ATLANTIC CENTRAL

RESPONSIBLE PARTNER

EV-ILVO, (Belgium)

COORDINATION

Lieven Waeyenberge

Senior researcher at ILVO, with expertise in molecular diagnostics of plant-parasitic and entomopathogenic nematodes. In this regard, he cooperated with several international research groups to aid in resolving diagnostic problems. Since a couple of years, his focus shifted towards amplicon-sequencing (a Next Generation Sequencing technique) to characterize soil nematode communities. Nematode communities are considered as capable bio-indicators of ecosystem health.

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Objective

A questionnaire and regional discussion group meetings with stakeholders and end-users revealed and prioritised the main threats affecting the agro-ecosystems of the Atlantic Central region and the qualitative assessment of their severity. Use of chemical fertilizers and liquid manure or slurry still cause a too large leakage of nitrate and phosphate in surface water and groundwater, intensive management regimes cause a deficit of soil organic matter, and a general drop of 'soil health', recognized by degraded biological and structural conditions, causes additional problems like soil erosion and water shortage.

Field experiments have been established to test different management practices for wheat, potatoes and vegetables in order to address the above mentioned agricultural threats. Especially attention is paid to soil fertility, organic matter content and biodiversity in each case-study in a different way: case-study 6 will investigate the combined effect of with and without 'brown' material co-composted farm yard manure and a differential management of the cover crops (incorporation or mowing), case-study 7 will focus on the effect of cover crop mixtures which will diversify further the cropping system (from simple till 12 species mixtures), case-study 8 will compare different agricultural systems (intensive versus extensive, conventional versus organic), and case-study 9 will investigate the use of different organic fertilization sources like farm yard manure, compost and silage (fermented) grass-clover.

The obtained data of the case-studies will contribute to the analysis of the environmental and economic impact on a farm and regional level. This will finally result in the proper selection of the most promising crop diversification methods (including cover crops), organic fertilizers, and farming systems to enhance the functionality of soil macro- and microorganisms, responsible for enhancing soil health, crop productivity and other ecosystem services.

Stakeholders consultations

DISCUSSION GROUP

19.05.2020 | Merelbeke, Belgium (Online)

Conclusions of the extensification of vegetable production survey presentation: What are the main problems and best fitting solutions for vegetable cropping in Flanders?

14 PARTICIPANTS: Farmers, researchers, agribusiness, policymakers, industry advisors.

30.06.2020 | Merelbeke, Belgium (Online)

General conclusions of the potato production survey were presented: What are the main problems and best fitting solutions in Flanders?

15 PARTICIPANTS: Farmers, researchers, agribusiness, policymakers, industry advisors.

REGIONAL MEETING

08-09 of 2020 & 02 of 2021 | ILVO, PSKW, Inagro, Pomona, Belgium. (Online and 'in person')

Finalising the details concerning the organisation, maintenance and study-objects of the case-studies in Flanders.

15 PARTICIPANTS: Belgian regional partners, researchers and experts in mechanisation, fertilization, plant quality assessment, lab technicians, field workers, advisors .

FIELD DAYS

12.08.2020 | Antwerpen, Belgium

Trial visit on their organic leek trial field.

7 PARTICIPANTS: Farmers and distribution sector.

29.09.2021 | Rumbeke-Beitem, Belgium

'Bioveldag' including visit of the SdA field trial.

71 PARTICIPANTS: Researchers, agro-technicians, advisors, farmers (conventional and organic), teachers, organic sector, policy makers and the industry

