

URBAN GULLY ASSESSMENT IN SÃO LUIS CITY (MARANHÃO STATE), BRAZIL, USING PENETROMETER DATA AND SOIL PROPERTIES

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ABSTRACT

This paper investigates soil erosion assessment in São Luis City, reporting an ongoing programme of field measurements (penetrometer measurements and gully monitoring), topsoil sampling and laboratory analyses. From the database, it is evident that the urban sector of São Luis is very prone to gully erosion, especially where land use promotes land degradation. This research work is part of the larger European Union Project 'BORASSUS', which investigates soil erosion assessment and rehabilitation in 10 different countries, including Brazil. In our case, we are the only country investigating urban gully erosion. Therefore, this paper presents some preliminary results, both in terms of penetrometer measurements and soil properties, and we make some initial conclusions regarding the four studied gullies, which are situated in São Luis City, Maranhão Island (2°19'9"-2°51'S; 44°1'16"-44°19'37" W). In order to achieve the research objectives, we have carried out both field and laboratory work, so that penetrometer data could be related to laboratory data. On each one, we selected different parts, around each gully, to take three penetrometer measurements, to calculate the site mean. On completion, we calculated the mean for the whole gully, taking into account the mean for each site. We collected topsoil (0-10 cm) samples to determine selected soil properties in the laboratory (particle size distribution, particle density, bulk density and porosity), using EMBRAPA (1997) protocols. Although most penetrometer studies are related to agricultural situations, for this study we have used penetrometry to assist our understanding of gully evolution and behaviour. The whole study area shows a high sand content and low silt and clay contents; textures being sandy loams. In 60% of analysed soil samples, the silt content is higher than the clay content, confirming the higher detachability and transportability of fine sand and silt. Penetrometer measurements are related to soil compaction, due to people walking on tracks around the gullies. Those values showed direct association with parameters related to vegetation cover. We can conclude that this area presents high sensitivity to erosion, expressed by high bulk density values, high fine sand and silt contents, low clay content and low porosity.

Keywords: Penetrometer measurements, gully erosion, soil compaction, bulk density and land use.