



Circular water solutions

Innovation for agriculture, forestry
and rural areas

4 Circular solutions for on-farm
water management

12 Reusing treated water from
agri-food industries at farm level



Funded by
the European Union

Table of contents

| | |
|--|----|
| Innovation for efficient water use in agriculture, forestry and rural areas | 3 |
| Circular solutions for on-farm water management | 4 |
| Turning rain into drinking water for poultry | 6 |
| Innovative water treatment in cranberry cultivation | 7 |
| Better water and nutrient retention in soils and streams | 8 |
| Local collaboration for climate-proof communities | 9 |
| A Living Lab approach for better take-up of nature-based measures in the Mediterranean | 10 |
| Reusing treated water from agri-food industries at farm level | 12 |
| Opportunities and risks in using industrial wastewater for agriculture | 13 |
| Exploring circularity in the meat industry | 14 |

04



12



Colophon

Managing editor: Antonia Gámez Moreno, Head of Unit – Rural Areas and Networks, AGRI-D1, Directorate-General for Agriculture and Rural Development, European Commission

Contents and editing: Support Facility for Innovation and Knowledge Exchange | EIP-AGRI

Layout: Communication and Logistical Support Team

More information: EU CAP Network – Innovation, knowledge exchange | EIP-AGRI - innovation-knowledge@eucapnetwork.eu

Pictures: © Adobe stock photo; LIFE-MICACC; EU CAP Network; Istvan Csak; Klara Kerpely / WWF; Mirela Kotlicka / Operational Group 'Adaptation and implementation of innovative water treatment technology in a close irrigation system with the use of biological protection agents'; Life ACLIMA; PRIMA Mara-Mediterra; REAQUA; Gabriella Szabo; WATERAGRI

Manuscript finalised July 2024 | Luxembourg: Publications Office of the European Union, 2024

© European Union, 2024

Reuse is authorised provided the source is acknowledged. The reuse policy of European Commission documents is regulated by Decision 2011/833/EU (OJ L 330, 14.12.2011, p. 39). For any use or reproduction of photos or other material that is not under the EU copyright, permission must be sought directly from the copyright holders.

Print: ISBN 978-92-68-18092-1, DOI 10.2762/433213, KF-09-24-492-EN-C

PDF: ISBN 978-92-68-18087-7, DOI 10.2762/652023, KF-09-24-492-EN-N



Innovation for efficient water use in agriculture, forestry and rural areas

Clean water is essential for a thriving agriculture and forestry sector and for quality of life in rural communities. EU farmers are facing an increasing water demand to safeguard food security for growing populations, while climate challenges, pollution and overuse are lowering water availability.

The **Common Agricultural Policy** promotes innovative methods that can support farmers, foresters and rural communities in making the most of available water resources and in becoming more resilient to water excess or shortages under changing climate conditions.

The **European Green Deal** works towards zero pollution in air, water, and soil, and more sustainable water use in agri-food systems through the **Farm to Fork Strategy** and the **Circular economy action plan**. The **EU Water Framework Directive** also plays a crucial role in ensuring the sustainable management of water resources across Europe.

This brochure highlights solutions for sustainable and circular water management. It features examples of innovative projects that tackle water-related challenges by efficiently saving, recycling, and reusing water sources for on-farm use, through innovation, collaboration and knowledge exchange.



Circular solutions for on-farm water management



Agriculture and forestry rely on a steady supply of clean water. However, a number of challenges are affecting the availability of water, including pollution from fertilisers or chemical residues, sedimentation caused by soil erosion, and overuse. In addition, new climate and weather patterns are increasingly leading to droughts, irregular rainfall, floods and water shortages, heavily affecting agriculture, forestry and rural areas.


While farmers, foresters and rural communities face a growing demand for freshwater, increasing water scarcity is calling for innovative practices and tools to make more efficient use of available water resources. Circular water systems offer plenty of opportunities to save, recycle, and reuse water for on-farm use.

Water that is used within farming processes (e.g. vegetable cultivation or livestock production) can be filtered and reused several times for on-farm purposes. When appropriately treated, wastewater from agricultural production or from agri-food industries can also be recycled for further reuse.

Harvesting rainwater from farm or greenhouse roofs or fields can offer an additional source of water which, when purified, can be used as drinking water for animals, irrigation for crops, or for other uses on the farm.

