

## EIP Operational Group - Sensor Gestuurd Boeren / Sensor-controlled farming

Innovative water quality sensors at farm level applied in cooperation project reducing eutrophication risks in Dutch surface water.

### EAFRD-funded projects

**Location:** Aa en Maas, The Netherlands

**Programming period:** 2014-2020

**Priority:** P2 - Competitiveness

**Focus Area:** Farm performance, restructuring & modernisation

**Measures:** M16 - Cooperation

**Funding:**

Total budget:	804 713 (EUR)
EAFRD:	163 912 (EUR)
National/Regional:	163 912 (EUR)
Private/own:	376 889 (EUR)
Other sources:	100 000 (EUR) -

province Noord Brabant

**Timeframe:** 01/04/2018 - 31/12/2022

**Project promoter:** Water Board Aa en Maas\*

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### Summary

Significant effort is still required in the Netherlands if the goals of the Water Framework Directive are to be achieved. The aim of this EIP project was to use real-time measurements in surface water, soil and groundwater as a basis for agricultural soil and nutrient management. A network of water quality sensors was set up to gather measurement data from surface water. In addition, efforts were made to conduct field experiments to reduce emissions in study groups and to increase knowledge sharing.

\* The project promoter/beneficiary is an EIP-AGRI Operational Group ([https://eu-cap-network.ec.europa.eu/operational-groups\\_en](https://eu-cap-network.ec.europa.eu/operational-groups_en))

### Project results

- The project provided a clear picture of which actions are effective in improving water quality at farm level. It did this in cooperation with farmers who, by taking part in the measurement gathering, could contribute their own perspectives and share their challenges and concerns with the project team.
- The EIP Operational Group developed a toolbox with different methods for monitoring, modelling and advising farmers on ways to reduce nitrate runoff from their plots.

### Key lessons and recommendations

- Study groups showed that farmers are much more interested in measurements of the soil than they are in measurements of the water. Therefore, measurements of the soil are considered more suitable.
- Prior to installing sensors, it is important to map a baseline of the area by taking soil samples to know if the use of sensors will bring added value or not.
- CAP funding for cooperation can be used to establish bottom-up approaches, combined with the use of smart technological applications, to play an important role in addressing environmental issues.



## Context

The North Brabant province was facing significant challenges in meeting the goals of the Water Framework Directive and the Nitrates Directive. Despite actions taken, such as establishing water treatment plants and strengthening rules protecting water quality (such as the fertiliser policy), it was clear that water quality was not improving any further. In addition, farmers had concerns about the effectiveness, implementation, enforceability and upscaling of these actions to improve water quality; this was because the effectiveness and the degree of applicability of solutions largely depend on the farm's characteristics (e.g. the kind of cultivation, fertilisers used or not, etc.) and also on the characteristics of the area (e.g. soil structure, source of water, groundwater flows, etc.).



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The water board of Aa en Maas is one of the four regional water managers in the province of North Brabant. As a water board, they do not deal with national policy (e.g. manure legislation), but they work on managing and monitoring the local water systems. The water board also implements actions for protecting water resources that are specific to their region. It set up an EIP Operational Group, alongside six farmers.

## Objectives

This project was driven by a need for the municipal water authority to understand farmers' perspectives about regional and local actions for improving water quality, and how these could be made more concrete and shared further.

The aim was to establish an EIP Operational Group to reduce nutrient runoff from agriculture by conducting an area-based pilot

action in which farmers, private parties, knowledge institutions, and local authorities would devise farm-specific solutions based on detailed monitoring results.

## Activities

Project activities clarified pollution hotspots and the timing of such occurrences in the area. Then, depending on the specificities of each farm (e.g. characteristics of the location, crops' structure, weather patterns, etc.), innovation support work explored the farmers' perspectives on how they could contribute to the reduction of nitrate emissions from their farms. This included:

- Designing and developing a smart innovative network of sensors to monitor the quality of the water (including the presence of nitrates) in farm ditches in real-time without being connected to the electricity grid.
- Setting up the ICT infrastructure to retrieve, validate, connect, and disclose the collected data.
- Developing and testing models that could be used to provide targeted advice to water managers and farmers.
- Setting up an area-based process in which participating farmers would have access to customised solutions based on measurements on their own farms. This process would be based on cooperation, knowledge transfer and concrete actions.
- Researching the practical feasibility of these actions and their impact.

The EIP Operational Group included six landowners in the catchment area and tenants of plots. Other members in the EIP Operational Group were the water board of Aa en Maas; the Province of North Brabant; the 'Aqun' water board laboratory; various knowledge institutes (Deltares, RIVM, KWR) and Wageningen University; companies that provided the sensors, ICT infrastructure, data science, engineering services; and providers of agricultural advice.

## Main results

- Participants gained insights into the processes affecting the water and soil on their farms, and what type of actions might be effective or not in reducing nitrate runoff.
- The project provided a better understanding to both the water board and the farmers of the issues concerning water quality in their area. The data they jointly collected enabled them to have more effective discussions on water quality while considering each other's perspectives.



- > The EIP Operational Group developed a toolbox with different methods of monitoring, modelling and giving advice to farmers on reducing nitrate runoff from their plots.
- > The water board has taken a big step forward in the use of sensors for the real-time measurement of water quality. This involves not only the hardware, but also sensor maintenance, ICT, and data validation. The experience, gained with help of CAP funding, is being applied in other sensor projects by the Water Board of Aa en Maas, as well as by other water boards.



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- > It became clear that working with sensors is not a panacea. The use of sensors is labour-intensive and costly. However, having some basic measurements and a thorough understanding of the situation on the farm are good starting points for discussion with the farmers.
- > These types of soil and water monitoring projects require a lot of time. Many external factors have an impact on water quality (e.g. weather conditions and type of crop rotation). It is therefore necessary to systematically collect data for a number of years. It is also important to build trust between public authorities and landowners, which also takes time.

### Quote

*“I would like to know if I can and should make individual choices when complying with the manure rules, based on for example, the crop, soil conditions, weather conditions and altitude of a plot. This gives me as a farmer the perspective that I know what to do to reduce the environmental impact of our farm. And it increases support for strict manure measures that deeply affect your operations.”*

Participant dairy farmer Jos Verstraten

### Key lessons and recommendations

- > Study groups with participants showed that farmers are much more interested in measurements of the soil than they are in measurements of the water. In addition, it is very difficult to measure the effect of an individual action in the water since it is also affected by the weather, the soil, the crops, etc. Therefore, measurements of the soil are considered more suitable.
- > Prior to installing sensors, it is important to map a baseline of the area by taking soil samples to know if the use of sensors will bring added value or not.
- > Addressing environmental issues requires bottom-up cooperation, bringing together public authorities (river basin = macro level), researchers and farmers (parcel = micro level) in order to find up-to-date solutions while considering each other's perspectives.

### Additional information:

[Project webpage](#)

[www.youtube.com/watch?v=W5ozk6Wphko](https://www.youtube.com/watch?v=W5ozk6Wphko)

[www.youtube.com/watch?v=lyB1XB5JgKU](https://www.youtube.com/watch?v=lyB1XB5JgKU)

[Web page about water quality sensors](#)



Funded by  
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