

THE INFLUENCE OF THE INTERPOLATION METHOD IN THE MANAGEMENT ZONES GENERATION

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ABSTRACT

Several interpolation methods, with different levels of complexity, are available in literature (CARVALHO et al., 2002). The inverse of the distance raised to a power (IDW) and the kriging are the interpolation methods most used for precision agriculture and the difference between them is how the weights are assigned to different samples (MIRANDA et al., 2009). The objective of this study was to evaluate whether the type of interpolation used in the generation of thematic maps influences the quality of management zones (MZ). Yield, chemical, physical, and altimetry data were used in an area of 15.5 ha. The interpolation inverse distance, inverse distance squared and kriging were used and MZ were generated using the Fuzzy C-Means clustering method. To evaluate MZ were used Anova and variance reduction. It was concluded that the interpolator has not influenced the generation of MZ, and that a less robust interpolator (IDW) can be used to generate thematic maps that are used to define MZ.

Keywords: IDW, Kriging, Fuzzy C-Means.

INTRODUCTION

The definition of management zones (MZ) allows the concepts of precision agriculture (PA) to be used even in small farmers with satisfactory results (ORTEGA; SANTIBÁÑEZ, 2007; MILANI et al., 2006). Through methodologies, the attributes that are influencing the productivity are selected

and thematic maps are generated (with interpolators as inverse of square of distance (IDW), inverse of distance (ID) and kriging (KRI)) and generate the MZs with clustering or empirical methods. After this step, the MZ may be evaluated aiming to identify if the divisions were executed correctly.

The objective this work were evaluate if the interpolate methods are influent to generate MZ and if is justified use robust method kriging.

MATERIAL AND METHODS

The sample data were collected in 2012 on an area of 15.5 ha, in Ceu Azul/PR - Brazil, with geographic coordinates 25°06'32" S e 53°49'55" O. Data of soybean yield, chemical and physical attributes of soil in 40 points were sampled. To select the attributes to generated the MZ the technique of Bazzi et al (2013) was used, and the software SDMZ (Software of Definition to Management Zone) was used to interpolate the samples and generate and evaluated the MZ. Two techniques (ANOVA and reduction of variance) were used to evaluate the MZ.

RESULTS AND DISCUSSION

The layers elevation and mechanical penetration resistance were selected as the best to generate the MZ. Then the samples were interpolated using ID, IDW and KRI (Figure 1) and generated the MZ with 2, 3 and 4 sub-regions (Figure 2).

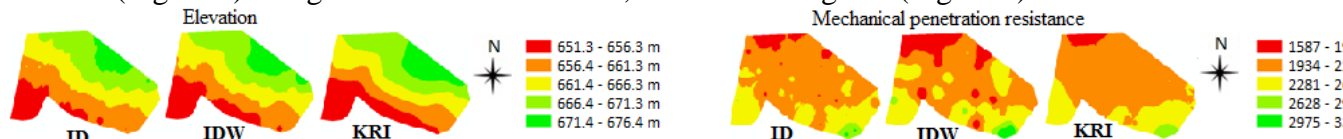


Figure 1. Elevation and Mechanical penetration resistance maps interpolated by ID, IDW and KRI

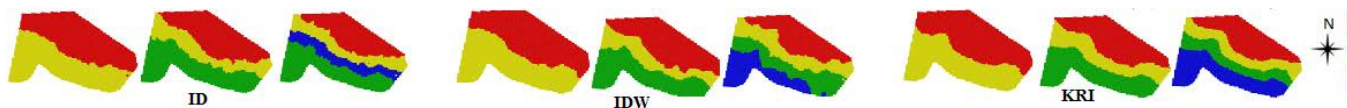


Figure 2. Management zones maps of ID, IDW and KRI

The Anova showed that the all MZ divisions were satisfactory, because the soybean yield was different at 95% of significance.

CONCLUSION

The maps of kriging showed de best results to generate MZ (Anova and Variance Reduction), but ID and IDW showed similar results. It was concluded that the interpolator has r

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REFERENCES

Bazzi, C. L.; Souza, E. G.; Opazzo, M. O.; Nobrega, L. H.; Rocha, D. M.. 2013. Management Zones Definition using soil chemical and physical attributes in a soybean area. *Engenharia Agrícola*. 33:1-14.