

An Analysis of Eco-efficiency and GHG Emission of Olive Oil Production in Northeast of Portugal

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Abstract : Olive oil production sector plays an important role in Portuguese economy. It had a major growth over the last decade, increasing its weight in the overall national exports. International market penetration for Mediterranean traditional products is increasingly more demanding, especially in the Northern European markets, where consumers are looking for more sustainable products. Trying to support this growing demand this study addresses olive oil production under the environmental and eco-efficiency perspectives. The analysis considers two consecutive product life cycle stages: olive trees farming; and olive oil extraction in mills. Addressing olive farming, data collection covered two different organizations: a middle-size farm (~12ha) (F1) and a large-size farm (~100ha) (F2). Results from both farms show that olive collection activities are responsible for the largest amounts of Green House Gases (GHG) emissions. In this activities, estimate for the Carbon Footprint per olive was higher in F2 (188g CO₂e/kgolive) than in F1 (148g CO₂e/kgolive). Considering olive oil extraction, two different mills were considered: one using a two-phase system (2P) and other with a three-phase system (3P). Results from the study of two mills show that there is a much higher use of water in 3P. Energy intensity (EI) is similar in both mills. When evaluating the GHG generated, two conditions are evaluated: a biomass neutral condition resulting on a carbon footprint higher in 3P (184g CO₂e/Lolive oil) than in 2P (92g CO₂e/Lolive oil); and a non-neutral biomass condition in which 2P increase its carbon footprint to 273g CO₂e/Lolive oil. When addressing the carbon footprint of possible combinations among studied subsystems, results suggest that olive harvesting is the major source for GHG.

Keywords : carbon footprint, environmental indicators, farming subsystem, industrial subsystem, olive oil

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