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A case study of olive oil mill waste water application in corn fields: Soil and groundwater quality assessment

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Abstract:

Greece is the third oil production country in Europe, after Italy and Spain, with annual production of 500 kilotonnes per annum. Due to the intensive oil production a large amount of Olive Oil Mill Waste Water (OOMWW) is generated, which needs to be treated. For the case of Greece, vast proportion of oil production depends on family enterprises, which seek for low cost and low environmental disturbance solutions. The application of OOMWW in soils has been already applied in pilot level in some areas (mainly Spain). The target of our study is to evaluate soil and groundwater effects from the application of OOMWW in a corn field. The oil mill is located in Lakonia Prefecture and uses a three phases centrifugation oil production process, which produces about 1 kg of OOMWW per 1 L of oil. The family enterprise has been operated this cost effective treatment solution for the last 3 years. The OOMWW is pretreated with calcium oxide and stored for 3 months in waste ponds before the application. The corn production has been increased since the OOMWW application and profits arises also from the extra reserve of water supply during dry period (May-August). Several chemical and physical parameters have been measured such as pH, conductivity, chemical oxygen demand, total phenols, etc. for both soil and groundwater. Total phenols level in groundwater appeared relatively low (1.9 to 2 mg/L) while conductivity is relatively stable (1105 $\mu\text{S}/\text{cm}$) which shows no further salt burden. Soil pH is 7.73 and conductivity 320 $\mu\text{S}/\text{cm}$, whereas organic matter (OM) ranges from 1 to 2.5 %. Up to now no adverse effects have been noticed. However future aspects of maintaining soil fertility and eliminating the possibility of soil degradation should be taken under consideration.