

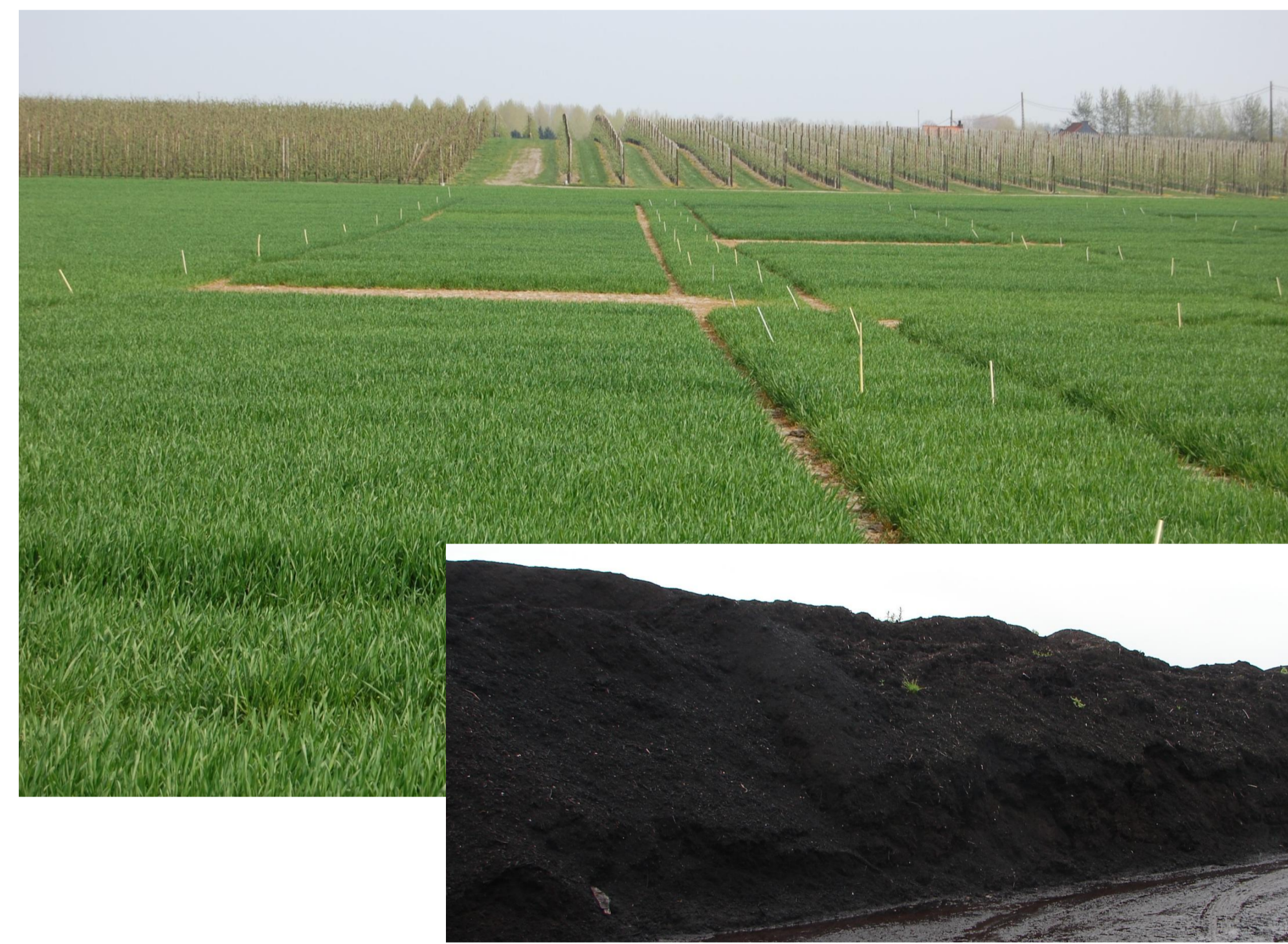


The C-simulator as a tool to investigate the potential of VFG compost to increase soil organic matter in Flanders

