



# RECARE FACT SHEET CASE STUDY EXPERIMENTS: INCORPORATION OF LOCAL BIOMASS

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## THE PROBLEM

The health of soils in Olden-Eibergen in The Netherlands is under threat due to declining soil organic matter stocks. According to farmers in the region, agricultural fields have lost on average up to 5% of organic matter in the last 10 years. As a consequence of this organic matter loss, researchers expect to see a decline in the soil's agricultural potential, as well as its water holding capacity and potential to buffer nutrients and pesticides. Nitrate leaching threatens soils in the Netherlands, especially in the study area, where drinking water is produced from groundwater. As a result, the cost of cleaning drinking water withdrawn from groundwater might rise. In the long term, we expect agricultural productivity to fall and costs of agricultural inputs, such as manure, fertilisers, pesticides and irrigation, to rise.

## PROPOSED SOLUTION

A proposed solution is the incorporation in the soil of biomass derived from local sources to improve the contents and stability of organic matter in the soil.



Biomass piles from local sources on field border

## STAKEHOLDERS INVOLVED

The stakeholders involved in the measure include around 20 dairy farmers organized 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.

## AIMS, OBJECTIVES AND EXPERIMENT DESIGN

The aim of the measure is to increase the organic matter content, and hence the bearing capacity, and its capacity to buffer water, nutrients and pesticides, and to serve as an habitat for soil fauna. Secondly, the measure aims to improve the water infiltration and retention capacity of the soil in order to prevent negative impacts on crop and grass growth from drought and water excess.

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



Biomass is spread out over the field

## EXPERIMENT: MAIN RESULTS

The incorporation of local biomass is expected to result in 2% extra effective soil organic matter (SOM) in fields with grassland-maize rotations and after 30 years, and 10% in fields with tuber crops (potatoe, beet). The recharge of the groundwater is expected to increase due to improved infiltration, as well as the breakdown of nitrates, pesticides and pharmaceuticals for animals.

However, no observations are available from experimental farms or from the actors monitoring the water quality in the area, that could confirm these expected outcomes. And since the measure was only started in 2014, there is no direct evidence from the area either. 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. The water retention in light, sandy soils seems better than before the measure, and less leaching of nutrients was estimated to have occurred.

Results from a groundwater monitoring campaign ordered by the drinking water company revealed that the average nitrate concentration in the groundwater in the area decreased to below the EU-standard of 50 mg/l between 2014 and 2016, but in 2017 the concentration increased again.



Contractor explaining the composition of the biomass to RECARE stakeholders

## FACT SHEET AUTHORS

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Further information about the case study: <https://www.recare-hub.eu/case-studies/olden-eibergen-the-netherlands>

## STAKEHOLDER INVOLVEMENT AND FEEDBACK

Farmers experienced that the incorporation of local biomass improved the aeration and structure of the soil, and even already noticed an increase in crop yield. Chips from tree bark were found to give the effects mentioned above after two years of application.

Drawbacks of the measure mentioned by farmers are the heavy machinery required to incorporate the biomass, which may cause damage to the soil by compaction, the presence of harmful substances (for animals or humans) in the biomass, soil acidification and a higher weed pressure. Also, strict rules and regulations apply to the use of biomass from local sources in soils, especially on biomass obtained from roadsides collected by the water board. They are also concerned about the obligation to include biomass in the accounting of manure as an extra supply of nitrogen and phosphorous. This also prohibits farmers to mix manure and local biomass – which would give an even better soil amendment, because when this is done, the complete mixture should be counted as an application of manure for the agricultural enterprise.

## KEY FINDINGS

- The amount of biomass going to the soil has increased by the measures.
- This has resulted in an improved bearing capacity of the soil and the groundwater is better protected from the influx of nitrates, pesticides and pharmaceuticals.
- Green residues from local sources are reused as an alternative fertilizer, thereby closing cycles of production and waste streams.
- The measure encourages collaboration between farmers and other actors in the area (providing biomass, protecting the groundwater quality), hence improving social cohesion and awareness on the importance of the soil in providing production, regulating and cultural ecosystem services.

## CONTACT INFORMATION

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