SPATIAL VARIABILITY OF SUGARCANE YIELDS IN RELATION TO SOIL SALINITY IN LOUISIANA

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ABSTRACT

Elevated soil salinity levels negatively impact sugarcane yields. In an effort to determine the potential magnitude of these effects in South Louisiana, several tests were conducted in 2009 and 2012 in commercial sugarcane fields in Dularge, LA that were subjected to salt water intrusion during recent hurricanes. The specific objective of these studies was to determine if elevated soil salinity levels resulting from these recent events had a negative influence on cane and sugar yields. Two commercial fields were selected for the study: a 4.0-ha field of 1st ratoon, 'L 99-226' in 2009 and a 2.5-ha field of plant-cane, 'Ho 95-988' in 2010. To determine actual yields, selected rows from each field were harvested in 23-m increments using a single-row chopper harvester. Cane yields were determined using a field transport wagon equipped with electronic load sensors, and theoretically recoverable sucrose (TRS) levels were estimated by the core-press method. Soil samples were taken (0-15 cm) from each plot to determine soil conductivity, which was then used to estimate soil salinity levels. Also, in 2010 a Veris Multi-Sensor Platform was utilized to map soil electrical conductivity (EC) in adjacent fields to determine if EC could be used to identify negatively affected areas. Results from 2009 showed that both cane and sugar yields exhibited significant variability with yields ranging from 0.7 to 102.6 Mg ha^{-1} and 53.6 to 10,490 kg ha^{-1}, respectively (Figure 1). In 2010, cane and sugar yields also exhibited significant variability with yields ranging from 14.6 to 89.6 Mg ha^{-1} and 1,680 to 10,660 kg ha^{-1}, respectively (Figure 2). Soil EC levels also showed significant variability in both years, but were markedly higher in the lower elevation regions of both fields (Figures 1, 2). The spatial variability observed in cane and sugar yields was correlated with the spatial variability observed in soil salinity levels, as estimated by soil conductivity (Figures 1, 2). The greatest effects on cane and sugar yields appeared to occur in the lower elevation regions of the fields where flood waters remained for the longest time. The combined results from this study indicate that elevated salinity levels resulting from salt water intrusion events associated with hurricanes (or tidal movement of salty water) can have a negative effect on both cane and sugar yields. Soil EC mapping appears to offer promise as a method that sugarcane growers could use to more effectively manage fields negatively impacted by soil salinity.

Keywords: soil salinity, sugarcane, soil conductivity.

