

Comparative life cycle assessment of chestnut production scenario

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In Portugal, chestnut (*Castanea sativa Mill*) is a national agricultural product providing important nutritional, cultural value, and conservation. Beira Interior chestnut orchards area is increasing during the past ten years, which means the utilization for input material (fertilizer, pesticide) and energy (non or renewable) has been increasing too. This condition is driving to produce more greenhouse gas (GHG) emissions for the environment.

To anticipate the future chestnut industrialization in Portugal, we analyzed the sustainability of current chestnut production and gave alternative scenarios to cutting carbon consumption.

In order to evaluate the environmental impacts of chestnut production in the Beira Interior region. The comparative life cycle assessment (LCA) was performed with the use of OpenLCA software with 16 EF impact categories were retrieved from the AGRIBALYSE database. The system boundary was from “orchard to market” and the functional unit was 1 ton of chestnut delivered to consumers. The processes model for the production of agricultural machinery, pesticides, fertilizers, and materials were modeled based on survey and existing literature. The data was gathered from four different production areas: Serra da Estrela, Malcata, Gardunha, plateau area. Each site has two selected representative producers with 250 km² square radius environment. The results showed that the average GHG emissions 2.614 kgCO₂-eq/Ton, with main contribution source of emissions in these four sites was fertilizers (76–83%). Sensitivity analysis results revealed the Estrela scenario is the best practice to produce chestnut under 5 tons/year, while producers over 10 tons are expected to adopt renewable energy scenarios.

Keywords: Life Cycle Assessment, Chestnut, AGRIBALYSE, Portugal

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