SPATIAL VARIABILITY OF SOIL COMPACTION IN ANNUAL CYCLE OF DIFFERENT CULTURE OF CANE SUGAR LAND CLAY SANDY

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Summary: The assessment of soil compaction levels and choosing the best management system are very important in modern agriculture, aiming to prevent or at least restore their physical conditions to a satisfactory level. The renewal of sugar cane plantation happens on average every 5 or 6 years. The current way repeats a sequence compaction and decompaction events during successive cycles of sugarcane, which promotes breakdown of soil structure. During the harvesting and transportation, the energy demanded in soil compaction is due tracks and tires rolling resistance, and in soil tillage is also expended a lot of energy to pull the equipments used at soil decompaction process. This work was carried out to evaluate the soil physical degradation in relation to the sequence of annual crop production of sugar cane, in a *dystrophic* Red Latosol (*Oxisol*) clayey texture calculating the Soil Cone Index (CI) in the folowing depth ranges: 0-10 , 10-20, 20-30 , 30-40 and 40-50 cm . The sugar cane productive area, belonging to Barra Grande mill, from Zilor group in Lençóis Paulista region, in São Paulo state, was evaluated during three subsequent seasons. For soil sampling it was used the Mobile Soil Sampling Unit - UMAS - belonging to Agroforestry Machinary and tire Test Center - NEMPA, Department of Rural Engineering, College of Agricultural Sciences - FCA - UNESP, Botucatu - SP. The sampling points in the areas and in subsequent crop cycles (subsequent years), collections were made using a sampling grid of 30 x 50 m , meaning 30 meters between points following the line of planting sugar cane and 50 meters between plant rows (traffic line) for penetration resistance. The models were adjusted by GS + 7.0 software. For the analysis of spatial dependence index (SDI) of attributes , it was used the relationship defined in GS + (C1/C0 + C1) software and the proposed ranges by Zimback that considers weak spatial dependence (IDE ≤ 25 %) ; moderate (25 % < IDE < 75 %) and strong (IDE ≥ 75 %) . As it was proved the spatial dependence, a interpolation was used to estimate values in not measured locations using the ordinary kriging method to create thematic maps. It was observed that every year, there was an increase in compaction of soil, and more intensive in the traffic lines and superficial layers (from 0 to 10, 10 to 20 and 20 to 30 cm).

Key words: spatial dependence, interpolation, soil structure

Introduction: The assessment of levels of soil compaction and choosing the best management system are of fundamental importance in modern agriculture , aiming to prevent or at least restore their physical conditions to a satisfactory level . The renewal of sugarcane happens on average every 5 or 6 years. In the current scheme repeats a sequence of actions compression and decompression during successive cycles of sugarcane, which promotes breakdown of soil structure. This work was carried out to evaluate the soil physical degradation in relation to the sequence of annual crop production of cane sugar, in a dystrophic Oxisol with clayey and in different locations of collection points of resistance to penetration (RP) and subsequently calculated the soil Cone Index (CI) in depth ranges : 0-10 , 10-20, 20-30 , 30-40 and 40-50 cm .

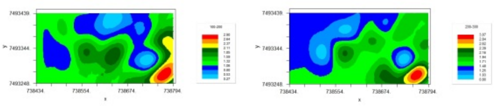
Material and Methods: The samples after three subsequent harvests were performed, the productive area of cane sugar mill belonging to Barra Grande, the Zilor group located in the region of Paulista - SP. For soil sampling it was used the Mobile Soil Sampling Unit - UMAS – belonging to Agroforestry Machinary and tire Test Center - NEMPA, Department of Rural Engineering, College of Agricultural Sciences - FCA - UNESP, Botucatu - SP. The sampling grid used was 30 x 50 m. Data were analyzed using geostatistical analysis. The models were adjusted by GS + 7.0 program. For the analysis of spatial dependence index (SDI) of attributes, we used the relationship defined in GS + program (C1/C0 + C1) and the intervals proposed by Zimback (2001), which considers the weak spatial dependence (IDE ≤ 25 %); moderate (25 % < IDE < 75 %) and strong (IDE ≥ 75 %). Proven spatial dependence held interpolation to estimate values in locations not measured using the method of ordinary kriging, to construction of thematic maps.

Results and Discussion :

Table 1. Models of semivariograms.

Layer (m)	Model	Co	Co+C	A	C/Co+C
0 - 0.10	Nugget effect	-	-	-	-
0.10 - 0.20	Gaussian	0.00100	0.3230	83.65	0,99
0.20 - 0.30	Gaussian	0.00100	0.1702	65.47	0,99
0.30 - 0.40	Nugget effect	-	-	-	-
0.40 - 0.50	Nugget effect	-	-	-	-

The values of spatial dependence were high for all layers evaluated as Zimback (2001). For two layers 0,10 to 0,30 m not fit the Gaussian model, showing greater range for this variable. The other layers showed no spatial dependence. The maps of Figure 1 related to spatial variability exhibited by this attribute.



(a) (b)

Figure 1. Maps isocompactação.

Conclusion: There was an increase in soil compaction and greater intensity, in lines of traffic and in the upper layers (0-0.10; 0.10-0.20 and 0.20 to 0.30 cm).

References: ZIMBACK, C.R.L. Spatial analysis of chemical soil attributes for mapping purposes of soil fertility. 2001. Thesis (Habilitation), Faculty of Agricultural Sciences, Universidade Estadual Paulista, Botucatu, 2001.