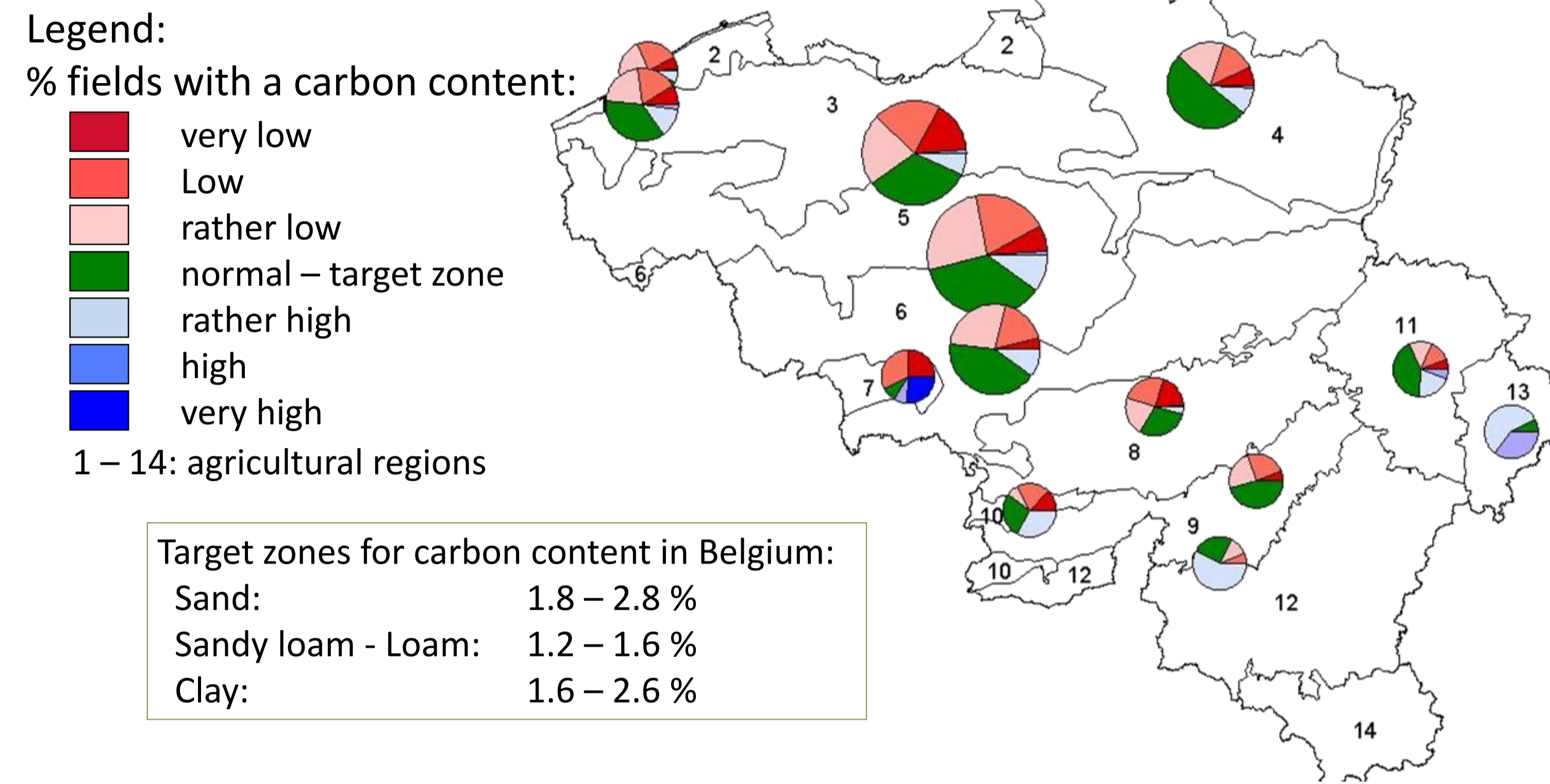
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1. Introduction

Soil organic matter (SOM) is an important parameter of the quality of arable land. Due to a dilution effect caused by an increased plowing depth, carbon contents in Belgian agricultural land have dwindled in the past decades, and this in spite of the increased use of animal manure from intensive livestock holdings. In order to restore the carbon stocks, soil organic matter content is one of the agro-ecological conditions to be fulfilled by the farmers in the framework of the Mid Term Review.