TRAINING DAYS

To be confirmed

OTHERS

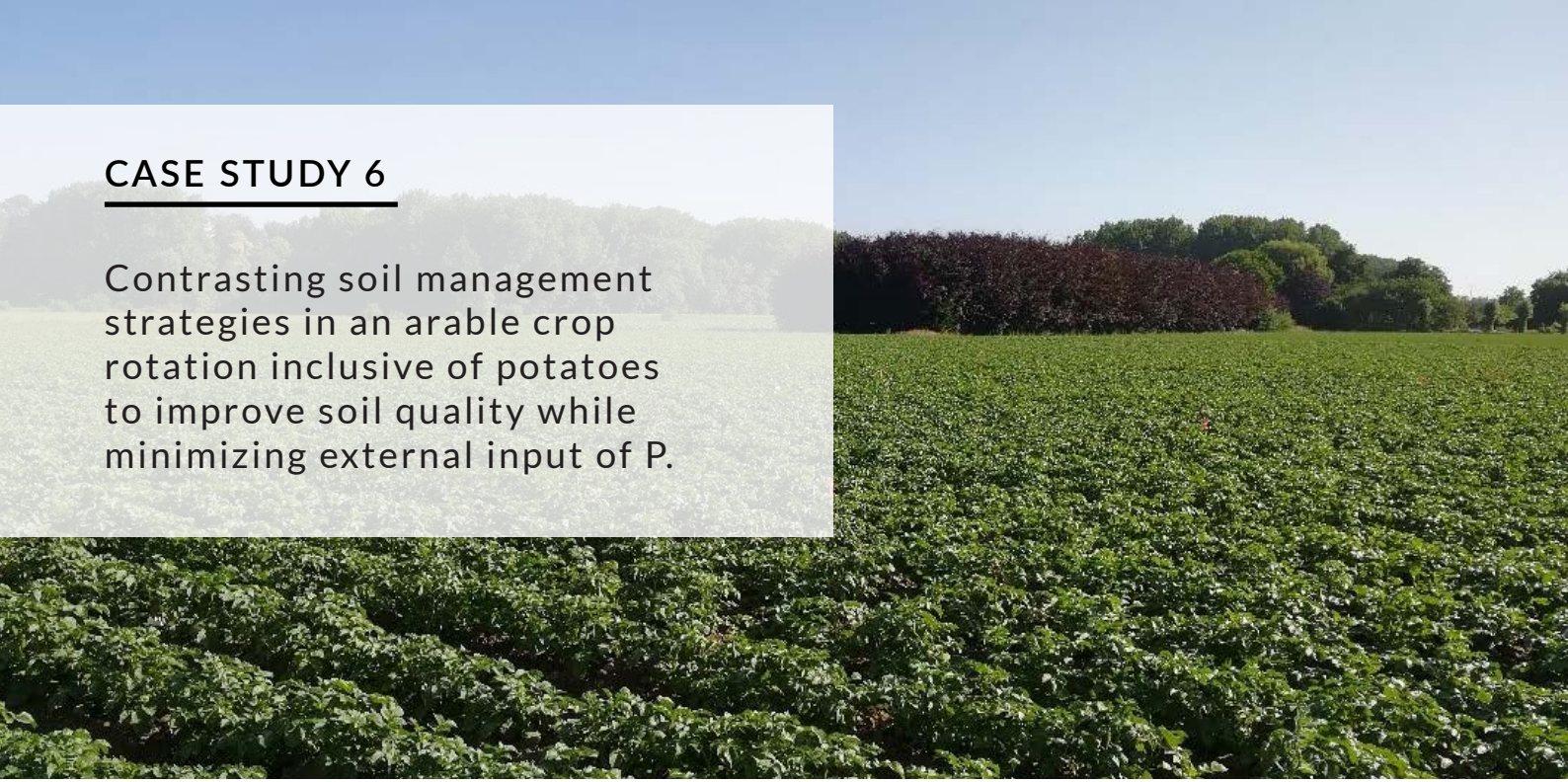
23.06.2021 | Online

Mini-symposium 'organic research' about results of projects (including SdA) dealing with organic farming

70 PARTICIPANTS: Researchers, advisors, farmers, farmer organisations and policy makers

NEXT STEPS

A minimum of 2 field days/regional meetings per year will be organised to inform and consult stakeholders and everybody interested.



CASE STUDY 6

Contrasting soil management strategies in an arable crop rotation inclusive of potatoes to improve soil quality while minimizing external input of P.

OBJECTIVE

The objective is to explore to what extent innovative strategies, contributing to soil quality and N supplying capacity, might reduce P surpluses compared to the usual soil management.

PROPOSED PRACTICES

N:P and C:P ratios of farm yard manure (FYM) will be modified by co-composting FYM with 'brown' material (e.g., grass clippings from nature reserves). The effect of co-composted FYM, compared to stockpiled FYM, on crop performance and soil quality will be assessed in a multiyear field trial with repetitive application of both fertilization products. A blank treatment with no base fertilization is included as well. In the same trial, two different management variants will be applied for cover crop mixtures grown in between the main crops in the rotation. The cover crop mixtures will be either used as green manure or harvested as a fodder crop. Differences in treatments regarding both factors will result in differences with regard to C and N input, and therefore possibly in differences with regard to main crop performance and soil quality.

STATE OF THE ART

An increasing amount of easily available P, as a result of a high soil P status (most of the Flemish agricultural and horticultural land) seems to counteract microbial activity in the rhizosphere. In particular, organic growers rely on this microbial activity in the rhizosphere as a plant feeding mechanism. Therefore, soil management strategies should aim at preventing P surpluses by reducing external input of organic matter.

