Spatial Variability of Soil Chemical Properties Following Long-Term Poultry Litter Application

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INTRODUCTION

Poultry litter applied to agricultural lands is the most common in northeastern and southeastern United States. Knowledge of spatial variation of soil pH and nutrients at different zones of a farm land is essential for precision fertilization. The characteristics of spatial distribution identified in this study could provide information for site-specific fertilization on the farm and guidance for other farms.

OBJECTIVES

We aim to characterize and model spatial variation of soil chemical properties in a commercial farm with long-term poultry litter application to improve fertilization management.

MATERIAL AND METHODS

- The experimental site is a cotton-corn-soybean field located in Noxubee county in Mississippi, soil is silt clay.
- Soil samples at 0-15 cm depth were collected at 190 locations in a 1 acre × 1 acre grid in 2016.
- Soil pH, carbon, nitrogen, phosphorus (P), potassium (K) and other nutrients were measured.
- Semivariograms, Crossvariograms, Simple and Ordinary Kriging analysis were performed.

RESULTS

- A strong spatial structure was found for variables such as pH, carbon, nitrogen, P and K.
- The analysis of the semivariance functions showed that the pH of Cotton and Soybean both had moderate spatial variability, and their variations were caused by the co-effects of structural (such as soil type, soil parent material, topography), and random factors (mainly human activity such as fertilization and irrigation).
- The pH of corn and carbon, nitrogen and P of soybean all had strong spatial correlations, and the spatial variabilities were mainly affected by structural factors.

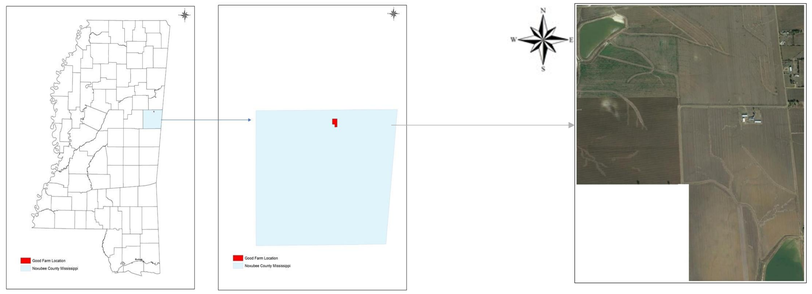
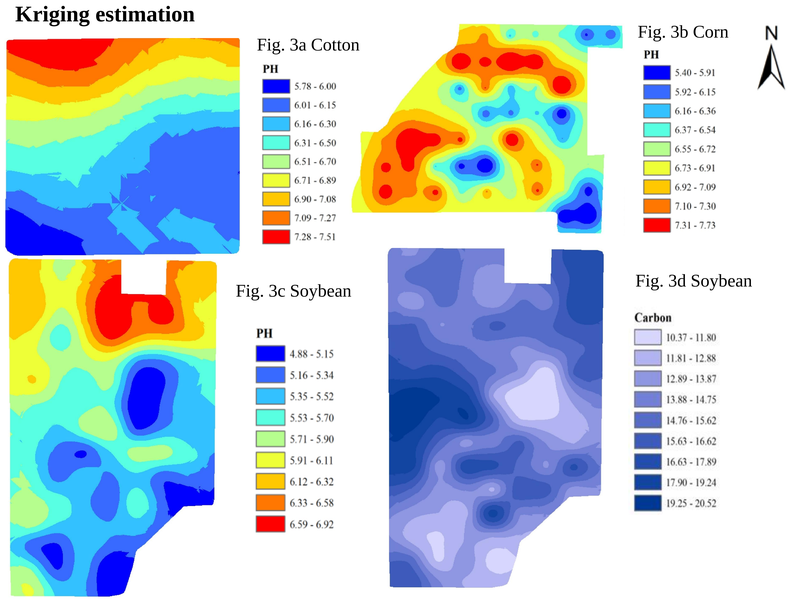


Figure 1. The location of the field (Good Farm).

Figure 2. Poultry litter and field.



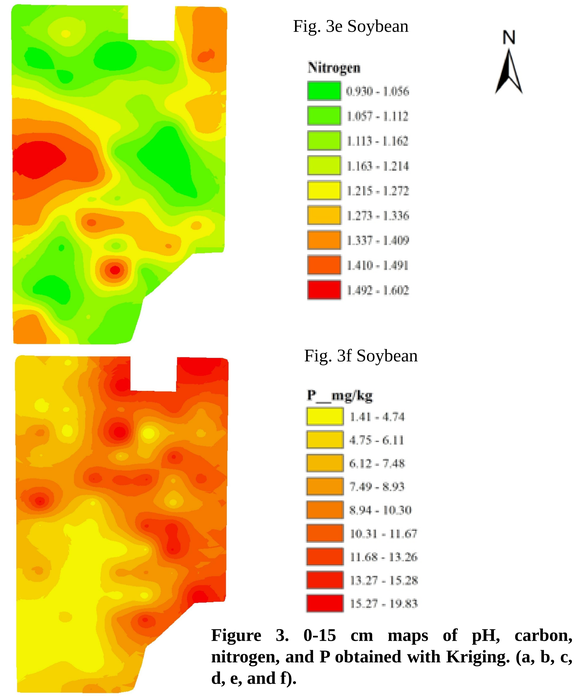


Figure 3. 0-15 cm maps of pH, carbon, nitrogen, and P obtained with Kriging. (a, b, c, d, e, and f).

CONCLUSIONS

- Spatial variations found for several variables in different zones in the field could be considered for a sectored fertilization management.

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