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A comparison of interpolation methods for predicting spatial variability of soil organic matter content in Eastern Croatia

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Soil organic matter (SOM) plays crucial role in soil health and productivity and represents one of the key functions for determining soil degradation and soil suitability for crop production. Nowadays, continuing decline of organic matter in soils in agroecosystems, due to inappropriate agricultural practice (burning and removal of crop residue, overgrazing, inappropriate tillage, etc.) and environmental conditions (climate change, extreme weather conditions, erosion) leads to devastating soil degradation processes and decreases soil productivity. The main objectives of this research is to compare three different interpolation methods (Inverse Distance Weighting IDW, Ordinary kriging OK and Empirical Bayesian Kriging EBK) and provide best spatial predictor in order to ensure detailed analysis of the agricultural land in Osijek-Baranja County, Croatia. A number of 9,099 soil samples have been compiled from layer 0-30 cm and analyzed in laboratory. The average value of SOM in the study area was 2.66%, while 70.7 % of samples had SOM value below 3% in Osijek-Baranja County. Among the applied methods, the lowest root mean square error was recorded under Empirical Bayesian Kriging method which had most accurately assessed soil organic matter. The main advantage of EBK is that the process of creating a valid kriging model is automated so the manual parameter adjusting is eliminated, and this resulted with reduced uncertainty of EBK model. Conducted interpolation and visualization of data showed that 85.7% of agricultural land in Osijek-Baranja County has SOM content lower than 3%, which may indicate some sort of soil degradation process. By using interpolation methods combined with visualization of data, we can detect problematic areas much easier and with additional analysis, suggest measures to repair degraded soils. This kind of approach to problem solving in agriculture can be applied on various agroecological conditions and can significantly facilitate and accelerate the decision-making process, and thus directly affect the profitability and sustainability of agricultural production.