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Maelia-OWM: An integrated assessment and modelling tool for territorial management of organic resources

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The use of organic wastes (OW) as fertilizers or amendments has multiple positive impacts on ecosystem services such as soil fertility (e.g., nutrients and water provision, sensitivity to erosion), climate regulation or soil biodiversity enhancement. However, the different effects of organic wastes are frequently studied separately (substitution to mineral fertilizers, carbon storage...) and mainly at field and farm levels. However, these effects are potentially in interactions through trade-offs or synergies from field to local level regarding the different sustainability domains. One way to improve sustainable management of organic wastes is to design an optimized territorial management of these resources considering their characteristics (e.g., organic carbon stability, fertilizing value), climate, soil and cropping systems (e.g. rotation and practices) heterogeneity, management constraints (e.g logistics) and objectives of involved local actors (e.g. farmers, organic wastes producers, managers and carriers) and their potential relationships. This territorial management could benefit from an Integrated Assessment and Modelling (IAM) tool allowing local stakeholders to take into account chemical, biological, economical processes from field to territory.

To deal with this challenge, we adapted the IAM Maelia platform developed for modelling and simulation of social-agro-ecosystem at local to regional level. Our model, called MAELIA-OWM (organic wastes management), provides solutions for assessing ecosystem services, soil biodiversity, economic and social impacts of scenarios regarding territorial organic wastes management, agricultural activities, agro-environmental policies and climate change. MAELIA-OWM is based on a set of models that are easily calibrated in different biophysical contexts such as the AqYield cropping system model, the HERBSIM grassland model, a dedicated livestock model. A dedicated OW-chain model, has been also integrated to take into account organic wastes production, transformation, transport and usage. In this contribution, we will present and discuss the application of MAELIA-OWM in three French territories characterized by very distinct agricultural, OW and pedo-climatic contexts.

Keywords: organic wastes, social-agro-ecosystem, spatial simulation, Integrated Assessment and Modelling