



Extreme soil erosion rates in citrus slope plantations and control strategies. A literature review

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Soil Erosion is a natural process that shapes the Earth. Due to the impact of agriculture, soil erosion rates increase, landforms show gullies and rills, and soils are depleted. In the Mediterranean, wheat, olive and vineyards were the main agriculture products, but new plantations are being found in sloping terrain due to the drip-irrigation. This new strategy results in the removal of the traditional terraces in order to make suitable for mechanization the agriculture plantation. Citrus is a clear example of the impact of the new chemical agriculture with a high investment in herbicides, pesticides, mechanisation, land levelling and drip computer controlled irrigation systems. The new plantation of citrus orchards is found in the Mediterranean, but also in California, Florida, China and Brazil. Chile, Argentina, and South Africa are other producers that are moving to an industrial production of citrus.

This paper shows how the citrus plantations are found as one of the most aggressive plantation due to the increase in soil erosion, and how we can apply successful control strategies.

The research into the high erosion rates of citrus orchard built on the slopes are mainly found in China (Wu et al., 1997; Xu et al., 2010; Wang et al., 2011; Wu et al., 2011; Liu et al., 2011; Lü et al., 2011; Xu et al., 2012) and in the Mediterranean (Cerdà and Jurgensen, 2008; 2009; Cerdà et al., 2009a; 2009b; Cerdà et al., 2011; 2012)

Most of the research done devoted to the measurements of the soil losses but also some research is done related to the soil properties (Lu et al., 1997; Lü et al., 2012; Xu et al., 2012) and the impact of cover crops to reduce the soil losses (Lavigne et al., 2012; Le Bellec et al., 2012) and the use of residues such as dried citrus peel in order to reduce the soil losses.

There are 116 million tonnes of citrus produced yearly, and this affects a large surface of the best land. The citrus orchards are moving from flood irrigated to drip irrigated land, and this contributes to increase the soil losses due to the sloping terrain.

Although citrus is a world wide food, and occupy a large surface little is being researched on their impact on soil erosion, land degradation and strategies to control the soil, water and nutrient losses. This paper review the research developed until now and the results show that there is a poor background on this topic. It is necessary to develop research projects to improve the knowledge on the impact of citrus plantations on soil degradation and soil erosion.

Another key information from the literature review done, is that most of the research was done in two regions of China and one of the Mediterranean. Definitively, a poor understanding of a huge environmental problem that need more scientific research.

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