

Modelling soil carbon fate under erosion process in vineyard

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Soil erosion processes in vineyards beyond water runoff and sediment transport have a strong effect on soil organic carbon loss (SOC) and redistribution along the slope. The variation of SOC across the landscape determines a difference in soil fertility and vine productivity. The aim of this research was to study erosion of a Mediterranean vineyard, develop an approach to estimate the SOC loss, correlate the vines vigor with sediment and carbon erosion. The study was carried out in a Sicilian (Italy) vineyard, planted in 2011. Along the slope, six pedons were studied by digging 6 pits up to 60cm depth. Soil was sampled in each pedon every 10cm and SOC was analyzed. Soil erosion, detachment and deposition areas were measured by pole height method. The vigor of vegetation was expressed in term of NDVI (Normalized difference Vegetation Index) derived from a satellite image (RapidEye) acquired at berry pre-veraison stage (July) and characterized by 5 spectral bands in the shortwave region, including a band in the red wavelength (R, 630-685 nm) and in the near infrared (NIR, 760-850 nm). Results showed that soil erosion, sediments redistribution and SOC across the hill was strongly affected by topographic features, slope and curvature. The erosion rate was 46Mg ha⁻¹ y⁻¹ during the first 6 years since planting. The SOC redistribution was strongly correlated with the detachment or deposition area as highlighted by pole height measurements. The approach developed to estimate the SOC loss showed that during the whole study period the off-farm SOC amounts to 1.6Mg C ha⁻¹. As highlighted by NDVI results, the plant vigor is strong correlated with SOC content and therefore, developing an accurate NDVI approach could be useful to detect the vineyard areas characterized by low fertility due to erosion process.