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Modeling soil functions for a sustainable bioeconomy

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Soils occupy a central position in the ecosystem and provide essential functions for both, humans and the environment. On the one hand, they are used to produce biomass for human nutrition and animal feed, but also for bioenergy, and the production of various industrial materials. In addition, they are the largest terrestrial carbon reservoir, filter and store water, recycle nutrients and provide a habitat for an immense diversity of organisms. For many years, agriculture was almost exclusively production-oriented. Today, climate change, biodiversity loss and a number of other environmental problems are calling for a change to more sustainable production taking into account the entire bundle of soil functions.

The BODIUM model (König et al., 2023) is a systemic soil model which aims to simulate the effect of changing agricultural management practices on soil functions such as yield, water storage and filtration, nutrient recycling, carbon storage and habitat for biodiversity. For this purpose, the influence of crop rotation, soil cultivation, fertilization as well as the effect of a changing climate is taken into account site-specifically. A version of this model, the BODIUM4Farmers, is intended to serve farmers as an on-site decision support tool for long-term planning of soil management measures in response to actual economic and ecological requirements. In this presentation, we introduce soil as a central resource for a sustainable bioeconomy and provide an overview about the BODIUM and BODIUM4Farmers models.

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