Paper No. 011044
An ASAE Meeting Presentation

EFFECTS OF CHEMICAL AND PHYSICAL SOIL PROPERTIES SPATIAL VARIABILITY ANALYSIS ON TWO-YEARS NO-TILLAGE SYSTEM CORN PRODUCTIVITY MAP IN BRAZIL.

by

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Written for Presentation at the
2001 ASAE Annual International Meeting
Sponsored by ASAE
Sacramento, California
July 29-August 1, 2001

Abstract: The field data showed on this 1st year (1999/2000) great differences on corn productivity, from 3.2 to 10.6 t/ha, on the same experimental area, of 38 ha under a central pivot irrigation system. Soils maps of chemical (pH, OM, P, K) and physical aspects were made in order to explain these variability's. Comparing the soil chemical maps with corn productivity map on this 1st year, the results indicate same pattern or similar distribution with organic matter map. The physical properties maps are being processed now but they are showing a slight correlation of low corn productivity area with soil compaction. On this second year (2000/2001), half of the experimental area was planted with soybean and half with corn, trying to use similar situation no-tillage system of the Center-West region of Brazil.

Keywords: Precision agriculture, grid sampling, soil fertility, site specific management, soil phosphorus map.

INTRODUCTION

The objective of this research work was to establish a methodology for the work will be conducted in remote areas, to monitoring farm areas and also, a contribution for to stabilize corn production.

MATERIAL AND METHODS

This study was conducted on 38ha irrigated area by a center pivot, on a Dark Red Latosol (Led), clayey texture, located on the National Research Center for Corn and Sorghum, in Sete Lagoas, State of Minas Gerais, Brazil, 19° 28' South latitude, 44° 15' West GrW, and 732 m elevation above sea level. The area was being cultivated on the last 6 years with beans and corn, on rotational system, using half part of the area with conventional system and the other half with no-tillage system. Last year, corn was planted during summer period and per-millet, winter period. The production map can be seen on the Figura 1

The soil samples were taken during the winter season of 1999, using a depth of 0-20cm, grid of 25mx25m (Figure 1). These samples were collected by using an auger (5 cm diameter), on the intersection grid point, with a total of 741 positioned points. The soil analysis were made according to Embrapa (1997) and the following elements were determined: water pH, Ca ($cmol_c\ dm^{-3}$), Mg ($cmol_c\ dm^{-3}$), H + Al ($cmol_c\ dm^{-3}$), P ($mg\ dm^{-3}$), K ($cmol_c\ dm^{-3}$) and MO ($dag\ kg^{-1}$).

The phosphorus spatial variability map was generated using the 741 points and divided in areas according to response classes described by fertilizer recommendation use for Minas Gerais State, Brazil, 4ª Edition (CFSMG, 1989). The soil recommendation was made based on spatial variability maps and the fertility average of the area or quadrant. A comparison was made using the method for the conventional agriculture system, and the one using site-specific management, applying fertilizer by variable rate application, and according the spatial variability map.

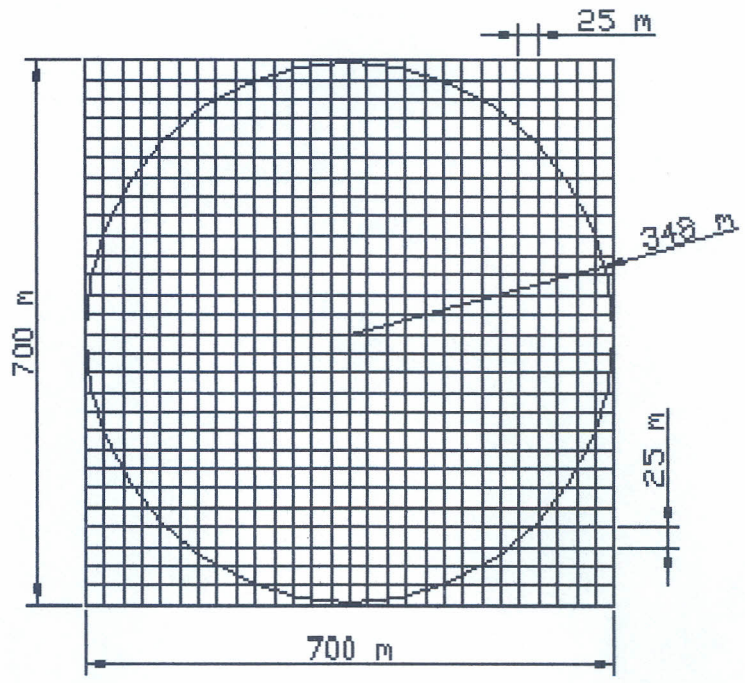

Figure 1- Grid sampling used for the soil sample.

RESULTS AND DISCUSSION

The results obtained, in the soil, even considering two uniform fertilizer application for the corn and beans crops in the last years, as shown in Figure 2.

