Strengthening an indigenous soil classification system using GIS-based mapping of the Buganda catena, Uganda

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Smallholder farmers with limited access to soil testing can benefit from soil mapping that considers landscape position to provide improved understanding of their potential soil quality. This study was conceived to improve local soil knowledge about the spatial distribution of soil types and processes driving those patterns. Soils studied belong to the Buganda catena, an area long recognized for having upland soils forming on ferricrete-capped hilltops and lowland soils forming on incised bedrock, but with less attention given to variability along hillsides. Local soil knowledge was strongly emphasized to ensure that results built upon existing knowledge and would be interpretable by farmers. The major local soil types were Lidugavu (black), Limyufumyufu (reddish), Luyinjayinja (stony), which were hierarchized into black or red, each with or without stones. Lubumbabumba (black clayey) was used as an additional subdivision of black soil. Understanding of the distribution of these soil types was captured by local farmers sketching soil maps for their own village. Soil samples were taken on a 150-meter grid and tested for Munsell color, pH, and nutrient levels using inexpensive equipment. GIS analysis indicated soil color, an indicator of soil fertility, was related to a combination of slope gradient and relative elevation. However, spatial analysis also indicated more investigation was needed to fully understand the occurrence of stony soils. Considering the hillslope processes of erosion and deposition suggested a utility to farmers for differentiating between black soils at different landscape positions. These concepts can be communicated with a block diagram, an automated classification of topography, or a participatory mapping of village soils with the assistance of GIS. We advocate that future work be done by participatory mapping of soils at the village level assisted by GIS for more accurate soil maps and to better connect village members to the value of such maps.