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Potential and challenges of long term uninterrupted field crop rotations modelling: case study from Czech Republic

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Crop rotation composition, fertilization strategy and residue management could have long term effects on soil properties and crop production. Due to system complexity and unceasing changes (e.g. the development climatic conditions) exact quantification of various factors is relatively complicated. Crop growth models are available tools for assessment of interactions and processes (crop development, biomass production, soil processes, flow of matters etc.) at various levels of agrosystems. This makes such tools very useful aside field experiment which has limited range of options and conditions. The aim of this study is to demonstrate functionality of HERMES crop model for simulations of long term uninterrupted crop rotations. The evaluation of the model behavior within recent period is described for selected soil-climatic conditions (examples for representative locations within Czech Republic) with focus both on crop production aspects and soil processes (including organic matter balance). Moreover the examples of the simulated processes by HERMES model under selected set of future climatic conditions during this century is presented. Based on acquired knowledges the challenges for further progress is described (e.g. crops mixtures modelling, new crop implementation, effect of tillage intensity). The ambition is to have the complex and reliable modelling procedure as a tool for possible adaptation measures design and assessment both for current and future climatic condition. The study and contribution was funded through SustES - Adaptation strategies for sustainable ecosystem services and food security under adverse environmental conditions“ project no. CZ.02.1.01/0.0/0.0/16_019/0000797.