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

This case study will illustrate best practices for soil fertility building while minimizing P input or balancing P input by fertilization products with P export by harvested plant parts.

PROBLEM TO SOLVE

Soil management strategies for organic cropping systems will be developed aiming at the sustainment of soil quality on one hand and at a balanced P supply on the other hand.

CROPS

LOCATION

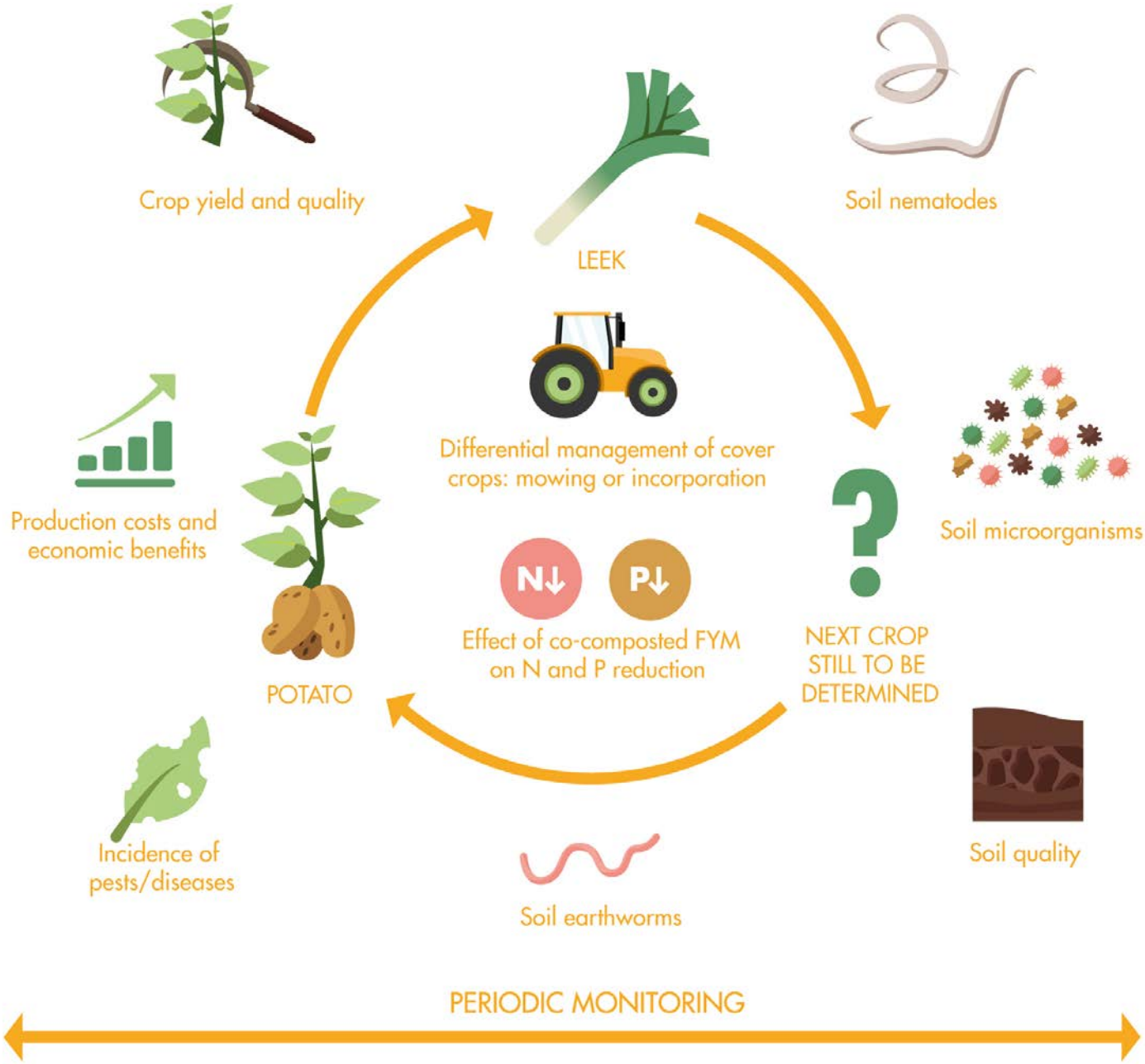
Melle, East-Flanders (Belgium)

