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Soil-landscape relationships and digital soil mapping in Maranhão State, Brazil

Silva, M.B.[1]; Mendonça-Santos, M.L.[2]; Lopes, J.R.[1]; Conceição Filho, J.F.[1]

Maranhão State University - UEMA, Cidade Universitária Paulo VI, Cep. 65055-150, São Luis, MA, Brazil[1];
Brazilian Agricultural Research Corporation/Embrapa Cocais (CPACP), Av São Luís Rei de França, no. 1, Jardim Eldorado, Turu, Cep:65.067-205, São Luís, MA, Brazil, lourdes.mendonca@embrapa.br[2]

The factors of soil formation, climate, organisms, relief and parent material acting together in different intensity during certain period, define the nature of soils and their spatial distribution on earth surface as a continuum. Soil attributes may give information on soil evolution and spatial distribution patterns. Soil survey using conventional techniques results in polygons maps of soil types. These maps are limited in the reproducibility of methodology and lack of uncertainty information. In the last decades new methodologies for soil mapping appeared, identified as Digital Soil Mapping (DSM), which use soil-landscape relationships to predict soil properties and/or soil classes. The relationship between different environments and soils in Maranhão State is complex, since it is located in a transitional zone between semiarid and equatorial climate, with a large diversity of relief forms and lithology. In the northwest region, originally covered by rain forest and with Precambrian parent material, Alisols and Plinthosols dominate. Along the coast and in the Maranhão Golf, with unconsolidated Quaternary sediments from wind and fluvial-marine deposition, an extensive plain is dominated by Gleysols and Vertisols, as well as some Fluvisols and Histosols. The largest geomorphological domain is formed by the sedimentary basin of the Parnaíba River and older Plio-Pleistocene sediments, showing a great lithological and pedological diversity. This domain shows large plateaus in the center-south region of Maranhão State, with sandstones from Permian period, covered by cerrado vegetation and dominated by Ferralsols and Arenosols. In the western part of the state, basaltic rocks from Jurassic-Cretaceous period are found, forming Nitisols, Ferralsols and Vertisols, covered by evergreen forest, a transition to Amazon forest. In the central-northern portion of Maranhão State, with layers of sediments from Cretaceous age, Plinthosols are associated to Alisols, under a transitional vegetation of palm trees locally identified as *Mata de Cocais ("Babaçu")*, and, to a minor extent, Luvisols, Phaeozems and Alisols can be found. This study presents a first attempt in exploring the expert knowledge of soil-landscape relationships in Maranhão State, in order to develop predictive models to estimate soil classes and soil properties by DSM techniques.

Keywords: Pedogenesis, MDS, Maranhão State, soil modelling