Precision irrigation systems and other decision support tools can help farmers optimise their water use, cutting costs in the process. Specific agroecological measures may help to retain water and nutrients in the soil and create more sustainable farming systems that are more resilient to droughts or water shortages.

A number of innovative projects dive deeper into **nature-based solutions (NBS)** in circular water management. They make use of natural elements to store, retain or filter water, to regulate water flow and improve nutrient recycling. Natural ponds can store water, while constructed wetlands and sedimentation basins can capture runoff water from agricultural fields and support natural filtration. The stored water can recharge aquifers or other groundwater reservoirs, and be used during dry periods when natural water sources are limited.

The **EU CAP Network workshop on circular water management** (held in March 2024) was dedicated to good practices in conserving, reusing, and recycling water for agricultural production and in natural ecosystems.

→ Browse all results **on the event webpage**.





Turning rain into drinking water for poultry

The Life ACLIMA project has set up four demonstration sites in Belgium where farmers can learn about solutions for optimal on-farm water use, with a focus on greenhouse and open field cultivation, livestock and poultry production. Solutions range from efficiently collecting and storing rainwater, water use to cool animal housing in warmer periods, reusing water to clean stables, and applying precision irrigation for strawberries.

Using rainwater offers farmers an additional resource to become less dependent on ground or tap water. At one of its demonstration sites, Life ACLIMA is testing techniques to purify rainwater into high-quality drinking water for laying hens and broilers.



“Low water quality can hinder animal development, lead to lower water and feed intake or reduced performance, for instance affecting egg quality or laying percentage”, says Peter Bleyen, researcher at the Experimental Poultry Centre. “It could also make them more susceptible to infections. We have tested two treatment methods and found that purified rainwater met all required quality standards, both for broilers and for laying hens. Results for intake, growth and animal welfare showed no significant differences to using tapwater.”

“While groundwater is still the cheapest option, we want to make farmers aware of sustainable alternatives to help them become more resilient in light of future droughts, groundwater shortages or legal restrictions, and changing climate conditions.”

“An increasing number of farmers have showed an interest in applying climate adaptation measures on their farms. We demonstrate solutions but also offer them guidance throughout this process.”

PETER BLEYEN

Researcher at the Experimental Poultry Centre

→ Get more details [on the Life ACLIMA website](#).

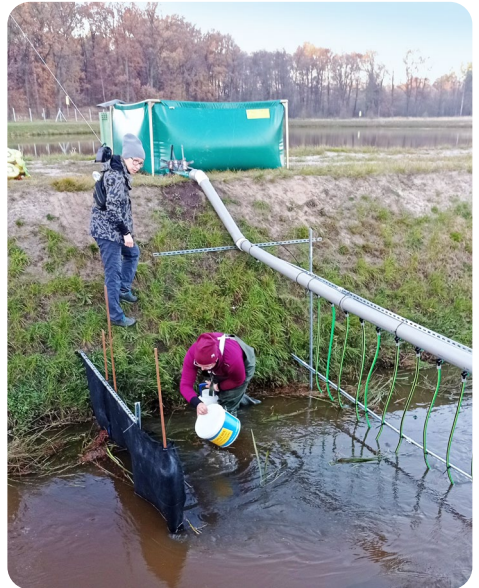


Innovative water treatment in cranberry cultivation

Cultivating cranberries requires a significant amount of water. To optimise water use for irrigation, a Polish Operational Group has tested innovative filtration techniques on a closed-circuit cranberry plantation.

Using a closed circuit allows for water to be recycled and reused. In this closed irrigation system, the project has tested a cascade purification process, which significantly reduced the presence of microorganisms and fungal growth in the water flows. In addition, introducing biological stimulants successfully increased the water-holding capacity of the cranberry crops.

→ **More details in the EIP-AGRI project database.**



Participants at the EU CAP Network workshop 'Enhancing food security under changing weather patterns: farm adaptation' discussed innovative solutions to strengthen farm resilience in the face of climate change.

→ Find all results **on the event webpage.**



Better water and nutrient retention in soils and streams

Nutrient leaching from agricultural fields or via sub-surface drainage water can affect soils and pollute nearby water bodies. At ten pilot sites across Europe, the Horizon project 'WATERAGRI' has developed affordable and easy-to-implement technologies for better water management and nutrient recycling in small agricultural catchment areas.

