

NEMORAL

RESPONSIBLE PARTNER

EULS, (Estonia)

COORDINATION



Merrit Shanskiy

PhD in field crop husbandry, associated professor of soil science at Estonian University of Life Sciences, Chair of Soil Science. Main fields of research are related to soil science and soil biodiversity, plants-soil interactions. EULS researcher-in-charge in the SoildiverAgro project, WP2 leader and involved in several WPs.

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Objective

The agriculture is important and traditional economic activity in Estonia. The sector has long traditions as food and job provider and it is continuously important to Nemoral region. The grain and rape cultivation are the main agricultural crops at local scale. For cultivation, the input by mineral- and organic fertilizers is needed in combination with right soil tillage system. Nowadays, the problem has risen due to the high use of pesticides and monocultures are increasing pest/disease spreading. That is causing the wider use of agrochemicals and different products usage on fields for yield protection, which consequently have impact on soil biology and soil organisms. Soil biological properties are found to be more sensitive toward changes compared to physical and chemical properties, which can be used as an early indication of changes in soil quality and the sustainability of agricultural management practices. Soil is one of the most species-rich, yet one of the most poorly researched habitats of our planet. However, soil organisms have been “out of sight, out of mind” for too long. Several properties or functions of soil fauna can be used to indicate soil quality: the presence of specific organisms and their populations or community analysis (functional groups and biodiversity) and biological processes such as soil structure modification and decomposition rates.

On recent years the weather conditions are very changing, there is rarely two similar years by precipitations and temperatures, which is causing an extra losses in yield, that could be alleviated by the right choice of cultivated crop and agrotechnology. The intensive soil management are replaced nowadays very often by soil sustainable management technologies as minimized tillage or direct sowing. But even with soil sustainable management applications there is still need for pesticide use. Furthermore, no-tillage systems often depend more on the usage of pesticides for plant protection compared to conventional or minimum tillage, which might result in higher number and different combinations of pesticide residues in the soil. However, the combined effects of residue mixtures on soil organisms and the processes they alleviate are unknown. The effect of pesticide residues on non-target soil organisms is not well established due to the diversity of the products and variety of breakdown pathways.

Our case studies are designed to solve the questions about pesticides accumulation rate in the litter layer of no-till cereal fields and on management impact to soil biodiversity with the goal to improve pesticide application and soil biodiversity. Pesticide accumulation in the mulch layer might inhibit their biological degradation, thus could potentially increase their persistence in the soil environment. To reduce the pesticide usage one possibility is to monitor plant health and detect plant diseases before their wider spreading. To solve this problem the control of phytopathogenic fungi by studying the spreading of spores by air in order to improve the pest monitoring and control system.

These are the main challenges for Nemoral agriculture, the results of current project will contribute to the better understanding of soil-plant management systems while transferred to different parties; farmers, producers, policy-makers and land owners. Soil is a living and dynamic entity that requires a unique balance between its physical, chemical and biological components in order to remain productive.

Stakeholders consultations



DISCUSSION GROUP

📅 03.07.2020 | Rapla county, Estonia

Discussion about field crops performance, soil biodiversity, soil fertility, soil biodiversity management, [project introduction](#)

19 PARTICIPANTS: Farmers, researchers, agribusiness



REGIONAL MEETING

📅 30.10.2020 | Tartu, Estonia

[Solutions for the cultivation of grains](#), [case study 12 content-pesticides](#) residues in soil, impact to soil biodiversity, phytopathogenic fungi, management of soil biodiversity, searching to find the relationship between soil biological groups, crop production and quality

26 PARTICIPANTS: Farmers, researchers



OTHERS

📅 11.03.2020 | Tartu, Estonia

Poster and paper about [earthworms abundance](#), [soil quality](#) on projects selected farms

152 PARTICIPANTS: Farmers, researchers, policymakers agribusiness



TRAINING DAYS

Planned to forthcoming 2022 season



FIELD DAYS

📅 3.7.2020 | Rapla county, Estonia

Organic grain cultivation and related problems solutions. SoilDiverAgro project was introduced to the participants. Active discussion related to crop rotation, soil biology, earthworms was conducted. Overview and final decisions to the questionnaires in Nemoral region.

