

Short description of the Fertilecrop project

Fertilecrop - How to build additional soil fertility in organic cropping systems - www.fertilecrop.net

Project summary

The project FertileCrop will address sustainable crop management techniques that will make efficient use of the interface to other plants, to the structured and stratified soil matrix, to beneficial microorganisms, and to the carbon and nitrogen cycle. The project targets organic farmers and will work in close collaboration with them in developing tools and decision support systems tailored to their needs. Participants of the project come from 12 European countries from research fields of agronomy, biology, crop sciences, soil sciences, microbiology, modelling and social sciences and experience in direct exchange with farmers and their organisations. The project builds on the network and findings of the previous TILMAN-ORG project, in which half of the project partners were participating. The previous project built on numerous field trials and farm networks on reduced tillage and green manures, which will be used again in FertileCrop, enriched with field studies from new partners. The focus of FertileCrop are farming systems using reduced soil tillage, cover crops, adapted crop rotations, and mixed cropping as well as orchards.

Thematic work packages will

- address the competition weeds in crop stands,
- look at the physical properties of stratified soils that accumulate organic matter in top soil layers but often show compaction in the deeper horizons,
- address the distribution of soil organisms along the soil profile and their influence on soil functions,
- provide a review on the knowledge about nutrient losses to the aquatic environment and the atmosphere, and
- model the reduction of emissions and soil carbon sequestration.

FertileCrop will develop tools with and for farmers to recognise good soil fertility and will develop in an iterative way decision support systems to optimise management strategies. The results will directly find their way into farming practice as farmers will be included in the project.

Aim, objectives and hypotheses

Aim and objectives

The overall aim of FertileCrop is to develop efficient and sustainable management techniques aimed at increasing crop productivity in organic farming systems.

To achieve this, the mutual interactions of crop plants with weeds and co-cultivated plants, with soil macro- and micro-organisms in their physically and chemically determined environment influencing C and N pools and fluxes as well as greenhouse gas (GHG) emissions will be studied. Top soil layers with increased fertility supporting crop growth may result from reduced soil tillage, increased inputs of organic matter, green manures, and animal manures, and often they are found in orchards and vineyards that are tilled only superficially.

Twenty field experiments along a South West to North East transect across Europe on fertility inputs such as green manure (10) and animal manure (7), on soil tillage (7) and crop rotations (7), and on whole farming systems (5) provide historical data on crop and soil performance built into a database.

These will be related to new data from case studies on weed dynamics, macro-organisms and their influence on soil structure, the community and function of soil microorganisms, and the dynamics of C and N pools and fluxes. Historical and new data from work packages 2-5 will be used to calibrate C and N models and to feed on-farm prototyping exercises and to assist with management decisions and strategic fertility planning in cooperation with farmers. All work packages will produce inputs by developing simple science based tools for practical applications

The specific objectives of FertilCrop are:

- To investigate the interaction of weeds, green manures, and crops in time and space;
- To evaluate the modulating role of soil structure and porosity in stratified soil layers on crop and root growth, nutrient uptake and losses as well as aeration;
- To identify, analyse and improve the understanding of plant-microbe interactions in stratified soils;
- To quantify and review changes in C- and N-stocks and the dynamics of fluxes;
- To calibrate existing models on C- and N-dynamics and crop growth for fertility building practices;
- To parameterise a strategic planning model for crop rotations with respect to fertility management;
- To develop and test with farmers tools and approaches to aid recognition of soil fertility.

Hypotheses

Interactions of crops with weeds, soil organisms and green manures in organic conservation agriculture systems will improve soil structure and nutrient use efficiency, reduce losses, and stabilise crop yields.

- Soils with more stratified organic matter, porosity, and biological activity, such as those under reduced soil tillage, provide fertile topsoil layers that are more favourable to crop growth than ploughed soils.
- Models simulating cropping system effects on the soil C- and N-cycle help improving farm level

decisions and soil fertility planning, if co-developed by researchers, advisors and farmers.

- Participatory prototyping of organic farming systems permits farmers to learn about research innovations and researchers to reflect on the adaptability of their scientific findings to real farm conditions.

Expected results and their impact/application

Combining improved management practices as recommended by decision support tools and models to assess soil quality and predict carbon and nitrogen fluxes, will help farmers to overcome the barriers in adopting organic farming. FertilCrop will help to increase and stabilise yields in an environmentally friendly way and close yield gaps between organic and conventional farming. It will provide strategies to improve soil fertility, while protecting the environment. The results of FertilCrop will provide the scientific basis for improved crop production by careful use of high energy inputs and relying on biological processes governing the ecological services of soils. Reduced tillage, green manures, adapted crop rotations, and mixed cropping will contribute to this. FertilCrop will implement the European Soil Thematic Strategy aimed at preventing soil degradation, preserving soil functions and remediating degraded soil. The project will promote the development of the organic sector in Europe in a more productive and environmentally friendly way as a result of knowledge gains in the domain of crop-soil interactions.

Coordinator, partners and countries involved

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More information

For a detailed description of project partners see <http://www.fertilcrop.net/fc-partners.html>

The publications of the FertilCrop project are archived at <http://orgprints.org/view/projects/FertilCrop.html>.

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