



RE CARE FACT SHEET CASE STUDY EXPERIMENTS UNDERSOWING OF GRASS IN MAIZE

THE PROBLEM

The main soil threat in the Olden-Eibergen Case Study area in The Netherlands is the gradual decline of soil organic matter stocks. On average, agricultural fields have lost up to 5% of organic matter in the last ten years according to farmers. This is expected to reduce the agricultural potential of the soil as well as its water holding capacity, and its potential to buffer nutrients and pesticides. Nitrate leaching is considered a relevant soil threat in the Netherlands, and specifically in the study area, where drinking water is produced from groundwater. In the long term, agricultural productivity is expected to drop and costs of agricultural inputs, such as manure, fertilizers, pesticides and irrigation, to increase. As a result, costs for cleaning drinking water withdrawn from groundwater are expected to rise.

PROPOSED SOLUTION

The proposed solution is the undersowing of a grass cover crop in a standing maize crop to improve the contents and stability of organic matter in the soil.

THE STAKEHOLDERS

The stakeholders involved in the measure include around 20 dairy farmers organised in a foundation of farmers and residents in the area, who are concerned about the sustainability of dairy farming and landscape quality. The drinking water company Vitens supports the solution out of concern for the quality of the drinking water produced from groundwater. The province of Gelderland supports measures to increase the soil organic matter to improve sustainable land management and to help the country comply with the EU Nitrate Directive.



Grass undersown in maize (© Henk Leever)

AIMS, OBJECTIVES AND EXPERIMENT DESIGN

The aim of the measure is to increase the organic matter content, the root density in the soil and the bearing capacity of the soil. Secondly, the measure aims to retain nitrogen by the grass, as an 'insurance' against leaching. Thirdly, the measure aims to keep fields green after the harvest, which improves the landscape quality.

Information was collected on the soil organic matter content, grass yield and nitrate concentrations in the groundwater.

EXPERIMENT: MAIN RESULTS

Grass undersowing in maize fields is expected to result in 0.5% extra soil organic matter (SOM) after 30 years, and also a little more production of grass in years with grass cropping. But since the measure was only started in 2014, the result is still unknown. Conversations with four farmers revealed that the SOM content has remained stable or slightly increased, and that the bearing capacity of the soil has improved.

Average nitrate concentration in the upper groundwater in the area fluctuated around the EU-standard of 50 mg/l: in 2014 and 2017 it was above and in 2005 and 2016 below the standard.

Farmers experienced variable results from grass undersowing, depending strongly on the weather, with good growth of the grass cover in wet years, but competition for water with the maize crop and no grass growth in dry years. Farmers frequently experienced poor grass cover.

Drawbacks of the measure mentioned by farmers are that the undersowing may cause damage to the standing maize crop and in the headlands of the fields and that the sowing is a difficult task since it needs to be done at the right places and in the right period. It is difficult to perform in small parcels, and the weed control is more difficult.

Farmers also indicate that grass undersowing is not effective in a grain maize crop, where only the maize cobs are harvested and the rest of the plant is frittered, thereby suffocating the undersown grass.

Grass undersowing was evaluated by farmers and residents to foster regulating ecosystem services, namely the increase of the buffer function for organic matter and nitrogen and the bearing capacity of the soil. Also, cultural ecosystem services were found to be improved when fields remain green after the harvest of the maize crop, instead of showing brown stubble.

However, the provisioning ecosystem services that were foreseen as a result of this measure (increase in feed crop yield and groundwater production) were not mentioned by the farmers as a benefit.



Grass seeding in maize (© Willem Rienks)

STAKEHOLDER INVOLVEMENT AND FEEDBACK

Stakeholders participated in meetings in the evenings where lectures were given by experts and experiences with soil management measures were shared between farmers. A field visit was organised to the experimental farm, De Marke, where the grass undersow is trialled.

A symposium was also organized for the wider group of stakeholders, where representatives of the province, municipality, the drinking water company and the water board were involved.

Stakeholders, other than farmers, are mostly positive about the measure of grass undersowing, and believe in positive outcomes in the longer term for drinking water production, soil quality and the sustainability of dairy farming, with benefits also for agricultural production in the area and recreation, tourism and aesthetic value of the landscape for the residents.

An agronomic and economic barrier to the uptake of grass undersowing is that implementation requires a special machine, which should be operated by a contract labourer.

An opportunity for the measure is that the application of a cover crop in maize fields has become mandatory in The Netherlands since January 2018.

KEY FINDINGS

- After four years of implementation the soil organic matter content has remained stable or slightly increased.
- The bearing capacity of the soil has improved.
- The aesthetic aspect of green fields after the maize harvest is valued.
- The measure is technically difficult to implement, and the growth of the grass cover is variable and highly dependent on the weather conditions in a year.
- There is no evidence yet on increased crop yield or reduction of nitrate leaching to the groundwater.

FACT SHEET AUTHORS

René Rietra, Sabine van Rooij and Simone Verzandvoort,
Further information about the case study:
<https://www.recare-hub.eu/case-studies/olden-eibergen-the-netherlands>

CONTACT INFORMATION

Project dissemination: www.recare-hub.eu
Case study leader Sabine van Rooij: sabine.vanrooij@wur.nl
Project coordinator: Prof. Dr. Coen Ritsema, coen.ritsema@wur.nl