

USING CROPSYST AND SUNDIAL TO SIMULATE SOIL ORGANIC MATTER DYNAMICS AT TWO SITES IN EASTERN EUROPE

[G. Bellocchi](#)¹, [M. Ashman](#)², [L. Shevtsova](#)³, [M. Donatelli](#)¹, [P. Smith](#)², [V. Romanenkov](#)³, [J. Smith](#)², [G. Dailey](#)²

¹ ISCI, Bologna, Italy

² SSD, IACR-Rothamsted, Harpenden, United Kingdom

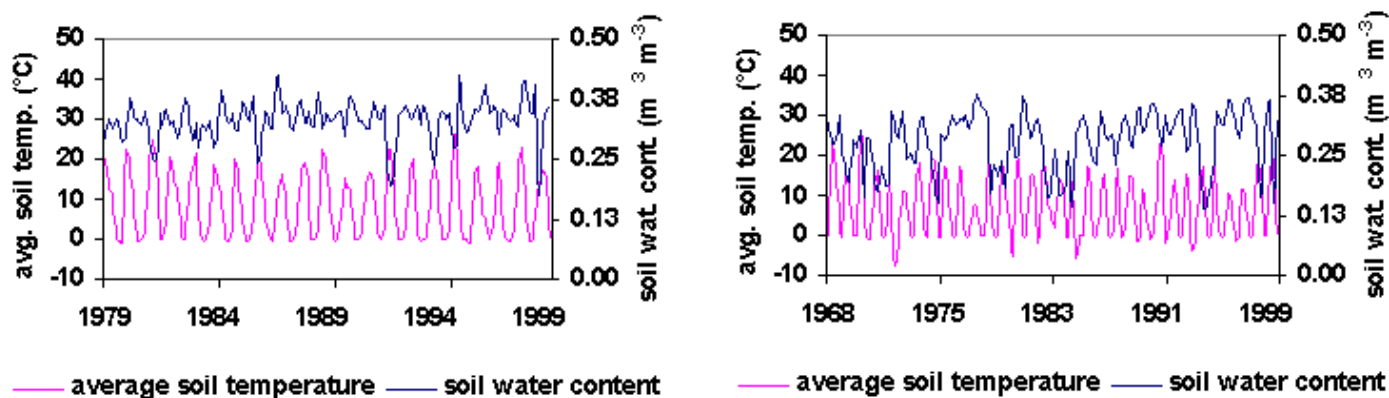
³ VIUA, Moscow, Russia

Introduction

The impacts on soil sustainability of the widespread cessation of inorganic fertilisation in Eastern Europe in the early 1990s have not been assessed. The LASSEE (Low-input Agriculture and Soil Sustainability in Eastern Europe) project attempts to quantify the first impacts. Long-term experiments are available in the former Soviet Union which were under constant high fertiliser inputs until the early 1990s, and have now (through financial constraints) converted to zero inputs. This reflects the changes that have occurred over much of Eastern Europe in the past few years. Other East European long-term experiments have continued with the same fertiliser inputs and can be used as controls. These data sets provide a unique opportunity to quantify the effects of reduced fertiliser inputs under East European conditions, with the help of soil/cropping systems models.

Methods

Field data. Long-term experiments were conducted at Smolensk, Russia (lat. 54.80 N; 31.88 E) from 1979 to 1999, and Grakov, Ukraine (lat. 49.57 N; long. 36.67 E) from 1968 to 1999, with the main objective of assessing soil organic matter (SOM) dynamics. Three fertilisation treatments were tested: control (no fertilisation), NPK (nitrogen-phosphorous-potassium fertilisation), FYM (organic fertilisation). SOM contents were determined in the top 0.2 m soil layer, measuring total carbon (modified Tyurin method). Differences between locations in soil water content and soil temperature are given in figure below (estimated).



Simulation models. The models CropSyst and SUNDIAL were used to simulate SOM changes across the years. CropSyst allows estimating both SOM turnover and crop growth. SUNDIAL uses measured yields.

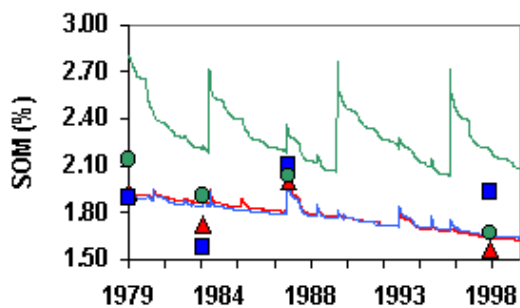
Objective

To conduct a preliminary evaluation of the ability of CropSyst and SUNDIAL to simulate long-term soil organic matter dynamics in Eastern Europe under different crop management.

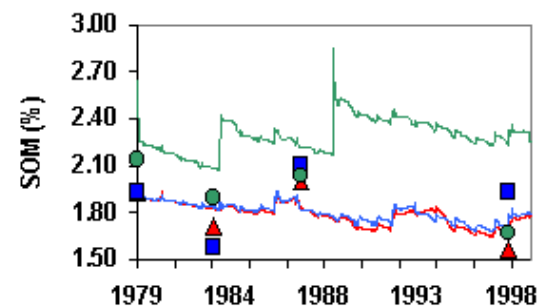
Results

The results of this study are reported in the graphs below, which refer to the soil layer 0-0.2 m. The SOM values at both locations showed a general trend over time towards a decrease. However, the resolution in the measured data at both sites does not allow a detailed evaluation. Peaks in the simulated FYM treatments occurred at manure supply. The evaluation of model output differences at both locations is still on going.

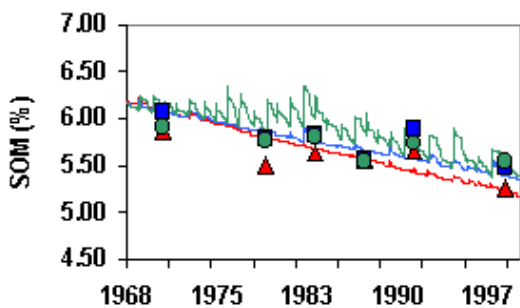
Smolensk: CropSyst_simulated and measured values



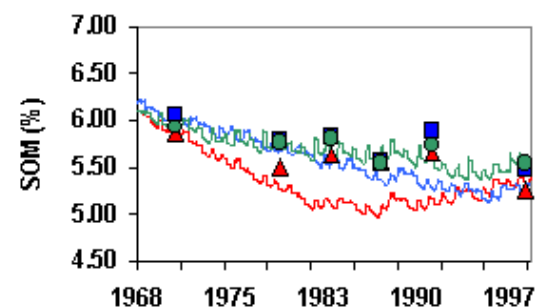
Smolensk: SUNDIAL_simulated and measured values



Grakov: CropSyst_simulated and measured values



Grakov: SUNDIAL_simulated and measured values



Conclusions

Both models simulated the negative trend of SOM, although the time resolution of experimental data did not allow a detailed evaluation of model performance.

Model simulations showed that selected management practices can mitigate the negative trend over time of SOM.

Investigations to other locations in Eastern Europe are on going.

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