PARTNERS

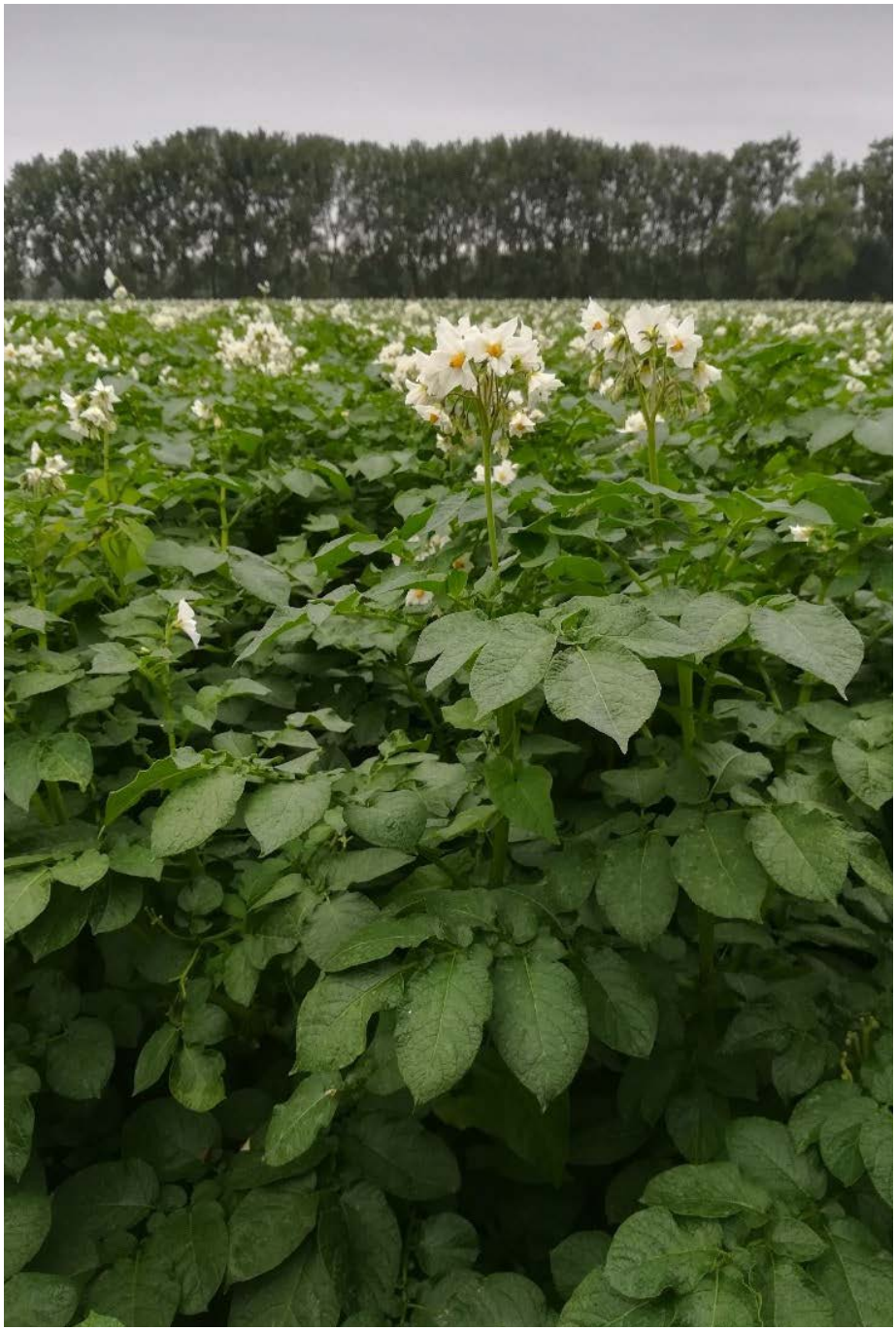
ILVO

CROPPING SYSTEMS

Application of co-composted farm yard manure and use of cover crops.


Crop yield and quality
LEEK
Soil nematodes
Differential management of cover crops: mowing or incorporation
Production costs and economic benefits
Soil microorganisms
N↓
P↓
Effect of co-composted FYM on N and P reduction
POTATO
NEXT CROP STILL TO BE DETERMINED
Incidence of pests/diseases
Soil quality
Soil earthworms
PERIODIC MONITORING

→ *Infographic for case study 6 made by ILVO*



CASE STUDY 7

Cover crop mixtures: a promotor of soil biodiversity in potato crops?

