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SOIL DEPTH DISTRIBUTION OF PHOSPHORUS IN COASTAL BERMUDAGRASS PASTURES SUBJECTED TO LONG-TERM STOCKING RATES 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 study was to investigate phosphorus (P) distribution within the soil profile in Coastal bermudagrass pastures continuously stocked for 35 years at various stocking rates.

Research Findings. With continuous stocking, soil P concentrations were nearly two-times greater at high stocking rates (2-3 cow-calf/ac) than at the low stocking rates (1 cow-calf/ac) (Figure 1). Differences in soil P concentrations due to stocking rates were mainly observed in the top 48-in soil depth. In contrast, deeper soil depths showed no evidence of stocking rates affecting P concentrations. Across all treatments, P concentrations decreased significantly with soil depth. This trend was expected, since P has slow mobility in the soil profile and tends to preferentially accumulate in the surface horizons in grazed pastures due to above ground contributions from fertilizer, animal wastes, and nutrient recycling.

After 11 years of no-P fertilization (1985-1996), soil P concentrations dramatically decreased, but were still rated either as high (21-40 ppm) or medium (11-20 ppm) within the top 36-in soil depth. Soil P depletion due to plant uptake was more evident in the 0- 48 in. soil depth. During this 11-year period of no P fertilizer, soil P concentrations were reduced by as much as 60% at low stocking rates, and from 20-30% at high stocking rates. From 1998 to 2004, clover and ryegrass pastures received P fertilizer (~ 100 lbs P_2O_5/ ac), and soil P concentrations significantly increased in 2004. Stocking rate effects on soil P concentrations were less evident, probably because P fertilizer application played a major role controlling residual soil P.

There were no significant differences in soil P concentrations between non N and N-fertilized pastures, except in 1989, when non N- clover pastures showed greater P concentrations (at both low and high stocking rates) compared to nitrogen-ryegrass pastures. This may be due to the high fertilizer N rates applied, which ultimately may have favored P uptake.

Application. Coastal bermudagrass pastures with prior history of P fertilization can maintain adequate soil P concentrations for several years under continuous stocking. Under low stocking rates, soil P will deplete faster than at high stocking rates. Animal manure can recycle substantial amounts of P and sustain adequate bermudagrass growth in Coastal Plain soils. Over

35 years of grazing, there was no evidence that P was accumulating in soils at levels that may potentially become an environmental hazard.

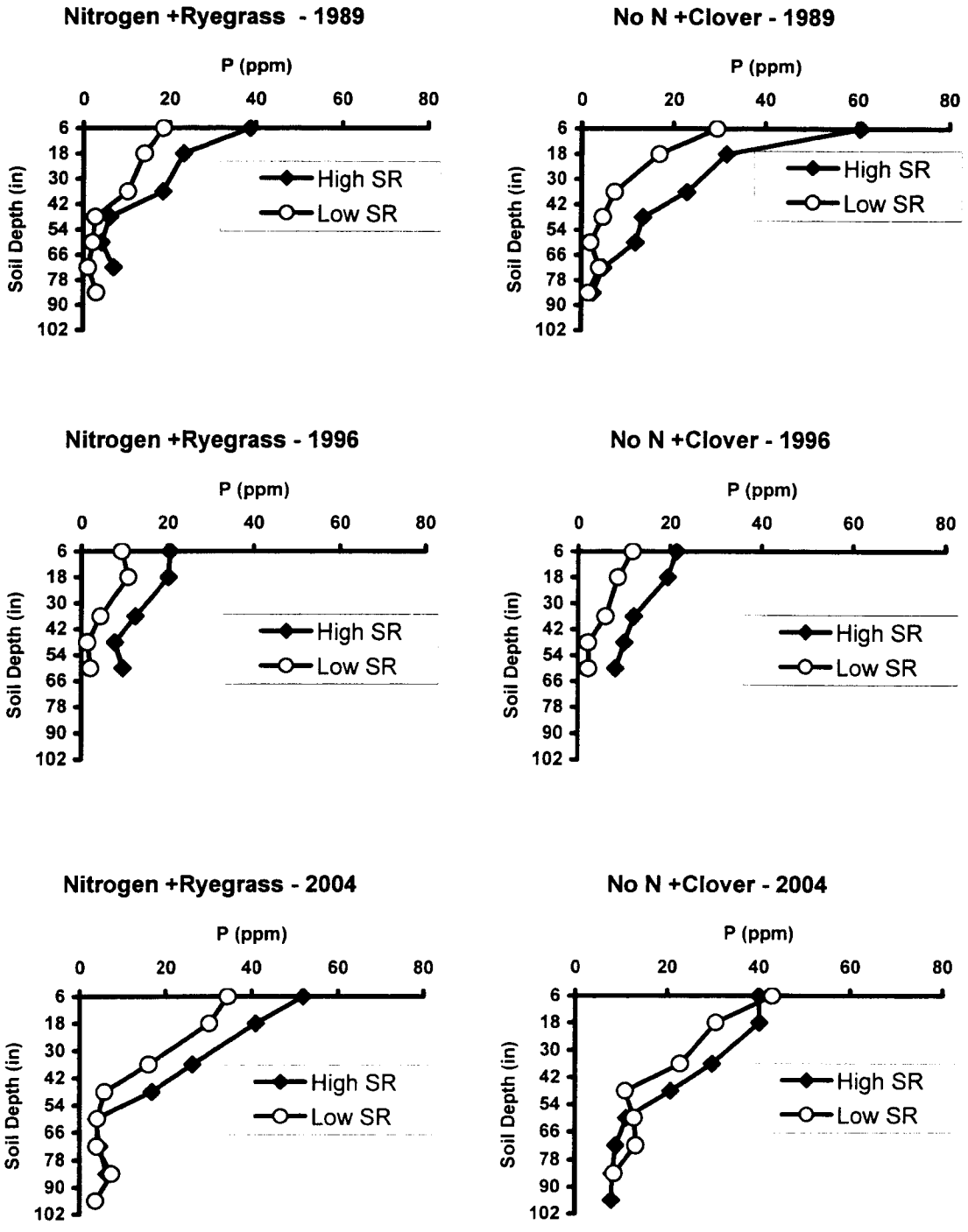

Figure 1. Phosphorus distribution in the Coastal bermudagrass soil profile as a function of different stocking rates (SR) and nitrogen fertilization.