



The C-simulator as a tool to investigate the potential of household waste compost to increase soil organic matter in Flanders

Mia Tits, Inge Hermans, Annemie Elsen, and Hilde Vandendriessche
Soil Service of Belgium, Heverlee, Belgium (info@bdb.be)

Soil organic matter (SOM) is an important parameter of the quality of arable land. At the global scale, agricultural soils are considered to be a major sink of carbon dioxide. Results of thousands of soil analyses carried out annually by the Soil Service of Belgium have shown that carbon stocks in Flemish agricultural land have dwindled in the past decades, and this in spite of the increased use of animal manure from intensive livestock holdings.

In the framework of the improvement of the SOM content and at the same time the idea of organic waste recycling (“cradle to cradle”-principle), a long-term field experiment with household waste compost (HWC) was set up in 1997 by the Soil Service of Belgium. In this trial different HWC application rates and timings were realized yearly, in order to investigate its nutritive value for arable crops, its effect on crop yield and its long-term effect on soil fertility, pH and soil organic matter content. Yearly data on crop rotation, crop development and yield as well as soil and HWC analyses were obtained for each trial treatment. Climatic data were obtained from nearby weather stations.

Also in the context of the SOM-problem, the Soil Service of Belgium and the University of Ghent have developed, at the request of the Flemish government, the C-simulator, a simple but efficient interactive tool to assist farmers with the carbon stock management on their arable land. By providing input on the current carbon status of a particular field, the crop rotation and the (organic) fertiliser plan, the program calculates the expected evolution of the soil organic carbon over a thirty year period. By consulting comparative lists of characteristics of different crops and organic manures the farmer can adjust his strategy for a more efficient organic matter management. The calculations of the C-simulator are based on the RothC model, which was calibrated for Flemish conditions through an extensive literature study. Specific data on the characteristics of plant residues of most common arable crops and organic fertilisers used in Flanders were obtained from the Soil Service of Belgium database and from literature. Based on a series of test runs, four initial RothC carbon pool distributions were developed for relevant soil-rotation combinations in Flanders.

The objective of our study was twofold: firstly, both the calibrated RothC-model and the C-simulator were validated using the data of the long-term HWC-trial. Secondly, the C-simulator was used to simulate future carbon evolution in the different HWC-trial treatments, in order to obtain a deeper insight in the built-up of soil carbon by the use of HWC.