OBJECTIVE

The objective is to test the potential beneficial impact of different cover crop mixtures in organic agriculture on soil biological diversity in function of the cultivation of potatoes. Whether more species-diverse mixtures can combine more soil benefiting functions like catching nutrients (nitrogen) is also investigated. By including leguminous species, the function of delivering nitrogen to the following main crops is tested. From these trails, farmers will be able to improve the design of their cover crop mixtures.

PROPOSED PRACTICES

Four different cover crop mixtures will be compared for their impact on soil biodiversity, N mineralization and main crop yield. The same mixtures will be sown in the same place for three years. BAU, the business as usual, is a mixture of phacelia and black oat. Secondly, a mixture of phacelia and Egyptian clover is tested. The two other mixtures are species-diverse: a five species mixture containing phacelia, black oat, Egyptian clover, fodder radish and vetch and a 12-species mixture that combines all the previously mentioned species with the addition of species such as pea, lupine and flax.

STATE OF THE ART

Advisors often recommend organic farmers to use species diverse cover crop mixtures to stimulate the soil diversity. However, little is known about the actual impact of the use of such cover crop mixtures on the soil diversity, nor in the short or longer term.

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

Increased understanding of the impact of different cover crop mixtures on soil biology and related ecosystem services together with increased knowledge to improve the design of cover crop mixtures.

PROBLEM TO SOLVE

Organic farmers heavily rely on an active and diverse soil biology to make their system work. The soil biology needs to be able to digest diverse types of organic material to provide sufficient and timely nutrients for the crops. Moreover, soil microorganisms also need to control soilborne diseases ('suppressiveness of the soil'). The use of species diverse cover crop mixtures could contribute to improve the soil biology.

CROPS

LOCATION

Rumbeke-Beitem (Belgium)

