SOIL DEPTH DISTRIBUTION OF NITRATE-NITROGEN 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 nitrate-nitrogen (NO_3-N) distribution within the soil profile in Coastal bermudagrass pastures continuously stocked for 19 years and subjected to different fertility management regimens.

Research Findings. After 5 years (1985-1989) of annual N fertilizer rates > 400 lbs/ac, soil NO_3-N concentrations in 1989 were predictably greater in N-fertilized bermudagrass pastures overseeded with ryegrass than in bermudagrass/clover pastures that received no N fertilizer (Figure 1). At both low and high stocking rates, NO_3-N concentrations in Coastal bermudagrass pastures plus N were considerably greater (~ 20 ppm) within the top 36 inches (Figure 1a). Deeper soil depths in the N-fertilized pastures showed a significant decrease in NO_3-N levels (~ 5 ppm). In contrast, Coastal bermudagrass pastures receiving no N fertilizer exhibited more homogeneous NO_3-N distribution within the soil profile compared to bermudagrass pastures receiving N.

In 1994, after 5 years of lower N application rates (238 lbs N/ac year), soil NO_3-N concentrations were dramatically decreased in the bermudagrass + N pastures (Fig. 1b). This trend was more evident in the top 36 inches. Similar results were observed for both stocking rates.

Soil NO_3-N concentrations in 2004 (Fig. 1c) were comparable to that in 1994. Bermudagrass without N fertilizer showed a slight increase in soil $NO_3$3 levels in 2004 compared to 1994, which was probably related to the better P nutrient status in 2004 (soil test P = 21 ppm) compared to 1994 (soil test P= 12 ppm); thus, greater forage production was promoted. Bermudagrass pastures, with no N-fertilizer application, sustained nearly constant soil NO_3-N concentrations over 19 years (1985-2004) of continuous stocking. Long-term stocking rates showed no detrimental effect on soil NO_3-N concentrations. Rather, nutrient cycling via animal excreta was apparently playing a major role maintaining adequate soil NO_3-N levels.

Applications. Nitrogen fertilization can tremendously affect soil NO_3-N concentrations in Coastal bermudagrass pastures and in certain soil types. Fertilization rates can be a much more important factor affecting soil NO_3-N concentrations than stocking rates. Clover proved to be a reasonable alternative to supply satisfactory amounts of N via animal excreta for Coastal bermudagrass production on sandy, acid soils in East Texas.

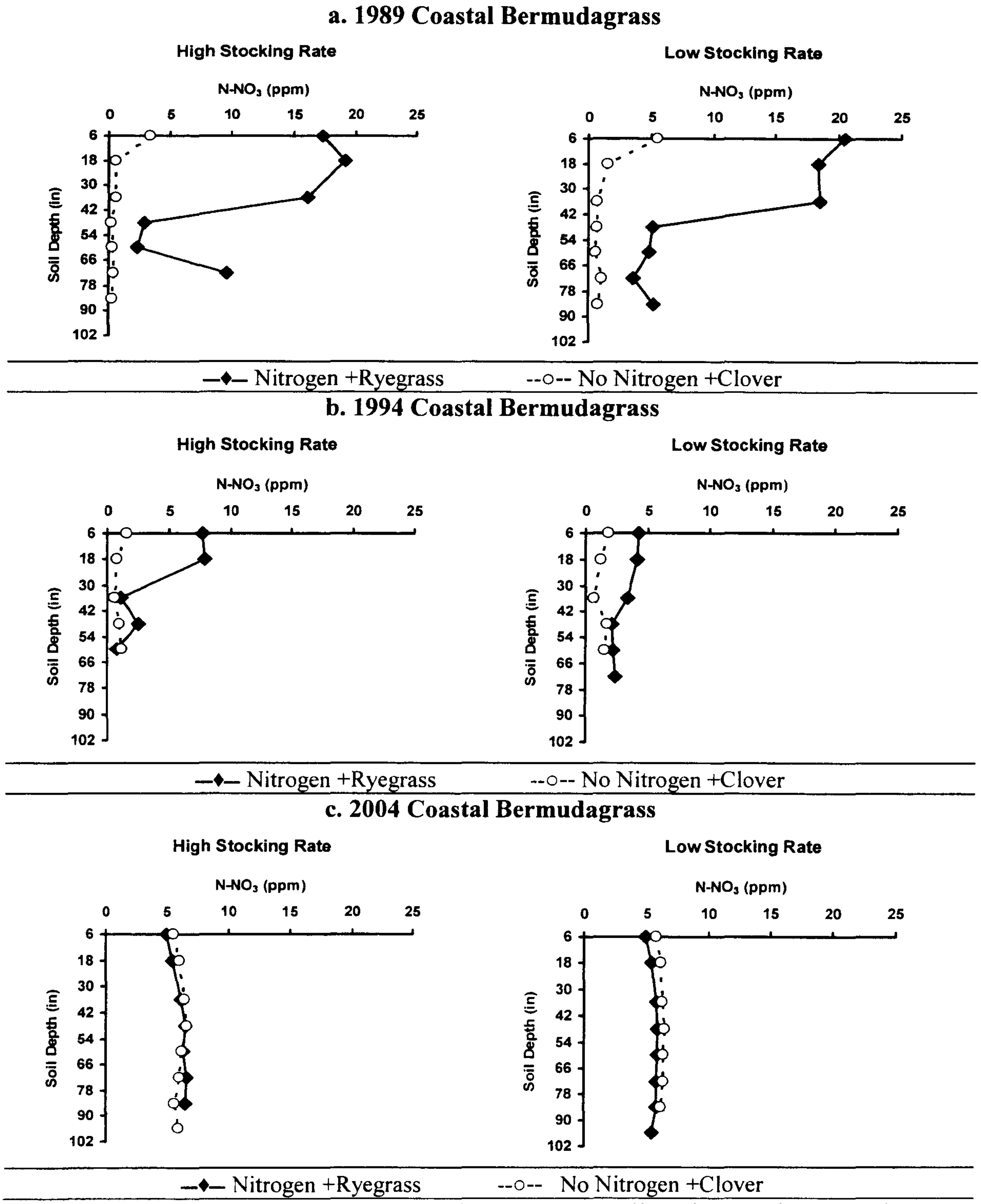

Figure 1. Nitrate-nitrogen (NO_3-N) distribution within the soil profile as a function of fertility regimens.