

Abstract

Land Management Impacts on Soil Water Erosion and Loss of Nutrients [†]

Leon Josip Telak ^{1,*}, Igor Bogunovic ¹ and Jesús Rodrigo-Comino ²

¹ Department of General Agronomy, Faculty of Agriculture, University of Zagreb, 10000 Zagreb, Croatia; ibogunovic@agr.hr

² Department of Geography, Instituto de Geomorfología y Suelos, Málaga University, Campus of Teatinos s/n, 29071 Málaga, Spain; rodrigo-comino@uma.es

* Correspondence: ljtela@agr.hr

[†] Presented at the TERRAenVISION 2019, Barcelona, Spain, 2–7 September 2019.

Published: 23 December 2019

Abstract: Humans are the driving factor of soil erosion and degradation. Therefore, sustainable land management practices should be developed and applied. The aim of this study was to determine land management impacts on soil properties, soil loss and nutrient loss in 3 different treatments; grass-covered vineyard (GCV), tilled vineyard (TV), and tilled hazelnut orchard (HO). The study area is located in Orahovica, Croatia (45°31' N, 17°51' E; elevation 230 m) on ~7° slope. The soil under the study area was classified as a Stagnosol. 8 rainfall simulations (58 mm h⁻¹, during 30 min, over 0.785 m² plots) were performed at each treatment where the next data were noted: ponding time, runoff time, and collection of overland flow. Soil samples were taken for determination of mean weight diameter (MWD), water stable aggregates (WSA), P₂O₅ content, and organic matter content. Analyses of sediment revealed concentrations of P₂O₅ and N. All three treatments had significantly different values of MWD (GCV 3.30 mm; TV 2.94 mm; HO 2.16 mm), while WSA and organic matter significantly differs between GCV and HO. The infiltration rate showed no significant difference between treatments. Sediment yield was significantly the highest at the TV (21.01 g kg⁻¹ runoff), while no significant difference was noted between GCV (2.91) and HO (6.59). Sediments of GCV treatment showed higher concentrations of P₂O₅ and N, compared to TV and HO. Nutrients loss was highest in the TV (450.3 g P₂O₅ ha⁻¹; 1891.7 g N ha⁻¹) as a result of highest sediment yield, despite the fact GCV had the highest nutrients concentrations. Results indicate that land management (and/or tillage) affects soil properties and their stability. Even though HO was tilled and had the lowest values of organic matter, WSA, and MWD, measurements were performed immediately after tillage where the plant residues reduced potential erodibility of the soil. Such results reveal that tillage should be avoided in vineyard and hazelnut production in order to prevent soil and nutrient losses.

Keywords: soil erosion; nutrient loss; rainfall simulations; land management

Acknowledgments: This work was supported by Croatian Science Foundation through the project “Soil erosion and degradation in Croatia” (UIP-2017-05-7834) (SEDCRO).



© 2019 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).