

Assessment of management systems according to their impact on SOM turnover on regional scale

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Models are widely used to predict SOM dynamics as reaction on management and climate. But the predicted SOM dynamics depend also on the initial conditions that on field scale are much better available from direct measurements than on regional scale.

In the case of the models CANDY and CCB that are both build upon the same turnover equations it is possible to predict the steady state amount of SOM from the carbon reproduction flux (C_{rep}) –the amount of carbon from fresh organic matter that is incorporated into SOM – and from the average turnover conditions that are expressed as Biologic Active Time (BAT). Both variables are combined to a new indicator, the reproduction index:

$$REP_IX = C_{rep} / BAT$$

The required data base comprises climate data (air temperature and rainfall), topsoil texture (clay and fine silt) as well as crop yield and amount of organic amendments. An implicit information base comes from the model parameters that describe the relation between yield and amount of crop residues and root material as well as the quality of the different sources of fresh organic matter.

According to the models the time course of SOM for a given management system is completely defined by the initial SOM content and the REP_IX. Any change in climate or management leading to a different REP_IX can be compensated by appropriate measures that will restore the previous value of REP_IX.

This concept was applied for two regions in Austria (Mühlviertel and Marchfeld) and for the federal state Saxony in Germany in order to identify possible changes in carbon cycling and to identify adaptation messages.

Depending on the individual situation it may be sufficient to have an increase in crop yields to stabilize SOM storage against climate change – as it has been shown in some long term experiments. In other cases it may be recommended to introduce additional intercrops to increase the C_{rep} flux or to increase areas with conservation tillage to decrease BAT. Those measures may also be required if carbon is withdrawn from the reproduction process for instance due to the production of biogas.