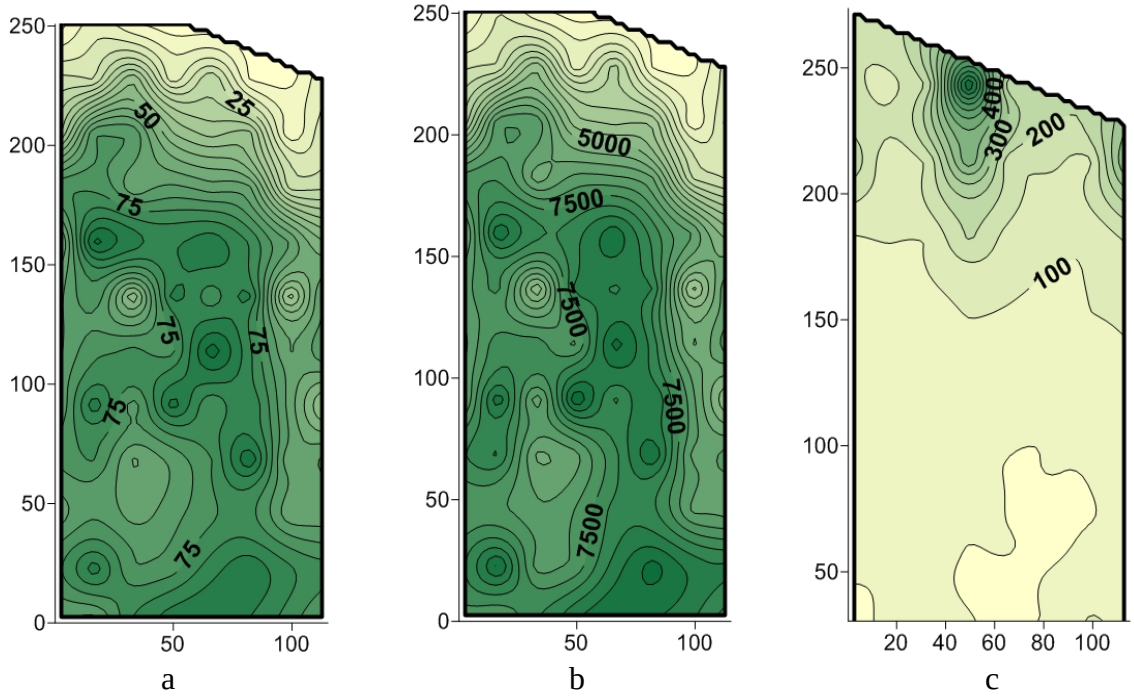

Figure 1. Contour plots from 2009 soil salinity experiment for **a,** cane yield (Mg ha^{-1}); **b,** sugar yield (kg ha^{-1}); and **c,** soil conductivity (mS m^{-1}).

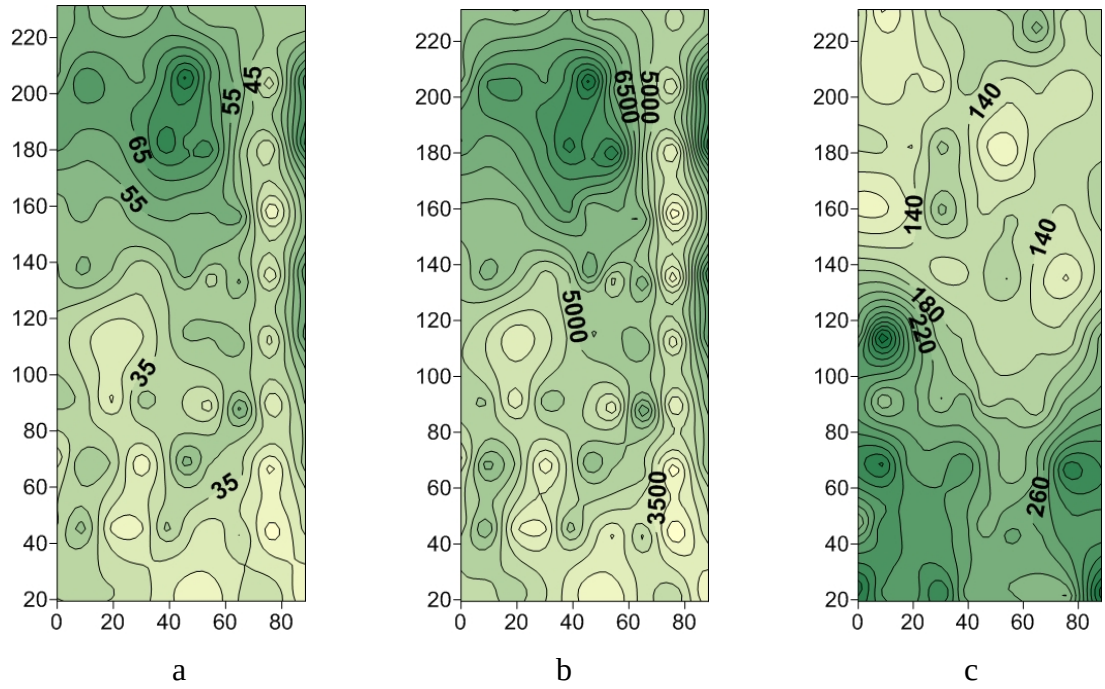

Figure 2. Contour plots from 2010 soil salinity experiment for **a,** cane yield (Mg ha^{-1}); **b,** sugar yield (kg ha^{-1}); and **c,** soil conductivity (mS m^{-1}).