

Simulation of root growth with mechanistic crop models to improve a better prediction of nitrogen use efficiency in organic vegetable production

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Background

Growing vegetable crops organically can have some problematic implications. First of all the control of many growing conditions is considerably more difficult here than for conventional production. Secondly there are some special demands for the quality before the vegetables are saleable compared to ordinary grain-growing. One of the most important conditions for growth is control for the nitrogen (N) supply. However, the organic growers are not allowed to supply with inorganic N, which makes the synchronizing of N supply with crop demand more difficult. Instead the growers may use farmyard manure, N fixing crops or green manure, or other organic matter, to control the N supply.

Objective

The project will be focused on a theoretical discussion of experimental data for root growth and root length density, which has been done, or is in progress at the participated research departments. Beyond this a literary research has to be done. The data will be collected and handled out in a database. The data will be used for parametrisation, calibration, and validation of root parameters for crop modules in the Soil Plant Atmosphere model Daisy and the Plant and Soil model N-able. When crop modules are adept, they will be worked out scenario analyses, where N dynamics will be tested with different compositions of crop rotations and soil- and climate conditions.

Progress – 2003

Are working on preparation of the final PhD project description and expect to have the final project description in the end of this year. Have started to compile a database for experiments, which have data for root growth, worked out at DIAS Aarslev. After this, I will setup a list for important parameters for simulating root growth by the models N-able and Daisy and use the database to select the best possible solutions for the selected parameters. Have started to compile a description for a simple decision support system. The system will be simulated by the Daisy model and simulation results will be available in a database. The database is going to help growers to decide which kind of catch crop – if any – he should select.

Start participation in weekly tutorials and Seminars for the Ph.D. Courses in Advances in Plant Nutrition, Module A. Department of Agricultural Sciences, The Royal Veterinary and Agricultural University.

Plans - 2004

Ph. D. Courses:

Finish Ph.D. Courses in Agrohydrology and Bioclimatology, Module A. Agrohydrology. Soil Physics and Root Zone Processes. Department of Agricultural Sciences. The Royal Veterinary and Agricultural University.

Finish participation in weekly tutorials and Seminars for the Ph.D. Courses in Advances in Plant Nutrition, Module A. Department of Agricultural Sciences, The Royal Veterinary and Agricultural University

Participation in a summer school, (SwOFF). "Agroecology with emphasis on horticultural cropping systems"
work:

Finish work with the database for experiments, which content data for root growth. Setup a list off important parameters for simulating root growth. Test and validate new parameters in simulation models.