Geophysical Research Abstracts
Vol. 14, EGU2012-12497, 2012
EGU General Assembly 2012

Biophysical and socioeconomic impacts of soil and water conservation measures. An evaluation of Sustainable Land Management in SE Spain.

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In close collaboration with stakeholders promising soil and water conservation measures were selected as part of the EU funded DESIRE project. These measures were monitored for nearly three years at an experimental farm in the upper Guadalentin (SE-Spain). Four Sustainable Land Management (SLM) measures were implemented on rainfed almonds: a) reduced tillage, b) green manure, c) straw mulch, d) traditional water harvesting. A fifth measure (e) reduced tillage of cereals, was compared to conventional mouldboard tillage. Here, we present monitoring results according to biophysical and socioeconomic criteria.

SLM measures a, b and e, aim to reduce soil and water loss through runoff. Therefore, for each measure three replica erosion-runoff plots and a control plot were installed to monitor soil and water loss and soil moisture content at two depths. SLM measures c and d aim to increase soil water content by preventing soil evaporation and adding additional water by water harvesting respectively. In these fields, the volume of harvested water was registered and soil water content was monitored. In all experiments, farm operation costs and crop harvest were monitored as well.

In the almond fields, green manure and reduced tillage significantly reduced soil and water loss as compared to the control plot with normal tillage operations. Also for the cereal field, results show lower erosion rates under reduced tillage as compared to traditional tillage operation. In two successive years, the highest almond harvest was found in the field with water harvesting (d), followed by the green manure field (b), though no significant differences were found in soil water content with their control plots. Mulching did not show a significant effect on soil water content or harvest.

Four of the selected SLM options showed a positive effect on the protection of soil and water resources, and were beneficial for crop yield. Whereas, reduced tillage also results in lower production costs, the other measures (green manure, mulching and water harvesting) require initial and/or maintenance costs. Therefore, even though these measures may lead to a higher farm income, due to the high inter-annual variability of harvest, they face a lower acceptance by most farmers of rainfed agriculture in semiarid SE spain.