"Based on the needs of European farmers, we have tested solutions for on-farm use to help manage an excess or shortage of water, avoid nutrient and top-soil losses and prevent pollution", project coordinator Rolf

Larsson explains. "This includes precision irrigation and nature-based drainage systems, constructed wetlands and flood retention basins, or using biochar for water and nutrient recovery."

"A decision-support framework will help farmers assess the technical, financial and environmental impact of their decisions."

ROLF LARSSON

Project coordinator



- ✓ In Finland, a remote sensing pipeline monitors water regulation for potato farming.
- ✓ A drainage system with activated biochar was set up in Austria to retain nutrients in runoff water and improve soil health.

→ Discover more **on the project website.**



Local collaboration for climate-proof communities

Collaboration with local municipalities can play a key role in ensuring that sustainable water measures are integrated into local resource management strategies.

In five Hungarian municipalities, the project 'LIFE-MICACC' has implemented nature-based water retention measures to improve the climate resilience of vulnerable local communities. With the support of local farmers, inhabitants and decision-makers, the project shows that these measures can benefit local communities and be further upscaled in a regional or European context.



In the village of Bática, heavy rainfall impacts the local community, agriculture, and infrastructure, while high evaporation leaves the area exposed to drought. To improve the balance in this cycle, the municipality is integrating former clay pits into local climate adaptation.

The clay pits serve as wetlands that collect and retain rainwater in cases of extreme rainfall. The retained rainwater infiltrates the ground, contributing to groundwater recharge, and reducing sensitivity to drought in the immediate surroundings. In addition, the basins serve as a freshwater habitat for amphibians and water birds, and help improve the local microclimate.

→ More details **on the LIFE-MICACC website.**



A Living Lab approach for better take-up of nature-based measures in the Mediterranean

Rural Mediterranean areas are especially vulnerable to the impact of climate change, droughts and irregular rainfall. They increasingly need to deal with water and land degradation, including salinisation and pollution, desertification, degradation of forests and wetland ecosystems, and wildfire risks.

At five 'hotspots' of land and water degradation in the Mediterranean (Greece, Turkey, Egypt, Algeria and Lebanon), the PRIMA project 'Mara-Mediterra' is testing nature-based solutions in local agroecosystems. The project closely involves local communities, farmers, water managers, and environmental NGOs in co-creating and testing the measures.

"Thanks to the 'Living Lab' approach, more than 125 farmers, researchers, advisors, and policy-makers are already taking part in testing solutions", says project manager Eleanna Pana.

"Over 470 people have been involved in roundtables and other activities. This approach helps to transform new ideas into tools that address real socio-environmental challenges, that can be taken up in practice."

ELEANNA PANA
Project manager



Tackling desertification in Greek olive groves

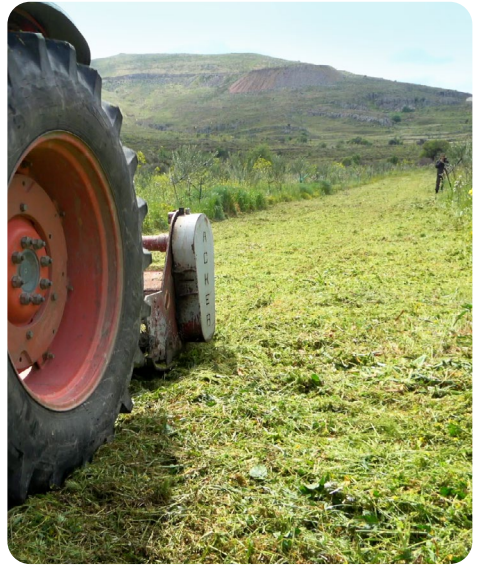
Olive cultivation was traditionally one of the main agricultural pillars in the hilly areas of the Greek North Aegean islands. Unsustainable practices and the abandonment of traditional cultivation areas due to a lack of irrigation water have led to desertification of the islands' rural landscapes. Mara-Mediterra's Greek Living Lab is now developing agroecological models for olive cultivation, including using cover crops and green manure, conservation tillage, and smart irrigation.



Olive farmer Kostas Iosifelis has noticed improvements: "In our area, we have little rain and low-fertility soils. We've been covering our soils with green mulching: all olive tree prunings and cut clover are left on the surface. We have limited the tillage of our soils and have seen that this resulted in better soil structure, more moisture in the soil, and lower costs for fertilisation and irrigation."

