

# The role of agricultural practices on long-term natural resource productivity in an LCA context: modeling and assessing effects of policy measures in Flanders.

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**Abstract** (*max. 2500 characters, including spaces*)

Agricultural has come under increasing pressure to meet the growing demand for food and feed, which resulted in agricultural intensification. This entails many adverse environmental impacts, including land degradation. Soil organic carbon (SOC) decline is hereby considered as a main danger which affects soil health and productivity. Agricultural land use practices (LUP), including the choice of crop rotation, fertilizer, cultivation of catch crops(CC), etc., can affect the SOC stock.

Life cycle analysis (LCA) can be used to assess the sustainability of the application of those LUP, but it fails today to incorporate long-term effects on (the loss of) resource productivity. Considering the main goal of the agricultural sector, we focus on the area of protection (AoP) natural resources as we refer to the impact of LUP on soil quality by the long-term ability to produce biomass. Two characterization factors (CFs) are developed<sup>1</sup>: long-term SOC change and long-term biomass productivity loss, which indicate respectively the yearly average loss of SOC ( $t\ C\ ha^{-1}\ yr^{-1}$ ) and yield ( $t\ DM\ ha^{-1}\ yr^{-1}$ ) when applying non-sustainable instead of sustainable LUP. For the development, the models RothC and EU-Rotate\_N are used, respectively.

Policy can play a key role in agricultural sustainability by encouraging LUP (e.g., CC cultivation) or promoting the use of advanced fertilizers (e.g., compost). In this study, we compare the impact of policy measures or possible recommendations in terms of SOC stock and biomass productivity for the agricultural sector in Flanders (Belgium) relying on the abovementioned CFs.

To do so, the agricultural sector is subdivided into agricultural types (e.g., dairy farming, field vegetables,...). For each agricultural type, one municipality, characterized by a certain soil texture, rotation system and organic fertilizer type, is selected. To compare the effect of the application of certain LUP in each municipality, the two CFs were calculated and used to simulate the effect of policy measures on long-term resource productivity. Next, maps were created to show the change in SOC stock and biomass productivity as a result of policy measures, indicating improvement options for Flanders as a whole.

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<sup>1</sup> *Boone et al. (2018). Accounting for the impact of agricultural LUP on SOC stock and yield under the AoP natural resources. J. Clean. Prod. (under review)*