

OPTAIN and selected Natural/Small Water Retention Measures for water and nutrient retention in European agricultural catchments



OPTAIN Project Overview

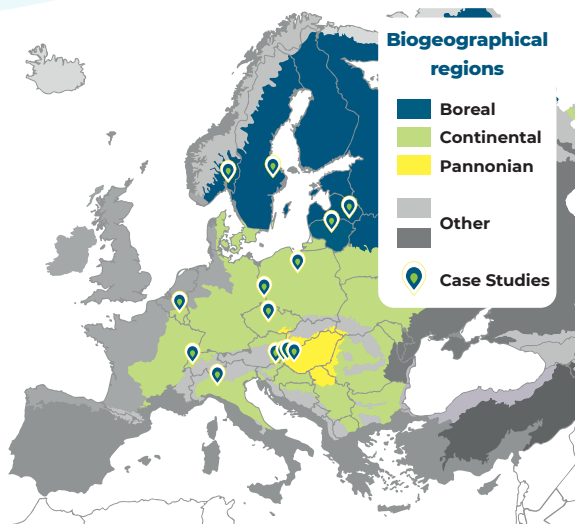
OPTAIN (OPTimal strategies to reTAIN and re-use water and nutrients in small agricultural catchments across different soil-climatic regions in Europe) is an EU-funded research and innovation project implemented between September 2020 and February 2026 with a budget of almost 7 mil €.

The project aimed to enhance the understanding of the potential practical implementation of Natural/Small Water Retention Measures (NSWRMs) in agricultural catchments across the Boreal, Continental, and Pannonian biogeographic regions, utilizing both scientific and stakeholder processes.

In collaboration with Multi-Actor Reference Groups (MARGs) across 14 European case studies, OPTAIN researchers developed and upgraded SWAT+ modelling workflows and optimisation tools to identify combinations of Natural/Small Water Retention Measures (NSWRMs) suitable for implementation in agricultural catchments. Through this approach, they assessed the potential of NSWRMs to retain water and nutrients while accounting for different climate projection scenarios.

Introduction to NSWRMs

Natural/Small Water Retention Measures aim to safeguard and enhance the water storage potential of landscapes, soils, and aquifers and foster ecosystem services for mitigating the impacts of floods and droughts, while contributing to the achievement of multiple UN Sustainable Development Goals and environmental targets formulated by EU policies. In the OPTAIN project, they focus on headwater catchments and farms, with the aim of developing easy-to-implement and efficient solutions at the farm and headwater catchment scales as defined within OPTAIN (link).



14 European case studies

7 million Euro budget

5,5 duration 2020-2026

Figure 1. Map of OPTAIN case studies



Photo: Dominika Krzeminska - Buffer zones along the Hobøl River, Norway

Selection and prioritization of Natural/Small Water Retention Measures (NSWRMs) on the case study level



NSWRMs were identified and prioritised through a harmonised, participatory process across the 14 case studies in three following steps:

- (1) **Identification** - OPTAIN case study teams applied a common questionnaire to systematically inventory existing potentially suitable NSWRMs to gather primary information on the local measures.
- (2) **Prioritisation** - In Multi-Actor Reference Group workshops, stakeholders discussed feasibility, benefits, and local relevance of identified NSWRM, and ranked the most relevant ones for the specific case study context.
- (3) **Selection** - Based on these rankings, case study teams, selected between two and seven NSWRMs per case study. Selection criteria ensured that the measures were classified as NSWRMs, locally relevant, representable in the applied models, and supported by available expertise, while collectively covering the key NSWRM categories across OPTAIN. In total, 66 NSWRMs were selected, currently being documented in the WOCAT database (link).



Photo: Michael Strauch - near Pfaffendorf hedge to subdivide fields, Germany



Photo: Dominika Krezeminska - Hobøl River Basin grassed flooded fields, Norway



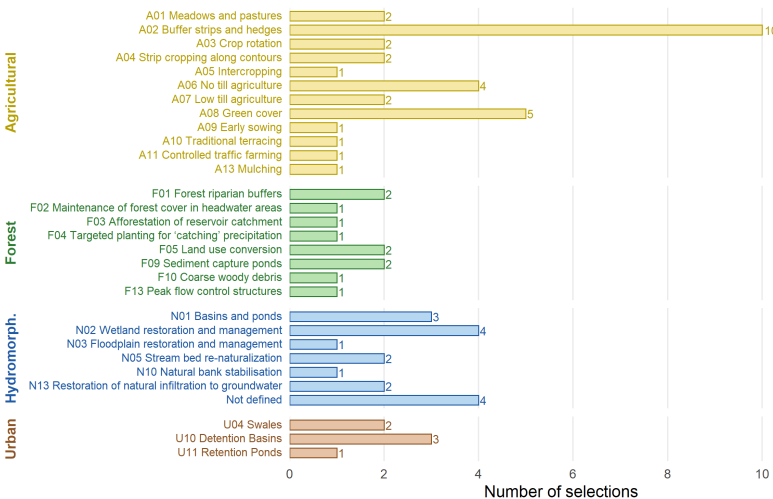
Which NSWORMs are most frequently selected across case studies?

Across the OPTAIN case studies, 66 NSWORMs were ultimately selected from an inventory of 235 measures, representing 29 relevant NWRM categories. Although many categories are represented by only one intervention, several recur across case studies, signalling their broad applicability. The most frequently selected are buffer strips and hedges (ten), green cover (five), no-till agriculture (four), and wetland restoration (four).



Photo: Jovita Mezine - Kedainiai district sedimentation pond, Lithuania

Selected NSWORM by NWRM Category



In addition, hydro-morphological measures such as retention ponds, constructed wetlands, floodplain and stream-bed re-naturalisation, natural bank stabilisation, and groundwater-infiltration restoration are repeatedly selected, reflecting their combined functions in run-off attenuation, pollutant removal, and ecosystem enhancement.

Figure 2. The NSWORMs selected for modelling and optimisation



Which climate-related challenges are addressed by Natural/Small Water Retention Measures implementation?

NSWRMs address multiple, inter-linked climate-related challenges by slowing, storing, and filtering water within catchments.

- They mitigate increasing flood peaks by attenuating runoff.
- They enhance drought resilience by improving soil moisture storage and groundwater recharge and by promoting drought-resistant and climate-adapted crop varieties, thereby reducing crop failure risks under prolonged dry periods and heat stress and stabilise yield production under changing climate conditions.
- Many measures reduce nutrient and sediment losses intensified by extreme rainfall, therefore improving water quality.
- They also limit erosion, buffer hydrological variability caused by climate change, and support ecosystem integrity and biodiversity, which further stabilise water regulation services.



Where can detailed descriptions of the Natural/Small Water Retention Measures be accessed?

Detailed descriptions of the NSWORMs are available as **standardised factsheets** in the **WOCAT Global SLM Database** (link) and on the **NWRM.eu platform** (link).

Once reviewed and published, each NSWORM is documented in the scope of OPTAIN while providing technical specifications, context, costs, impacts, and references.

They are also compiled in **OPTAIN's Learning Environment** (linked to both mentioned platforms) and described in the OPTAIN catalogue, where users can browse, and download the factsheets directly.



Photo: Nives Ramisberger - Petit Glane riparian forest, Switzerland

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