The Mara-Mediterra project is now establishing the first knowledge transfer hub for agri-environmental nature-based solutions in the Mediterranean to promote stakeholder involvement and knowledge exchange, benefiting rural communities and the environment.

→ More details [on the project website](#).



→ For more good practices, browse all results from the **[Focus Group on nature-based solutions for water management under climate change](#)**.

→ **Watch the video:** Nature-based river restoration in Sweden.

Reusing treated water from agri-food industries at farm level



Climate change, irregular rainfall patterns and droughts are increasingly putting pressure on the availability of freshwater for use in EU agriculture, forestry and rural areas. Treating and reusing water can help preserve resources, lower the pressure on groundwater aquifers, rivers and lakes, and increase resilience to water shortages.

Specifically designed treatment systems can remove organic matter, excess nutrients and contaminants from agricultural runoff, or industrial waste streams. When appropriately treated, water that is used in farming processes and agri-food industries can be reused for agricultural purposes at a small scale. Brewery or winery wastewater, water used in food transformation or to rinse vegetables, wastewater from slaughterhouses, or water used in small agricultural installations can be successfully treated and reused for crop irrigation or other on-farm purposes such as cleaning stables.



The **#WaterWiseEU** campaign raises awareness of the increasing stress placed on Europe's water systems, and spotlights solutions to build a water-resilient EU.

→ **Discover how you can get involved.**



Opportunities and risks in using industrial wastewater for agriculture

During periods of drought, many farmers look for alternative water sources to irrigate their fields. While using purified wastewater from nearby industries may be a promising alternative, it is important to be aware of the associated risks and legal restrictions.

To facilitate the reuse of treated wastewater as irrigation water, Operational Group 'Water chain' has developed an 'easy-to-read' overview of the expected wastewater quality from different industry types (slaughterhouses, dairy, potato processing, breweries). This is matched with the quality conditions that need to be met for this water to be used as irrigation or fertigation water for different crops (potato, maize, leaf vegetables, non-food). The results will bring clarity to the legal framework, and indicate which industrial effluents are suitable for which crops and soils.

→ Get more details **in the EIP-AGRI project database.**





Exploring circularity in the meat industry

Animal slaughtering is a water-intensive industry. To open up more sustainable water management strategies for the meat industry, the Spanish Operational Group 'REQUA' is exploring the possibilities to reuse treated wastewater from abattoirs for on-site use and irrigation.



In slaughterhouses, water is mainly used in processes that involve direct contact with meat products such as washing carcasses or sanitising. Some of the non-contact water is used outside of the meat processing environment, for instance to clean trucks or animal pens. Wastewater effluents typically hold a high content of organic matter, with a significant nutrient load (including chemicals or pathogens) that needs to be removed before it is discharged into surface or groundwater.

"The circular economy offers options for this water to be recovered", says Sergio Ponsá, director at the BETA Technological Centre. "Current regulations establish quality criteria for water reuse for industry or irrigation, but there are barriers when the reclaimed water has an industrial origin. This is why reuse strategies are currently not widely promoted in the agri-food sector."

REQUA applies innovative technologies to help companies comply with necessary quality requirements to be able to use high-quality treated water in activities outside of the production process, without creating risks for human health or the environment. Results will be turned into a practical guide covering potential risks and promoting the reuse of treated wastewater in the meat sector.

→ More details **in the EIP-AGRI project database.**



Several innovative projects address water reuse from agri-food industries:



While solid fractions of livestock manure can be recovered by composting or by biodrying to produce energy, an **Operational Group from the region of Catalonia** is recovering the liquid effluents from pig slurry. The result is high quality water without pollutants, salts, or nutrients, that can be reused on the farm or for recharging aquifers and other environmental services.



The project **REDWINE**, funded under the Circular Bio-based Europe Joint Undertaking (CBE JU - formerly BBI JU) reuses liquid effluents from wine production and off-gas from wine fermentation - rich in CO₂ - to produce microalgae biomass. This process supports the uptake of CO₂ emissions and helps producers diversify their income through biomass compounds that can be developed into cosmetics or agri-food products.



→ Discover more innovation **in the EIP-AGRI project database** and **on the CBE JU website**.

Visit the EU CAP NETWORK Website

 eu-cap-network.ec.europa.eu

Follow the EU CAP NETWORK on social media

 facebook.com/eucapnetwork

 x.com/eucapnetwork

 youtube.com/@eucapnetwork

 linkedin.com/company/eu-cap-network

