Geophysical Research Abstracts
Vol. 14, EGU2012-7227, 2012
EGU General Assembly 2012

Carbosoil, a land evaluation model for soil carbon accounting

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The belowground carbon content is particularly difficult to quantify and most of the time is assumed to be a fixed fraction or ignored for lack of better information. In this respect, this research presents a land evaluation tool, Carbosoil, for predicting soil carbon accounting where this data are scarce or not available, as a new component of MicroLEIS DSS.

The pilot study area was a Mediterranean region (Andalusia, Southern Spain) during 1956-2007. Input data were obtained from different data sources and include 1689 soil profiles from Andalusia (S Spain). Previously, detailed studies of changes in LU and vegetation carbon stocks, and soil organic carbon (SOC) dynamic were carried out. Previous results showed the influence of LU, climate (mean temperature and rainfall) and soil variables related with SOC dynamics. For instance, SCS decreased in Cambisols and Regosols by 80% when LU changed from forest to heterogeneous agricultural areas. Taking this into account, the input variables considered were LU, site (elevation, slope, erosion, type-of-drainage, and soil-depth), climate (mean winter/summer temperature and annual precipitation), and soil (pH, nitrates, CEC, sand/clay content, bulk density and field capacity). The available data set was randomly split into two parts: training-set (75%), and validation-set (25%).

The model was built by using multiple linear regression. The regression coefficient (R2) obtained in the calibration and validation of Carbosoil was >0.9 for the considered soil sections (0-25, 25-50, and 50-75 cm). The validation showed the high accuracy of the model and its capacity to discriminate carbon distribution regarding different climate, LU and soil management scenarios. Carbosoil model together with the methodologies and information generated in this work will be a useful basis to accurately quantify and understanding the distribution of soil carbon account helpful for decision makers.