



## **Measuring, understanding and implementing (or at least trying) soil and water conservation in agricultural areas in Mediterranean conditions**

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Understanding soil erosion processes is the first step for designing and implementing effective soil conservation strategies. In agricultural areas, spatially in arid and semiarid conditions, water conservation is interlinked with soil conservation, and usually need to be addressed simultaneously to achieve success in their use by farmers. This is so for different reasons, but usually because some reduction in runoff is required to prevent soil erosion or to the need to design soil conservation systems that do maintain a favourable water balance for the crop to prevent yield reductions.

The team presenting this communication works around both issues in Southern Spain, interconnecting several lines of research with the final objective of contribute to reverse some severe issues relating soil conservation in agricultural areas, mostly on tree crops (olives and vineyards).

One of these lines is long-term experiments measuring, runoff and sediment losses at plot and small catchment scale. In these experiments we test the effect of different soil management alternatives on soil and water conservation. We also measured the evolution of soil properties and, in some cases, the evolution of soil moisture as well as nutrient and carbon losses with runoff and sediment. We also tests in these experiments new cover crops, from species better adapted to the rainfall regime of the region to mixes with several species to increase biodiversity. We complement these studies with surveys of soil properties in commercial farms. I some of these farms we follow the introduction by farmers of the cover crop strategies previously developed in our experimental fields.

These data are invaluable to elaborate, calibrate and validate different runoff generation, water balance, and water erosion models and hillslope and small catchment scale. This allows us to elaborate regional analysis of the effect of different strategies to soil and water conservation in olive growing areas, and to refine these strategies under predicted climate change scenarios in a few decades from now. The models are also used to evaluate historical erosion rates, and the long-term impact of soil erosion on olive yield due to the loss of soil profile. This is our second major line of research.

Our their key line of research is the analysis of gully erosion processes, from field based observation to evaluation at regional scale, and the development of cost-effective strategies for gully control at farm scale. This includes the testing of some of these strategies with farmers. We integrate the use of vegetation in gully erosion control strategies to enhance biodiversity and landscape values; both severely degraded in many agricultural areas in the Mediterranean.

The fourth, and last, major line of research is the development or improvement of technologies for soil erosion studies. Among them is the use of rainfall simulations, laboratory flumes, photoreconstruction techniques for 3D model, improved sampling devices, etc. Within this line we have improved the use of sediment tracers to understand the processes of sediment mobilization within the landscape, or at plot scale. This greatly improves our understanding of erosion processes and the actual effectiveness of erosion control strategies.

The results of these lines of research are put together in the form of Good Agricultural Practices, and technical notes, software, for implementation by farmers and technicians working at the fields that are disseminated through seminars, cooperation with government and non-government agencies and other documents such as videos or web sites.

In this communication we mention some of the our research in order to highlight the major problems and questions that are faced when trying to develop viable soil and water conservation techniques, specially the need for transdisciplinary research and the cooperation, form the start, with key stakeholders, specially farmers.