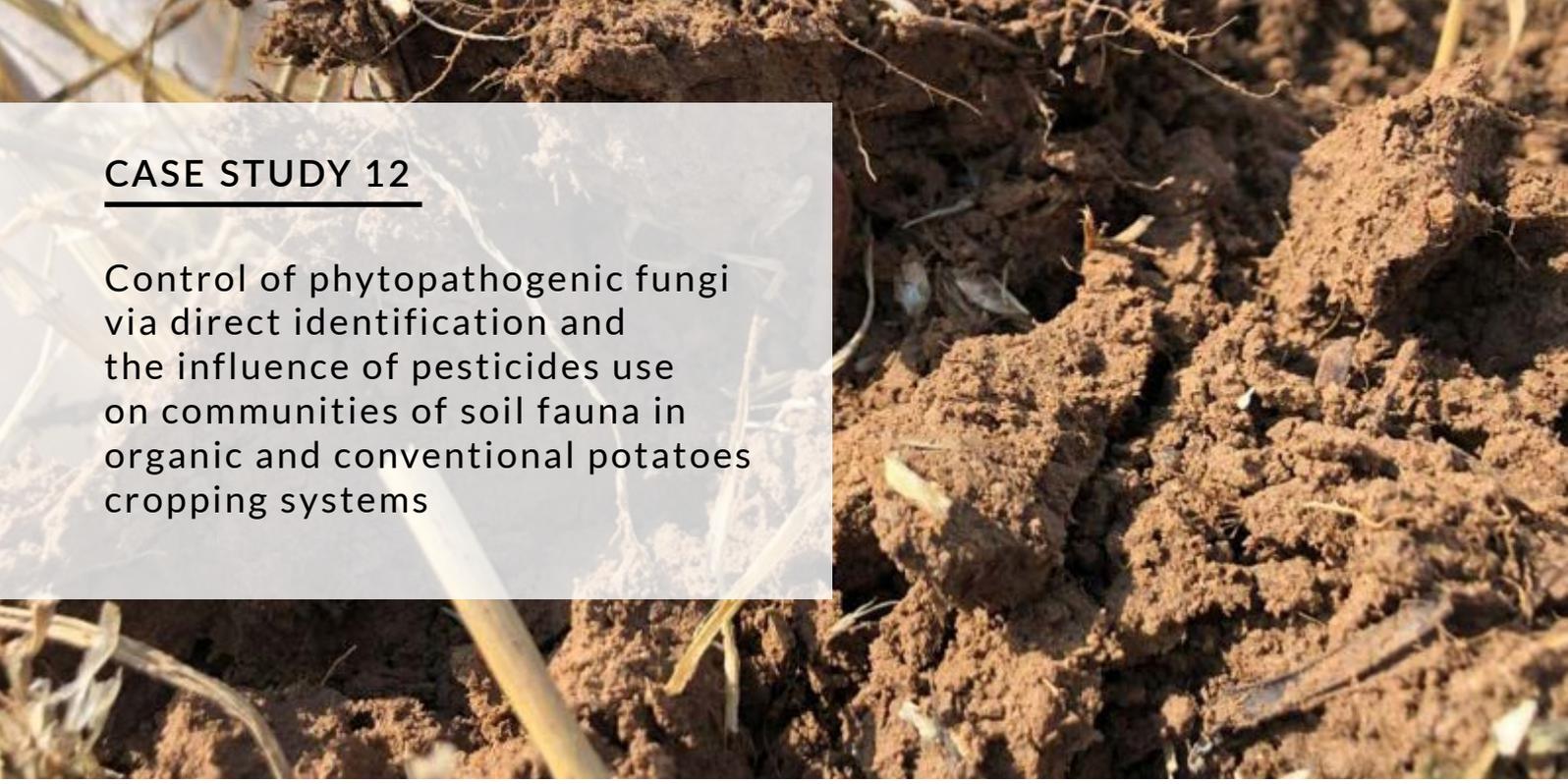
17 PARTICIPANTS: Farmers



NEXT STEPS

More information will be shared with local project partners and project community



A close-up photograph of soil and plant roots. The soil is dark brown and appears moist, with several thin, light-colored roots extending through it. The background is slightly blurred, showing more soil and some plant matter.

