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Utilizing Residues from Olive and Olive Oil Production for Environmental Protection and Soil Fertility Enhancement

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Abstract

In the Mediterranean area, olive grove soils are mainly characterized by a low carbon content (Trigo et al., 2009), while they are particularly vulnerable to erosion and subsequent desertification (Ping et al. 2015). Nowadays, it is considered necessary to increase the organic matter in olive groves to improve their quality and consequently their fertility (Fernandez-Romero et al., 2016). Shredding and incorporating olive pruning is a suggestive alternative solution, as opposed to their traditional burning method, significantly limiting CO_2 emissions and reducing the loss of organic matter from the olive grove itself (Koubouris et al., 2018). However, this approach, also increases the risk of diseases and insects spread in the fields (Benyei et al., 2018). On the other hand, composting olive pruning before incorporating it into the soil ensures the production of a high quality and stabilized organic material, free of pathogens (Ghoneim et al, 2017). Also, olive mill waste contains significant amounts of nutrients, mainly N and K, which after appropriate treatment could also be incorporated into the soil for crops nutrition (Galliou et al., 2018). Finally, studies have shown that using biochar as a soil conditioner can also be a useful tool for adapting to climate change (Stavi et al., 2003). Biochar produced from olive pruning has higher nutrient content and a higher cation exchange capacity compared to other materials (Alburquerque et al. 2016). In the preset study, the project “ELAIONAS” will be presented. It will be implemented in two regions in Greece, with a long tradition in olive cultivation, Lesvos and Crete. The olive tree pruning that will be produced from the “pilot olive groves” in these two specific areas will be crushed and incorporated into the soil after composting. The innovative process that will be implemented at “ELAIONAS” project involves the use of the olive mill waste from the olive mills after sedimentation, to regulate the humidity in the compost windrows. In addition, in the olive mill, the sludge from the sedimentation tank will be co-composted

with the olive leaves to produce excellent quality compost, which will also be beneficial for crops. At the same time, biochar - the residue of the charcoal production process from the thick olive wood - will be used in the crops themselves. In addition, the production of hydrochar from the olive mill waste by the process of hydrothermal carbonization will also be examined. Afterwards, soil improvers will be applied to olive groves in Crete and Lesvos. The olive groves will be monitored for a period of approximately two years to assess the benefits and the impacts on the olive grove system. Overall, the "ELAIONAS" project aims to contribute to the development of an improved, on-site management system for the integrated utilization of olive growing and olive production residues. By following the Circular Economy model this endeavor seeks to enhance the well-being of olive crops and the environment.

Keywords: agro-industrial waste, biochar, composting, olive mill waste, olive grove

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