Carbon content in Belgian arable soils in 2004-2007
 Source: Soil Service of Belgium



2. Setup of the VFG-trial (Vegetable, Fruit and Garden waste compost)

Background:

- Improvement of the SOM content of the soil
- Organic waste recycling ("cradle to cradle"-principle)

Objectives:

- Investigate the nutritive value of VFG compost for arable crops
- Investigate the effects on crop yield
- Investigate the long-term effects on soil fertility, pH and SOM

Methods:

- Long-term field experiment, set up in 1997 by SSB, with the support of Provincie Vlaams-Brabant, Ecowerf and VLACO
- Different VFG rates and timings, applied each year

Observations and measurements:

- Crop rotation, development and yield
- Soil analyses
- VFG-analyses
- Climatic data from nearby weather station



PROVINCIE VLAAMS-BRABANT



3. Development of the C-simulator

Background:

Improvement of the SOM content of the soil

Objective:

Development of an interactive tool to assist farmers with the assessment and improvement of their agricultural practices with respect to carbon stock management on arable land.

Realization:

- Soil Service of Belgium
- University of Ghent, Department of Soil Management and Soil Care
- At the request of the Flemish government

Methods:

- Based on the Roth-C-model, calibrated for Flemish conditions
- Calibration with specific data on the characteristics of plant residues of most common arable crops and organic fertilizers used in Flanders (SSB-database + extensive literature study)
- Estimation of four initial Roth-C carbon pool distributions for relevant soil-rotation combinations in Flanders, based on test runs

Practical use of C-simulator:

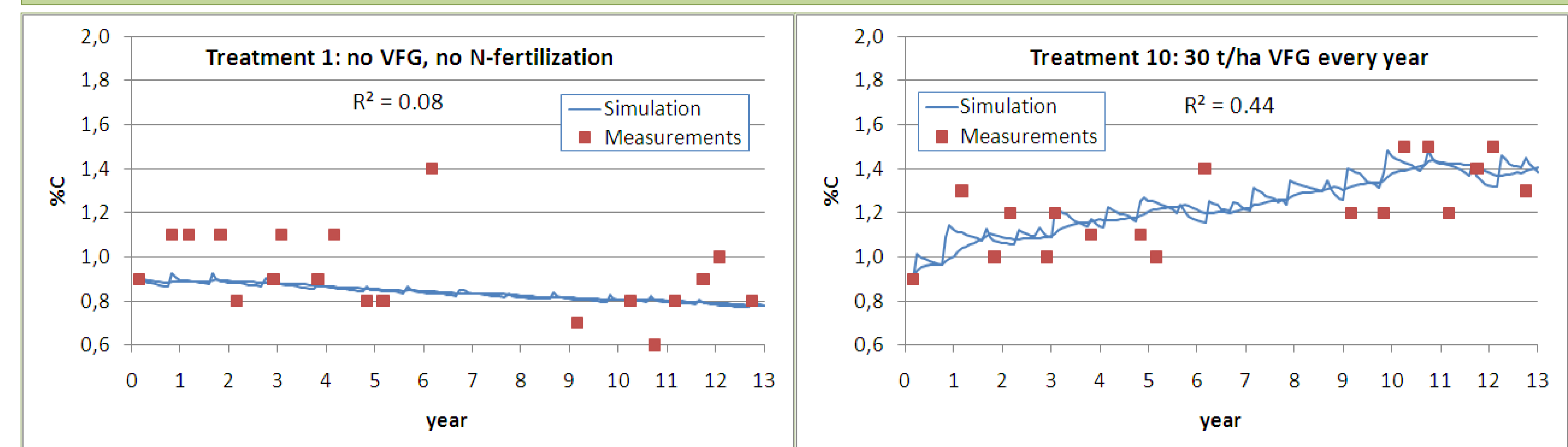
- Easy installation of the tool on a personal computer
- User input: current carbon status of the field, crop rotation, organic fertilizer plan
- Simulation output: expected evolution of the soil organic carbon over a thirty year period
- The user can adjust his strategy for a more efficient organic matter management by consulting comparative lists of characteristics of different crops and organic manures