CASE STUDY 12

Control of phytopathogenic fungi via direct identification and the influence of pesticides use on communities of soil fauna in organic and conventional potatoes cropping systems

OBJECTIVE

The objective of this case study is (i) to study the role of airborne inoculum on disease development in relation to climatic conditions (ii) to find out pesticides accumulation rate for no-till fields and impact to soil fauna.

PROPOSED PRACTICES

It is aimed through monitoring system to set up more precise management practices for targeted pesticide application and promote in wider sense the soil fauna in conventional and organic farming. The management practices to be tested in cooperation with farmers including changes in soil management and pesticide application. Burkard 7-day recording volumetric sampler have been used to collect the air-borne fungi present in the air.

STATE OF THE ART

In order to deal with the problem of fungal pest occurrence the higher input of pesticides are used (conventional farming, no-till farming) and high tillage intensity (conventional and organic farming), which reduces functional soil biodiversity. Farmers are advised to follow the crop rotation with cover crops and grains. Following potato, cover crops are sown then cultivated grains are contaminated with mycotoxins. In no-till farming system the soil is covered with a litter layer, that is accumulation point for pesticides from where those are released into soil. For economic reasons, the rotation sequence is 2-3 years. In the long-term, soil conditions are threatened and soil biodiversity lost.

PROGRESS WITH THE CASE STUDY IN RELATION WITH THE STATE OF THE ART

Providing evidence that targeted disease management with reduced input of pesticides should rely on monitoring the phytopathogenic fungi present in the air. The case study also illustrates pesticides behavior on direct sowing fields through the debris layer and influence to the soil fauna and soil quality.

PROBLEM TO SOLVE

The measures of current study will help to reduce the external input, through sustainable agricultural management and substantial improvement of soil fauna services for fungal plant pest control. In the results, agroecosystems are more resilient and managed with less monetary costs; while with higher soil biodiversity the yield reductions are avoided and healthier crops are obtained. For targeted IPM implementation the causal agents of the airborne phytopathogenic fungi must be identified fast and accurately. Many phytopathogenic fungi spread long distances through wind dispersal of spores and cause outbreaks far from the source location and also remain viable for several growing seasons.



CROPS



LOCATION

Lääne-Viru County / Põlva County
/ Pärnu County / Saare County /
Viljandi County (Estonia)

PARTNERS

EULS

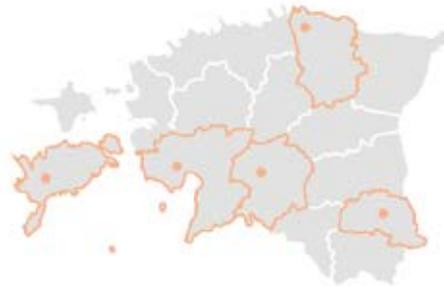
NGO Soil Innovation Cluster

MTÜ Põllukultuuride klaster

CROPPING SYSTEMS

Crop rotation and crop
diversification

MONITORING



WINTER
WHEAT



POTATO

PESTICIDES ACCUMULATION RATE

Non-inversion tillage



Inverting tillage



Control

MANIPULATING
WITH PESTICIDE
CONCENTRATIONS

Airborne spore
sampling



IMPACT OF PESTICIDES ACCUMULATION ON SOIL ORGANISMS

FIELD EXPERIMENT



Soil earthworms



Soil microorganisms



Soil nematodes



Soil quality

IMPACT OF PESTICIDES ACCUMULATION ON CROP YIELD AND QUALITY



Crop yield and quality

→ Infographic for case study 1.2A made by EULS

