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## Assessing Soil Organic Carbon Dynamics Across Croplands and Grasslands: A RothC Model Analysis with Varied Carbon Inputs

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The preservation and enhancement of soil organic carbon (SOC) are essential for ensuring sustainable agricultural productivity, improving soil health, and addressing global environmental challenges. This study utilizes the RothC model to explore the dynamics of SOC across two distinct land uses in Wallonia, Belgium—croplands and grasslands. We used remote sensing methods to predict the necessary boundary conditions for the RothC model, focusing on precise estimations of carbon inputs from different sources based on the land use. The research assesses the impact of varied carbon inputs by comparing traditional inputs, derived from statistical methods and existing datasets, with predictions obtained from remote sensing data. This comparison aims to illustrate discrepancies and synergies in SOC estimation and modeling, thereby providing insights into more precise and scalable methods for predicting changes in SOC. Focusing on specific demonstration sites within the region, the research underscores the localized responses of SOC to diverse management practices and environmental conditions. This focus helps support the development of effective carbon sequestration strategies. Ultimately, this study not only enhances our understanding of SOC dynamics over time but also fosters the development of customized agricultural practices that enhance carbon retention and contribute to the mitigation of climate change impacts in temperate regions.