Figure 2 and Figure 3 show the mathematical curve approach for the phosphorus application, based on the corn yield of 6.5 ton/ha.

Figure 2. Curve approach for P application at 6.5 ton/ha

CONCLUSIONS

1. Data variation amplitude shows that part of the studied area presents sub-areas which soil fertility is different from the average used as traditional fertilize recommendation, as well by the spatial variability maps.

2. A soil spatial fertility variability indicates differences in management used in the area along the planting season.

3. Soil fertility recommendation by its average and spatial variability presents distinct values for phosphorus leading to corn productivity losses.

4. Mathematical prediction for 6.5 ton/ha was not good for being applied for this specific sampling situation for not showing adequate calibration standard.

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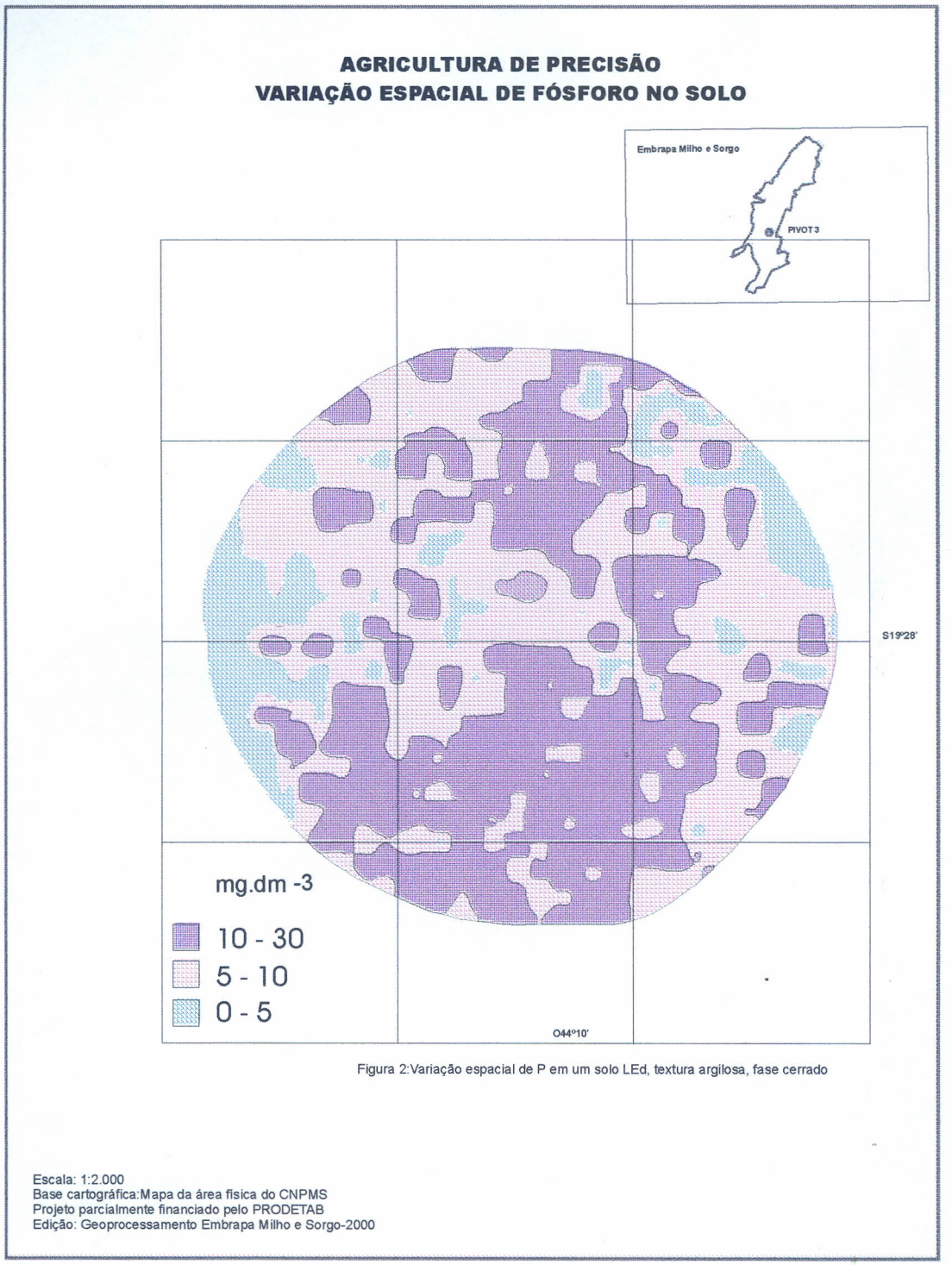

Figura 2:Variação espacial de P em um solo LEd, textura argilosa, fase cerrado

Figura 2. Mapa da Variabilidade espacial de P em um solo LEd, textura argilosa, fase cerrado.