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Maize production and land degradation: a Portuguese agriculture field case study

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While food security is a main challenge faced by human kind, intensive agriculture often leads to soil degradation which then can threaten productivity. Maize is one of the most important crops across the world, with 869 million tons produced worldwide in 2012/2013 (IGC 2015), of which 929.5 thousand tons in Portugal (INE 2014). In Portugal, maize is sown in April/May and harvest occurs generally in October. Conventional maize production requires high inputs of water and fertilizers to achieve higher yields. As Portuguese farmers are typically rather old (on average, 63 years) and typically have a low education level (INE 2014), sustainability of their land management practises is often not a principal concern. This could explain why, in 2009, only 4% of the Portuguese temporary crops were under no-tillage, why only 8% of the farmers performed soil analyses in the previous three years, and why many soils have a low organic matter content (INE 2014). Nonetheless, sustainable land management practices are generally accepted to be the key to reducing agricultural soil degradation, preventing water pollution, and assuring long-term crop production objectives and food security. Sustainable land management should therefore not only be a concern for policy makers but also for farmers, since land degradation will have negative repercussions on the productivity, thus, on their economical income.
This paper aims to assess the impact of maize production on soil properties. The study focusses on an 8 ha maize field located in central Portugal, with a Mediterranean climate on a gently sloping terrain (<3%) and with a soil classified as Eutric Fluvisol. On the field, several experiments were carried out with different maize varieties as well as with different fertilizers (solid, liquid and both). Centre pivot irrigation was largely used. Data is available from 2003, and concerns crop yield, fertilization and irrigation practices, as well as soil properties assessed through occasional laboratorial analyses (pH, organic matter content, available phosphorous and potassium, exchangeable sodium, calcium, magnesium and potassium, as well as copper, zinc, iron and manganese).