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Effect of land use on the spatial variability of organic matter and nutrient status in an Oxisol

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Heterogeneity is now considered as an inherent soil property. Spatial variability of soil attributes in natural landscapes results mainly from soil formation factors. In cultivated soils much heterogeneity can additionally occur as a result of land use, agricultural systems and management practices. Organic matter content (OMC) and nutrients associated to soil exchange complex are key attribute in the maintenance of a high quality soil. Neglecting spatial heterogeneity in soil OMC and nutrient status at the field scale might result in reduced yield and in environmental damage. We analyzed the impact of land use on the pattern of spatial variability of OMC and soil macronutrients at the stand scale. The study was conducted in São Paulo state, Brazil. Land uses were pasture, mango orchard and corn field. Soil samples were taken at 0-10 cm and 10-20 cm depth in 84 points, within 100 m x 100 m plots. Texture, pH, OMC, cation exchange capacity (CEC), exchangeable cations (Ca, Mg, K, H, Al) and resin extractable phosphorus were analyzed.. Statistical variability was found to be higher in parameters defining the soil nutrient status (resin extractable P, K, Ca and Mg) than in general soil properties (OMC, CEC, base saturation and pH). Geostatistical analysis showed contrasting patterns of spatial dependence for the different soil uses, sampling depths and studied properties. Most of the studied data sets collected at two different depths exhibited spatial dependence at the sampled scale and their semivariograms were modeled by a nugget effect plus a structure. The pattern of soil spatial variability was found to be different between the three study soil uses and at the two sampling depths, as far as model type, nugget effect or ranges of spatial dependence were concerned. Both statistical and geostatistical results pointed out the importance of OMC as a driver responsible for the spatial variability of soil nutrient status.