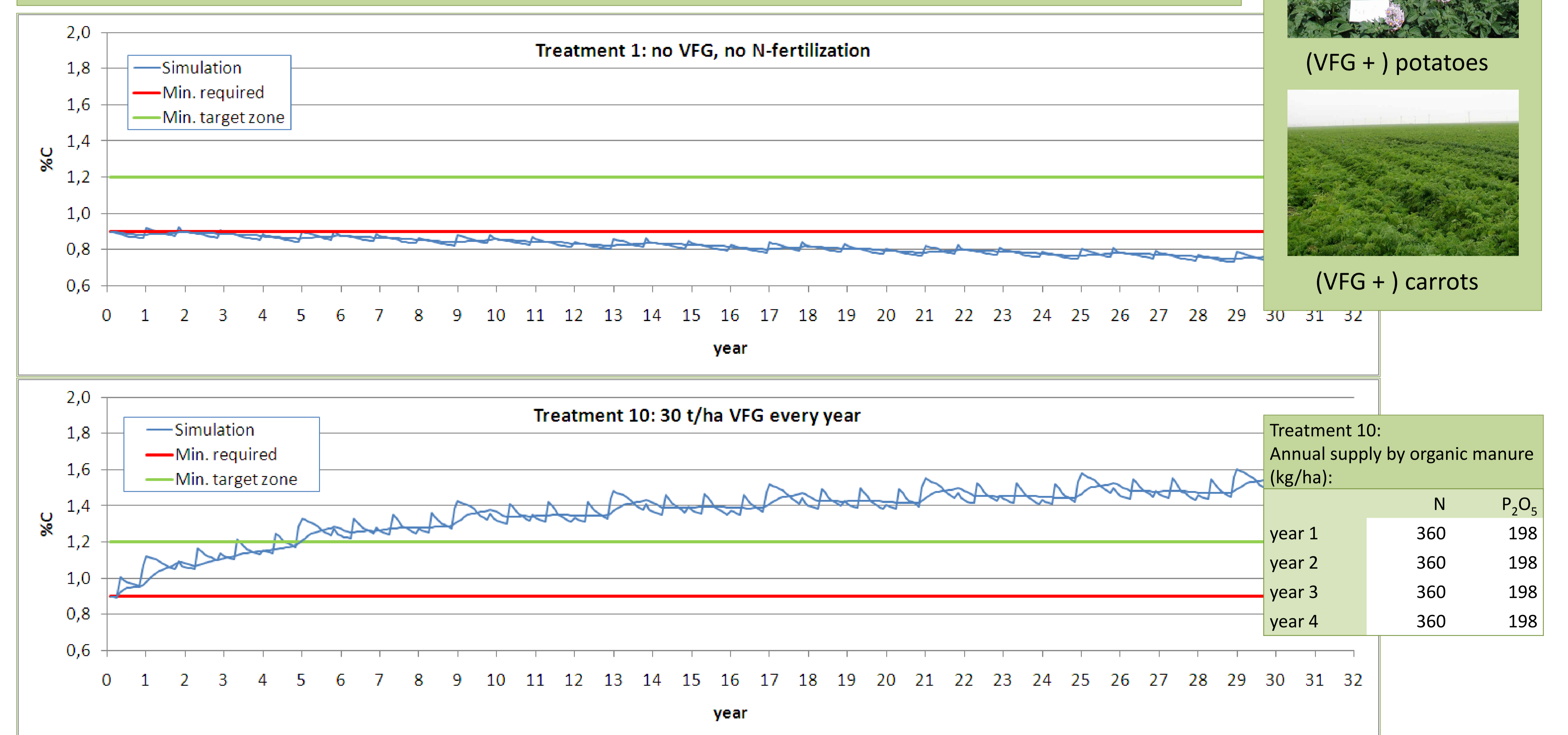
4. Objectives of the study

- Validation of both the calibrated RothC-model and the C-simulator using the data of the long-term VFG-trial
- Simulation of future carbon evolution in the different VFG-trial treatments, in order to obtain a deeper insight in the built-up of soil carbon by the use of VFG

Validation of the Roth-C model with field trial data:



Output of the C-simulator program:



Rotation:



(VFG +) sugar beets



(VFG +) winter wheat



(VFG +) potatoes



(VFG +) carrots

5. Conclusions

- The model fit of Roth-C and C-simulator is good for the treatments with higher VFG quantities applied. In general, the more VFG is applied, the better the model fit becomes. For the treatments with no or lower quantities of VFG, the evolution of the soil C-content is smaller (flatter curves) and the noise on the C-measurements results becomes relatively more important, resulting in a lower predicting power of the simulation model.
- The frequent use of VFG can significantly contribute to the build-up of soil organic matter. However, in practice, the use of VFG-compost in Flemish agricultural land is limited by the annual supply of N and P₂O₅ (restrictions of the Flemish legislation in execution of the Nitrate Directive!).