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From natural land to irrigated crops: impact of land use change and crop diversification on interrill erosion

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Soil erosion is one of the most important processes of soil degradation, especially vulnerable are many agricultural systems of SE Spain which are being transformed from a rainfed to irrigated agriculture. Crop diversification has been raised as a possible management measure with multiple benefits to combat soil degradation. Interrill soil erosion rates and processes were assessed in three land uses in SE Spain next to each other, with the same basic characteristics (climate, lithology and soils) representing a gradient of land use change: natural shrubland, rainfed almond crop (*Prunus dulcis*) on terraces and levelled citrus crops (*Citrus reticulata*) with street-ridge morphology. The experimental design included two diversifications in the rainfed almond: intercropping *Capparis spinosa* and *Thymus hyemalis*, respectively, while in the citrus irrigated area a rotation with *Hordeum vulgare* and *Vicia sativa* (from February to July) or *Vicia faba* (from October to January) were intercropped in the streets.

In the rainfed and natural area interill erosion was measured using erosion pins with a 2 or 3 x 3 x 3 scheme (2 or 3 plots of 1 m^2 with 9 pins at two diversifications and control, at three different agricultural terraces). In the natural area two pin plots were set up. At the irrigated area the experimental design was a 2 x 2 x 2 scheme (2 plots (ridge; street) x 2 replicates x 2 (bare, vegetated). Pins were measured after each rain event or each month during 14 months, identifying detachment (positive values) and sedimentation (negative values) within the erosion process.

The preliminary results indicate significant higher erosion rates in the irrigated areas than in the traditional rainfed terraces (83.6±147.4 t ha^{-1} versus 9.59±170.34 t ha^{-1}, respectively). Shrubland natural areas show significant higher deposition rates (-74.97±43.08 t ha^{-1}) than recent diversified plots with *Capparis* and *Thymus* (-52.56±227.06 and -28.29±85.94 t ha^{-1}, respectively). Neither differences within diversification type (*Capparis versus Thymus*) nor between control and diversifications in the rainfed almond area have been yet detected. In the *Citrus* irrigated area erosion rates under *Hordeum vulgare* and *Vicia sativa* were significantly higher than under *Vicia faba* (129.58±94.43 and 25.61±87.79 t ha^{-1}, respectively).

So far, those preliminary results indicate that natural shrubland and traditional rainfed crop

systems facilitate sedimentation rates and are effective systems for soil conservation. However, the conversion from rainfed to irrigated crops mean a significant increase of erosion rates due to a system that does not facilitate retention of detached soils. Within this temporal framework, crop diversifications, both in rainfed and irrigated systems, have not yet significantly reduced erosion rates. A longer experimentation period is necessary to determine the effect of crop diversifications on soil erosion.