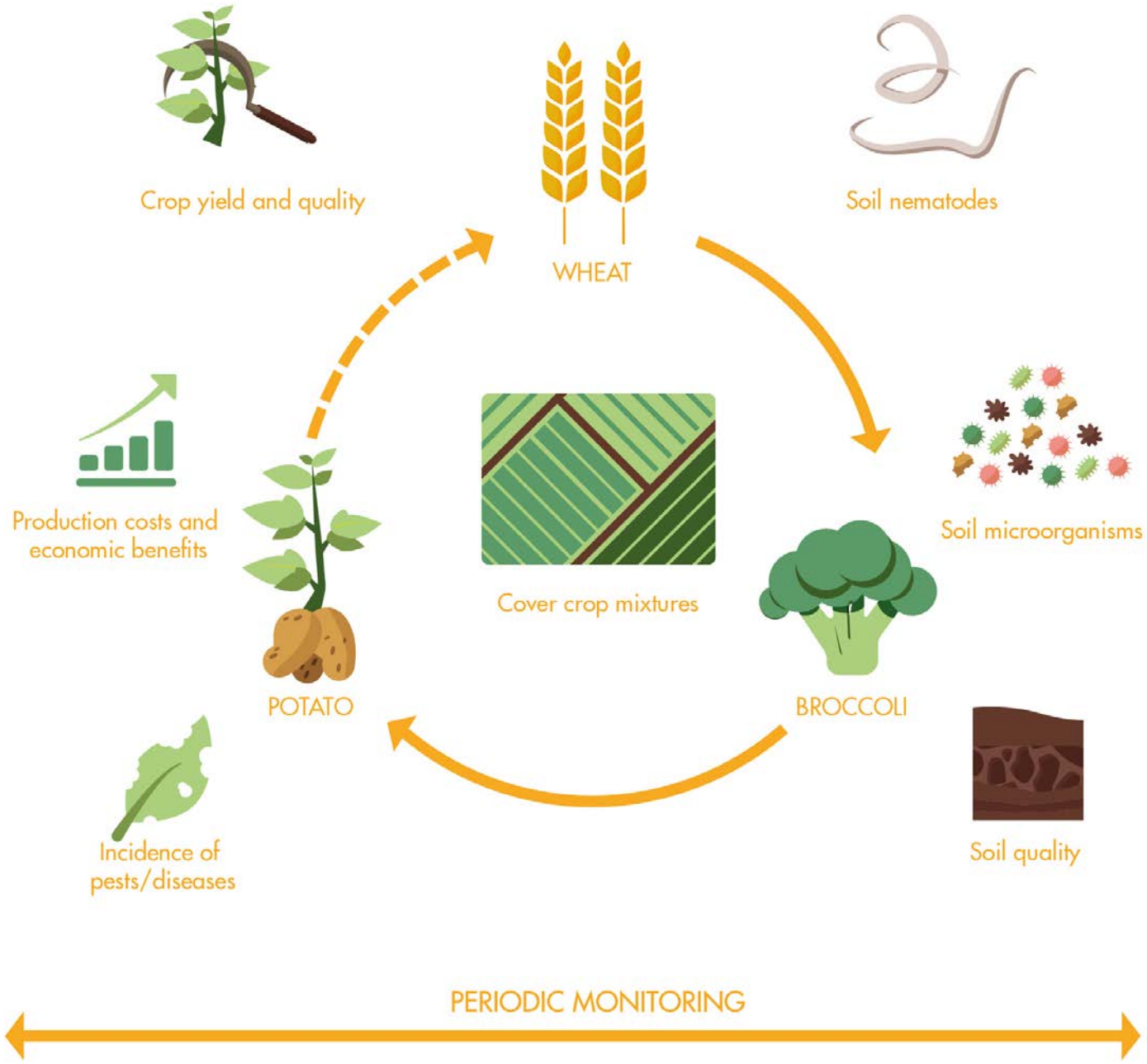
PARTNERS

INAGRO

ILVO

CROPPING SYSTEMS

Use of cover crop mixtures.


Crop yield and quality
WHEAT
Soil nematodes
Production costs and economic benefits
Cover crop mixtures
Soil microorganisms
POTATO
BROCCOLI
Incidence of pests/diseases
Soil quality
PERIODIC MONITORING

→ *Infographic for case study 7 made by INAGRO*

CASE STUDY 8

Extensification of conventional and organic vegetable farming.

OBJECTIVE

The objective is to test the positive effect of extensive farming on the soil compared to intensive farming, in conventional and organic vegetable cropping. What is the effect on the fertility of the soil and on soil pathogens when reversing to another farming system.

PROPOSED PRACTICES

We will work on a conventional field and an organic field. Each field will be divided in two halves. On one half, we will continue with an intensive cultivation as a reference. On the other half, we will switch to a more extensive system to study the benefits of it. Reduced tillage, use of compost and green manure will be studied in a system approach.

STATE OF THE ART

In Belgium around 45% of the area of vegetable production outdoors are used for intensive farming. The rest is cultivated in crop rotation with arable crops (extensive farming). The growers are mainly focused on the yield of their crops, sometimes at the expense of the soil quality.

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

With these studies we hope to demonstrate the long-term positive effects of extensive and organic farming compared to intensive farming. Growers need to be convinced of the positive effects this type of farming can have on their soil and their crops, even when they don't see immediate results in for example the yield. The goal is to persuade them that investing in a healthy soil will eventually result in a better crop.

PROBLEM TO SOLVE

The intensive vegetable production in Belgium with intensive tillage, limited crop rotation and unilateral fertilization has a negative effect on soil quality. This could also lead to a favourable environment for pests and diseases and result in a lower yield and quality of the crop.

CROPS

LOCATION

Sint-Katelijne-Waver (Belgium)

