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Effect of biochar application on soil hydrophysical properties and erosion potential

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Biochar application is considered a beneficial strategy for improving soil ecosystem services and also takes place in carbon sequestration, decreasing greenhouse gas emissions, renewable energy, elimination of waste, and as a soil remedy. The literature reports that, in general, biochar application reduces runoff by 5-50% and soil loss by 11-78%, suggesting that it may be effective in reducing water erosion, but the extent of erosion reduction is highly variable. The main mechanism by which biochar can reduce water erosion is by improving soil properties (i.e., organic carbon, hydraulic conductivity, aggregate stability) that affect soil erodibility.

The subject of this study is the application of a relatively new approach to estimating soil erosion in small catchment using the physically-based erosion Erosion-3D model. The model has been developed as a physically-based model for predicting soil erosion by water on agricultural land, amount of runoff and sediment concentration. Erosion-3D model is predominantly built on physical principles and simulates surface runoff, erosion, deposition and separation of soil particles for individual events and provides a beneficial tool for simulating and quantifying soil erosion.

The impact of biochar application on soil water erosion was determined for several scenarios in order to cover various condition and reflect the answer of biochar application to different soil properties. Based on the results, it can be concluded that the application of biochar has a positive effect on erosion activity to a certain extent.

The positives and negatives of biochar application to different soil properties were identified and provide a useful basis for further research.

Keywords: Erosion 3D model, biochar, soil water erosion, physically-based model

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