MAELIA-OWM : an integrated assessment and modelling tool for territorial management of organic resources

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Abstract

The use of organic wastes as fertilizers has various positive effects on ecosystem services such as soil fertility (e.g. nutriments provision, water storage, erosion control), climate regulation and soil biodiversity. Organic wastes use can also have negative effects such as increased nitrogen leaching and heavy metals accumulation. Moreover, organic wastes can affect different aspects of a farming system (workload, yields, fertilizing costs). Optimizing organic wastes management at local level requires an approach that would consider their characteristics (e.g. organic matter stability, fertilizing value), climate, soil and cropping systems heterogeneities (differences in rotations and crop management) as well as the multiple feedback relationships that link the system components. Organic wastes territorial management could benefit from an Integrated Assessment and Modelling (IAM) tool allowing stakeholders to consider biophysical and socio-economic processes from field to territorial level.

To reach this objective, we adapted the IAM MAELIA platform developed for modelling and simulating social-agroecosystems at local/regional level and implemented with the GAMA platform. MAELIA-OWM (Organic Wastes Management) provides solutions for assessing ecosystem services, economic and social impacts of scenarios regarding territorial OWM, agricultural activities, agro-environmental policies and climate changes. MAELIA is based on a set of models that for which parameters can be set for different biophysical contexts (e.g. AqYield cropping system model).

MAELIA-OWM is applied on the Versailles Plain, France (240 sq.km). This territory is dominated by rapeseed and wheat cultivation and is characterized by a high availability but low usage of urban organic wastes. We compare three different scenarios (greater use of available organic wastes and mineral fertilization only) to a baseline scenario (little use of organic wastes, current practices). These scenarios are assessed through a set of agro-environmental and socio-economic criteria (GHG emissions, carbon storage, nitrogen leaching, gross margins and workload). Actual developments of the model are dedicated to the implementation of an organic wastes chain model that will consider organic wastes production, transformation and transport.