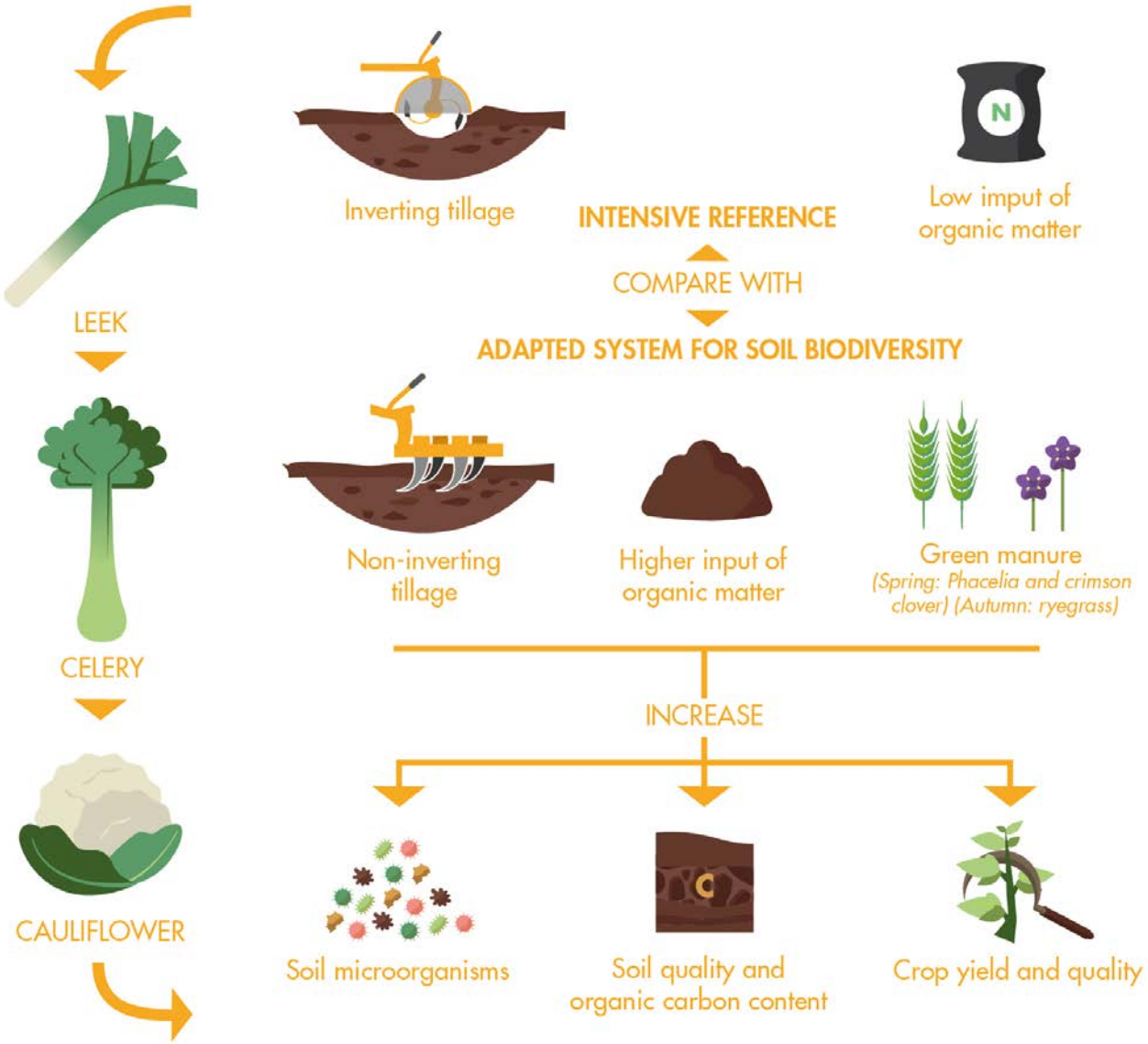
PARTNERS

PSKW

ILVO

CROPPING SYSTEMS

Crop rotation, different cultivation techniques, reduced tillage, and use of compost and green manure.


LEEK
CELERY
CAULIFLOWER
Inverting tillage
INTENSIVE REFERENCE
Low imput of organic matter
COMPARE WITH
ADAPTED SYSTEM FOR SOIL BIODIVERSITY
Non-inverting tillage
Higher input of organic matter
Green manure
(Spring: Phacelia and crimson clover) (Autumn: ryegrass)
INCREASE
Soil microorganisms
Soil quality and organic carbon content
Crop yield and quality

→ *Infographic for case study 8 made by PSKW*

CASE STUDY 9

Testing different sources of green manure in agro-ecological wheat production.

OBJECTIVE

Agro-ecological farming relies on ecological processes to support the production system. It is a holistic way of thinking on agronomy, ecology and biology. In this respect, the objective is to test different sources of locally produced organic fertilizer to increase the SOM content, ameliorate the soil's structure and improve plant health and development. Especially farmyard manure, compost and fermented organic waste will be tested.

PROPOSED PRACTICES

We will divide a field with an organic farming system, in combination with agro-forestry, into different parts. Each part will receive another source of green manure. Especially farmyard manure, compost and fermented organic waste (bokashi) which was produced 'on farm' or locally will be tested.

STATE OF THE ART

Organic farming mostly applies composted or non-composted green manure to increase C-content, and improve the soil's structure. However, fermented organic waste has some additional advantages: improved microbial diversity and activity to produce natural antibiotics, essential vitamins and plant growth hormones; the soil's quality improves further and it gets more resilient against pests and diseases.

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

With this experiment we hope to demonstrate that different sources of green manure exist as excellent alternatives the conventional way of external inputs of nutrients. Also we want to demonstrate the potential of fermented organic waste on soil structure, SOM content and improved plant health.

PROBLEM TO SOLVE

Conventional farming depends on high amounts of external inputs of fertilizer because it negatively disturbs the soil's capacity to produce crops: nutrients get depleted, the SOM (soil organic matter) content decreases and the structure of the soil deteriorates. The proposed field trial wants to demonstrate that a sustainable way of farming is possible in combination with a reduced dependence of external fertilizers.

