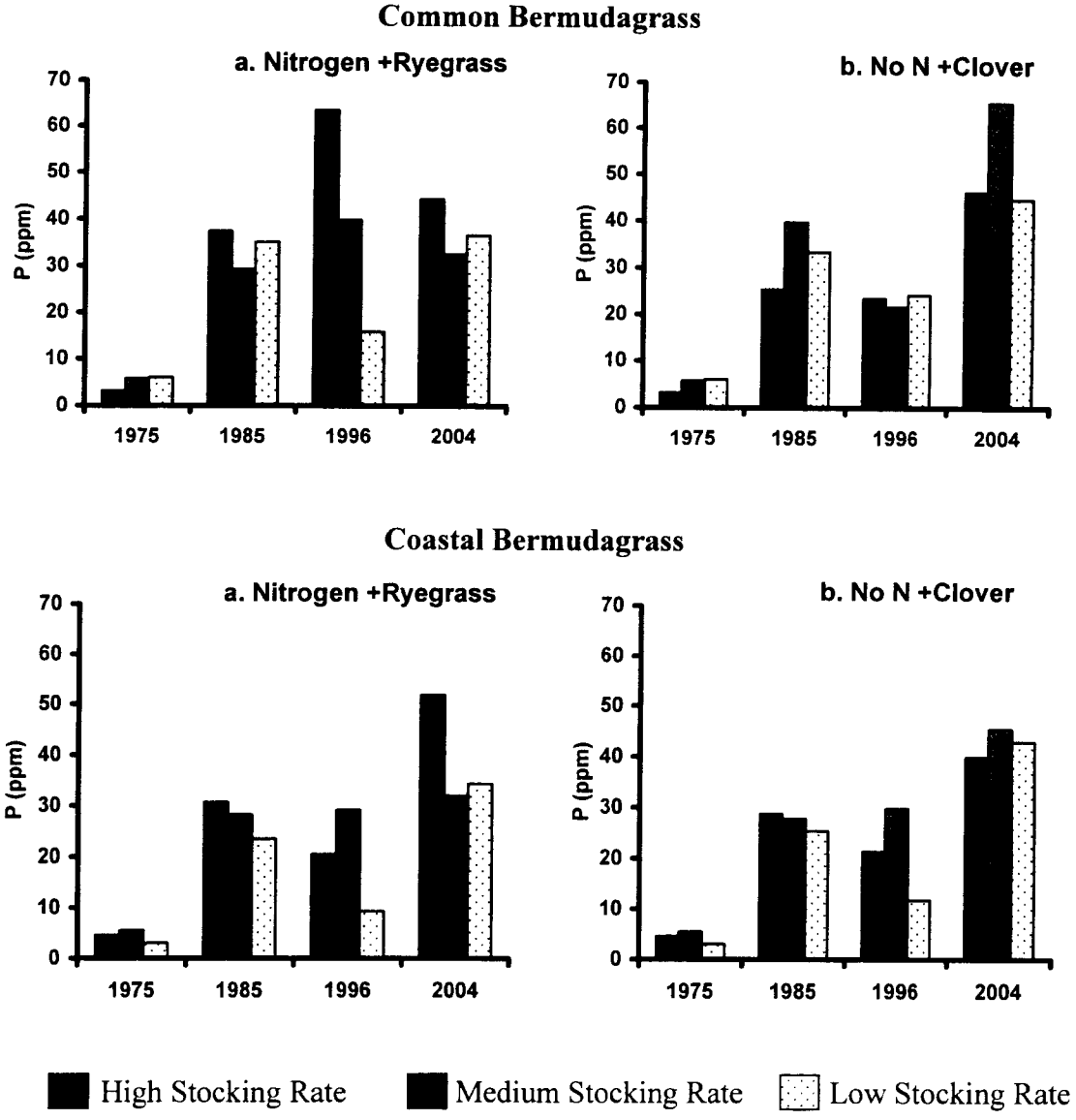


Figure 1. Changes in soil P concentrations (0-6" soil depth) in common and Coastal bermudagrass pastures after 29 years of continuous grazing at different stocking rates and fertility regimens.