



Sampling network stratification by terrain classification in eroded agricultural landscapes at plot scale

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The description of soil properties variability is important aspect in land management and food production at plot scale. We describe novelty approach for design of sampling network on agricultural plots with high relief variability. The terrain properties were used for improved spatial prediction of soil properties including design of the sampling network. Regular sampling network, random sampling network, systematic unaligned sampling network and stratified sampling network schemes were compared to prove the advantages of relief based stratified sampling networks. The study was performed for humus horizon depth prediction on agriculture plot of 6.5 ha with dissected relief where originally homogenous soil cover was differentiated by erosion and sedimentation into mosaic of Chernozem, Regosol and colluvial soils. Moreover the comparison was done on three levels of sampling density (65, 40 and 24 sampling points). The stratification of sampling network was based on unsupervised relief classification. The performance of the soil properties prediction based on different sampling network was assessed by RMSE calculation based on predicted values versus validation dataset. According the RMSE, the stratified sampling network performed the best (7.4 cm) comparing the regular sampling network (10.8 cm), random sampling network (17.7 cm) and systematic unaligned sampling network (11.2 cm). The accuracy of the soil properties spatial prediction decreased with the decreasing number of sampling points, but the stratified network performed significantly better than other used methods. The study showed that, for soil properties spatial variability description at certain accuracy level, relief-based stratified network can contain 25 % less sampling points comparing to regular network. This leads to potential financial and person cost reduction for the soil survey.

The study was supported by grant nr. 13-07516P of the Czech science foundation and by grant nr. QJ1230319 of the Ministry of Agriculture.