Geophysical Research Abstracts
Vol. 18, EGU2016-4142, 2016
EGU General Assembly 2016

Modelling soil properties in a crop field located in Croatia

Igor Bogunovic (2), Paulo Pereira (1), Mesic Millan (2), Aleksandra Percin (2), and Zeljka Zgorelec (2)

(1) University of Zagreb, Faculty of Agriculture, Svetosimunska 25, Zagreb, Croatia, (2) Mykolas Romeris University, Environmental Management Centre, Vilnius, Lithuania (paulo@mruni.eu)

Development of tillage activities had negative effects on soil quality as destruction of soil horizons, compacting and aggregates destruction, increasing soil erosion and loss of organic matter. For a better management in order to mitigate the effects of intensive soil management in land degradation it is fundamental to map the spatial distribution of soil properties (Brevik et al., 2016). The understanding the distribution of the variables in space is very important for a sustainable management, in order to identify areas that need a potential intervention and decrease the economic losses (Galiati et al., 2016). The objective of this work is study the spatial distribution of some topsoil properties as clay, fine silt, coarse silt, fine sand, coarse sand, penetration resistance, moisture and organic matter in a crop field located in Croatia. A grid with 275x25 (625 m2) was designed and a total of 48 samples were collected. Previous to data modelling, data normality was checked using the Shapiro wilk-test. As in previous cases (Pereira et al., 2015), data did not followed the normal distribution, even after a logarithmic (Log), square-root, and box cox transformation. Thus, for modeling proposes, we used the log transformed data, since was the closest to the normality. In order to identify groups among the variables we applied a principal component analysis (PCA), based on the correlation matrix. On average clay content was 15.47% ($\pm$3.23), fine silt 24.24% ($\pm$4.08), coarse silt 35.34% ($\pm$3.12), fine sand 20.93% ($\pm$4.68), coarse sand 4.02% ($\pm$1.69), penetration resistance 0.66 MPa ($\pm$0.28), organic matter 1.51% ($\pm$0.25) and soil moisture 32.04% ($\pm$3.27). The results showed that the PCA identified three factors explained at least one of the variables. The first factor had high positive loadings in soil clay, fine silt and organic matter and a high negative loading in fine sand. The second factor had high positive loadings in coarse sand and moisture and a high negative loading in coarse silt. Finally, the factor 3 had a positive loading in penetration resistance. The loadings of these three factors were mapped using ordinary kriging method. The analysis of incremental spatial correlation identified that the highest spatial correlation in the factor 1 was identified at 41.87 m, in factor 2 at 75.61 m and factor 3 at 143.9 m. In the case of factor 2, the maximum peak of spatial autocorrelation was significant at a $p<0.05$. This showed that the variable has a random distribution, as confirmed with the Moran's I spatial correlation analysis. In relation to the other factors the maximum peaks were significantly clustered at a $p<0.001$. These results suggested that the each factor has a different spatial pattern and the studied soil properties explained by each factor had a different spatial distribution.

References

Breivik, E., Baumgarten, A., Calzolari, C., Miller, B., Pereira, P., Kabala, C., Jordán, A. Soil mapping, classification, and modelling: history and future directions. Geoderma, 264, Part B, 256-274.

Galiati, A., Gristina, L., Crescimanno, Barone, E., Novara, A. (2016) Towards more efficient incentives for agri-environment measures in degraded and eroded vineyards. Land Degradation and Development, DOI: 10.1002/ldr.2389

Pereira, P., Cerdà, A., Úbeda, X., Mataix-Solera, J. Arcenegui, V., Zavala, L. (2015) Modelling the impacts of wildfire on ash thickness in a short-term period, Land Degradation and Development, 26, 180-192.