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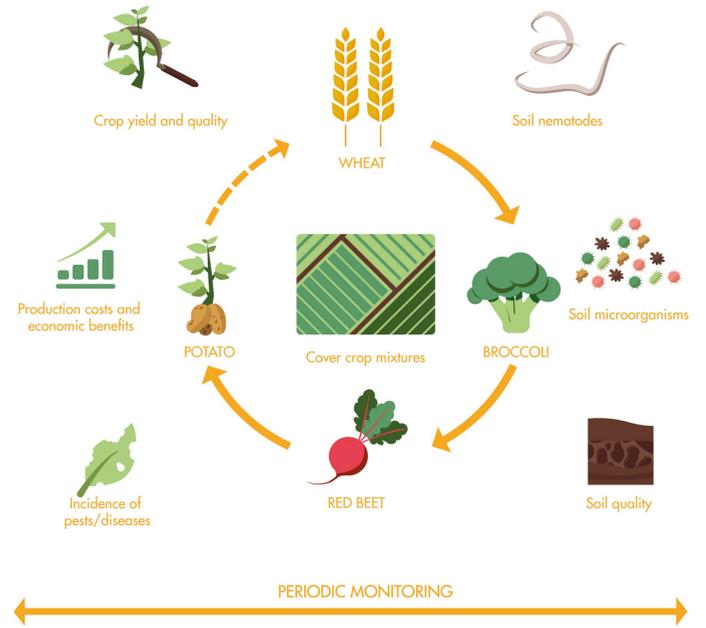
## Objective

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.



Trial field at the organic experimental farm of Inagro

- Pedoclimatic region: Atlantic Central
- Country: Belgium
- Location: Rumbeke-Beitem (Region of Flanders)  
50°54'23.1"N 3°07'41.9"E
- Mean annual temperature/precipitation: 10.5 °C
- Mean annual precipitation: 836 mm
- Annual potential evapotranspiration: 533 mm



## 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.

## 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.

## 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. The main crop in 2021 was broccoli. In 2022 and 2023 this will be red beet and potato.



Phacelia + Black oat



Phacelia + Egyptian clover



Harvested organic broccoli



5-species mixture



12-species mixture

## Preliminary results 2020-21

1- The total aboveground biomass of the BAU mix (phacelia/black oat) was the smallest in the autumn of 2020 but the difference was only significant with the 5-species mixture that had the largest average biomass. The biomass of both the 2-species mixes was dominated by phacelia. The biomass of the 5-species mixture was dominated by radish. Also the 12-species mixture was dominated by radish biomass. Serradella, niger and squarrosium clover were present to a limited extent in that mixture. Lupin was missing in the samples.

2- The BAU mix, the only cover crop mixture containing solely non leguminous species (phacelia + black oat), had a significant lower total nitrogen content than the other mixtures (on average 36 kg ha<sup>-1</sup>). The leguminous species in those mixtures contain also nitrogen fixed out of the air by the symbiosis with soil rhizobium bacteria and add in that way extra nitrogen to what is taken up from the soil.

3/4- The nitrogen in the green covers could partly be released by mineralisation after destruction (frost + flail mowing) and incorporation in soil in order to be utilised by the following main crop broccoli. The evolution of the nitrate-N content of the 0-90 cm soil layer did show significant differences during the growing period of 2021 according to the cover crop mixture used. At the beginning of august there was on average 95 kg ha<sup>-1</sup> more nitrate-N present following the 5-species mix compared to both 2-species mixtures. Also the aboveground biomass of the broccoli plants (marketable + rest part), planted at 14<sup>th</sup> of June and harvested at the end of august, showed the largest total nitrogen content but there were no significant differences.

5- The marketable yield of the broccoli plants was on average 14,3 ton ha<sup>-1</sup> and highest for the 12-species mixture but there was no significant difference according to the cover crops used. Also there was no significant difference in quality, which was generally good. Because of a larger harvest residue, the total aboveground biomass produced was largest for the 5-species mix but this was not significant. Early after planting there were on average 1,8% plant losses by rhizoctonia. There was a small significant difference between the 5- species (3,5%) and the phacelia/Egyptian clover mix (0,5%), probably as the result of the presence of radishes (cabbage family). These losses were included in the yield calculation.