CROPS

LOCATION

Verrebroek, East-Flanders (Belgium)

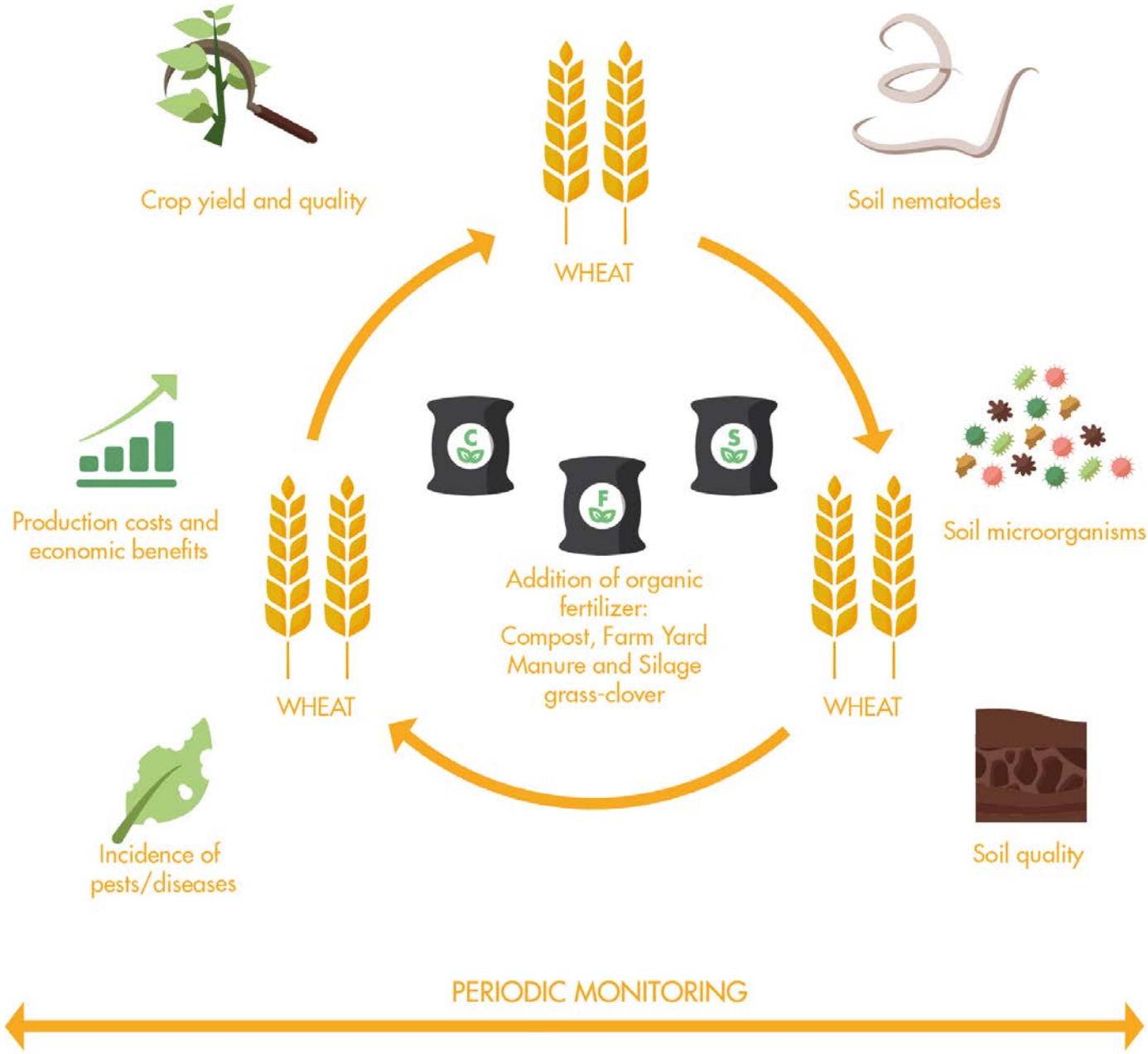
PARTNERS

POMONA

ILVO

CROPPING SYSTEMS

Application of different types of green manures, cover crops incorporated after destruction, reduced tillage.


Crop yield and quality
WHEAT
Soil nematodes
Production costs and economic benefits
Soil microorganisms
Addition of organic fertilizer: Compost, Farm Yard Manure and Silage grass-clover
WHEAT
WHEAT
Incidence of pests/diseases
Soil quality
PERIODIC MONITORING

→ *Infographic for case study 10 made by POMONA*