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The use of straw to reduce the soil and water losses in agriculture and forest ecosystems in the Mediterranean Type-Ecosystem. The Soil Erosion and Degradation Research Group contribution

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Soil Erosion is a worldwide environmental issue (Keesstra et al., 2007; Dai et al., 2015; Erkossa et al., 2015; Ochoa-Cueva et al., 2015; Taguas et al., 2015). The high erosion rates are affecting mainly the non-developed countries due to the lack of vegetation cover, deforestation and the intense ploughing (Lieskovsky and Kenderessy, 2014; Biwas et al., 2015, Colazo and Buschiazzo, 2015; Ligonja and Shrestha, 2015); and the developing countries due to the herbicides abuse and heavy machinery (Cerdà et al., 2009; Novara et al., 2011). Non-sustainable erosion rates result in the loss of soil and also changes in the hydrological, erosional, biological, and geochemical cycles, which produce the lack of the services, goods and resources the soil offers to the humankind (Keesstra et al., 2012; Berendse et al., 2015; Decock et al., 2015; Brevik et al., 2015; Smith et al., 2015). This is why there is a need to reduce the soil losses, and to achieve a sustainable situation with lower and renewable soil erosion rates and to improve the infiltration rates (Cerdà et al., 2015; Nanko et al., 2015; Mwango et al., 2016). Vegetation cover is the most efficient strategy to control soil and water losses (Cerdà, 1999; Keesstra, 2007; Zhao et al., 2014), however there is the need to use other covers once the vegetation is not recovered such as after the forest fires or when the crops do not allow to have weeds and the soil should be bare. This is sometimes a cultural and aesthetic need (farmers from the Cànyoles river watershed personal comm).

Under the above-mentioned circumstances, a straw cover can reduce the soil losses and increase infiltration. This is the main research topic that is being carried out by the Soil Erosion and Degradation Research Group from the University of Valencia during more than one decade: to find solutions to the non-sustainable soil erosion rates under forest and agriculture land under Mediterranean climatic conditions. The research was developed using paired plots under natural and simulated rainfall at the Soil Erosion Stations of Montesa, El Teularet and Celler del Roure. Rainfall simulation experiments with very small (0.25 m2), small (1 m2) and medium (20 m2) plots were carried out in scrublands and recently fire-affected land, and on vineyards and orchards. The plots under natural rainfall conditions ranged from 1 to 300 m2. The results show a positive influence of the straw mulch to reduce the soil and water losses, although is more efficient to control the sediment delivery due to the reduction of the raindrop impact. Reduction in one order of magnitude is usual after the immediate application of the straw on vineyards (Prosdocimi et al., 2016) and apricots (Keesstra et al., under review) and in persimmon plantations (Cerdà et al., in press).

The above-mentioned results show the positive effect of the straw mulch found by other researchers with other types of mulches such as rock fragments (Cerdà, 2001; Jordán et al., 2009; Jordan and Martínez-Zavala, 2008; Martínez-Zavala and Jordán, 2008, Zavala et al., 2010). There is a need to develop new and advanced research on the effects of the straw cover and other mulches such as litter on the recently forest fire affected soils, and pruned chipped branches and other organic amendments on agriculture land (Yazdanpanah et al., 2016). This new reseach challenge should give information about the soil and water losses, but also about the organic matter recovery, the soil water retention, and the biological, chemical and physical soil properties changes.

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