Land-Use Management using a soil survey geographic database for the Viisoara-Aiton hills (Transylvanian Plain-Romania)[1]

H. Cacovean, T. Man, T. Rusu, D.C. Weindorf, I. Fodorean, C. Moldovan, V. Puiu, A. Pop
O.S.P.A., 1 Fagului street, 400483 Cluj-Napoca, Romania
Contact: turda75@yahoo.com

Introduction

In Romania, the determination of the best management practices (BMPs) for land resource management is complicated by a lack of modern means for land evaluation and a lack of soil quality. Quantifying agricultural landscape patterns and their change is essential for monitoring and assessment of the ecological consequences of recent transformations in agriculture of the Viisoara-Aiton Hills (Irvin *et al*., 1997; Wu, *et al*., 1997). Using GIS-based land-use data and pedological data we have constructed an analysis of the surrounding of the urban center of Turda with landscape metrics to quantify the spatial patterns of the agricultural transformations in the Viisoara-Aiton Hills. Modernization of the agricultural practices is a major force driving land-use change, which inevitably affects the structure, function and dynamics of the land-use cover and ecosystem.

Material and methods

The Viisoara-Aiton Hills, located in the southern part of the Transylvanian Plain (Romania), was chosen for this study. This region has a surface of 8,670 ha and represents the most important agricultural area in the province of Cluj. This province is well developed and economically important in Romania. Agriculture is an important economic branch in this geographic area, with corn (*Zea mays*) and wheat (*Triticum aestivum*) being the major crops. Existing soil maps of the area contain 4 classes and 26 types of soil, not including significant inclusions that could also occur within each map unit. Each soil layer has unique physicochemical properties, and an area-weighted number was computed, representing the value of the property for each map unit (Richardson *et al*., 1977). In this study, we considered organic matter (OM) content, clay content, soil reaction and soil texture that are the main variables to asses the land-use management of that area (Fix & Burt, 1996). From these properties, interpolated maps were generated using geographic information system (GIS) software (Blaszczynski, 1997). The topographical map, as obtained from the Military Topography Department (1996), was used to realize the physiographic layer and because the physiographic region of Viisoara-Aiton Hills is closely related to soil cover. This region consist of one physiographic region and by referencing the physiographic map of the Transylvanian Plain we merged all soil types within the same region and formed a final physiographic layer. The four thematic maps were coupled with aerial photos and used to evaluate land use/management in relation to quantified soil properties (Lark, 1999; Park *et al*., 2001. The objectives of this study were to: (1) identify land-use change; (2) evaluate the influence of soil cover on land-use; and (3) assess land-use potential and present management alternatives.

Results and discussion

To evaluate the importance and influence of OM content, clay content, soil reaction and soil texture on land-use patterns, we correlated land-use distribution with soil types/properties. Corn farmland had the lowest OM content, while wheat and alfalfa farmland approached average values. In terms of clay content, grassland showed the lowest value of all land-use types. The percentage of each textural class of the surface horizon that was used for wheat,

[1] In cooperation with University of Babes-Bolyai, Romania; USAMV, Romania; Louisiana State Univ., USA.

corn and grassland. We find four textural classes in that region and without any difference for the wheat and corn. Land capability classes are generally used to make land-use assessments, determine erodible areas and review land-use potential. An examination of land suitability class for a forest steppe conditions is important in the determination of land-use alternatives. By overlaying the suitability class with the land-use map, we obtained a map that highlighted those surfaces with lower suitability classes: ~1,256 ha of Class II, 3,478 ha of Class III, 2,145 ha, and 1,791 ha of Class IV. Those lands with suitability Class IV or higher are unsuitable for cultivation, and should be used for conservation practices such as grassland.

References

Blaszczynski, J.S., 1997. Photogrammetric Engineering and Remote Sensing 63: 183-191.
Fix, R.E. & T.P. Burt, 1996. Earth Surf. Processes Landforms 20: 817-827.
Irvin, B.J., *et al*., 1997. Geoderma 77: 137-154.
Lark, R.M., 1999. Geoderma 92: 141-165.
Park, S.J., *et al*., 2001. Geoderma 103: 249-272.
Richardson, A.J., *et al*., 1977. Eng. Remote Sensing 43: 207-216.
Wu, J., *et al*., 1997. J. Soil Water Cons. 52: 352-358.