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Sustainable strategies for soil and water conservation in hillslope farming

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Semi-natural vegetation and diverse cropping systems have been converted into monocultures with low tree densities, leaving the soil unprotected in marginal areas in south-eastern Spain. We monitored the association in soil and water conservation systems in almond (*Prunus amygdalus* Basch cv. *Desmayo Largueta*) plantations and the effect of plant strips. Soil loss and runoff were studied in hillside erosion plots with almond trees under soil-management systems: (1) non-tillage with rosemary (*Rosmarinus officinalis* L.) strips 3 m wide (ROS), (2) non-tillage with thyme (*Thymus baeticus* L. *Boiss. exlacaita*) strips (THS), and (3) Conventional Tillage (CT) on the south flank of the Sierra Nevada (SE Spain). Also, the nut yield from almond trees, and the biomass from aromatic-shrub strips were recorded. Our findings showed that the most effective treatment proved to be THS, reducing the annual soil loss by 93% and runoff by 80%, with respect to CT. The ROS system reduced soil loss by 91% and runoff by 82%, with respect to CT. The average nut yield from ROS, THS and CT during the study period was 3.2, 3.8 and 4.5 kg tree⁻¹, respectively, and the potential average essential oil yield from ROS, THS and CT was 8.7 and 10.8 L ha⁻¹, respectively. The non-tillage with thyme strips decreased the soil erosion and runoff rates and thus had a positive impact on the environment while simultaneously maintaining

reasonable almond-production levels. The thyme and rosemary strips led to a loss in the almond harvest, a loss that could be offset by the economic value of the thyme and rosemary crops. Thus, the combination of orchard trees with shrubs provided a viable option to conserve soil and water in hilly areas in the context of sustainable agriculture.

Biography

Víctor Hugo Duran Zuazo is a researcher at Institute of Agricultural Research IFAPA Centro Camino de Purchil (Granada, Spain). He has coordinated research projects in the area of natural resources and agriculture at regional, national and EU level. Since 2009 Víctor is the head of the Conservation and Sustainable Use of Soil, Water & Biodiversity in Agricultural Systems research group (AGR-144). He deals with land- and water-management interventions in Mediterranean agroforestry systems, with the aim of preventing, reducing or recovering losses of soil, water, and biodiversity. In terms of knowledge and research, the focus by his research group is on sustainable land management, specifically: land-degradation processes; conservation measures and interventions at both field and watershed scale; and the harmony of sustainable management practices that encourage productivity, climate-change mitigation, soil quality, and water-use efficiency.

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