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Scenario analysis of Agro-Environment measure adoption for soil erosion protection in Sicilian vineyard (Italy)

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Most of the challenges in designing land use policies that address sustainability issues are inherent to the concept of Agro-Environmental Measures (AEM). Researchers, farmers and mainly policy makers need to evaluate the impact of new and existing policies for soil protection.
In Europe, farmers commit themselves, for a minimum period of at least five years, to adopt environmentally-friendly farming techniques that undergone legal obligations. On the other hand, farmers receive payments that provide compensation for additional costs and income foregone resulting from applying those environmentally friendly farming practices in line with the stipulations of agri-environment contracts.
In this context we prospect scenarios on soil erosion variations in a detailed case study after the application of Agro-Environmental Measures (AEM).
The study area is located in the South part of Sicily. In a district area of 11,588 ha, 35.5 % is devoted to vineyard cultivation, 32.2 % is arable land and only 11.1 % cultivated to olive grow. 2416 ha are urbanized areas and other less important crops.
A paired-site approach was chosen to study the difference in soil organic carbon stocks after AEM adoption, following criteria based on Conteh (1999) also applied in several research studies. For the purpose of comparison, the members of a paired site were selected to be similar with respect to the type of soil, slope, elevation, and drainage, but not to AEM. The comparisons were made between adjacent patches of land with different AEM, and a known history of land use and management.
100 paired sites (two adjacent plots) were chosen and three soil samples (0-30 cm depth) were collected in each plot (600 soil samples).
The rainfall erosivity (R) factor (Mj mm ha-1 hour-1 year-1) was estimated with the formula specifically proposed for Sicily by Ferro and coauthors in 1999. The soil erodibility factor (K, in tons hour MJ-1 mm-1) was mapped on the base of soil texture and soil organic carbon content of the topsoil (averaged on the first 50 cm of soil depth) with the table published by Stone and Hilborn (2012). The slope-length and slope gradient (LS) factors were derived from the Digital Terrain Model of Sicily (20 x 20 m) using the formulas proposed by Wischmeier and Smith (1978), and revised by McCool et al. (1987 and 1989). The C factor were applied according previous studies in the same area and ranged among 0.22 and 0.12 and less than 0.10 using permanent species able to reduce erosion rate up to 90% (Gristina et al., 2006; Novara et al. 2011).
The scenario analysis of the soil erosion reduction after the adoption of AEM could be used by policy makers as a base for the evaluation of the Payment for Ecosystem Service (PES) to be paid to farmers through the future Agro-Ecosystem measures incentives.

Gristina, L., Bagarello, V., Ferro, V., Poma, I., 2006. Cover and management factor for Sicilian vineyard systems. In: 14th International Soil conservation Organization Conference—Water Management and Soil Conservation in Semi-arid Environments, 14–19 May 2006, Marrakech, Marocco ($ISCO_2006$), pp. 1–4.
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