

Studies from the EU CAP Network workshop Circular water management

**Seville, Spain
12-13/03/2024**



Funded by
the European Union

ROUND 1: Re-use in the agro-food value chain



REAQUA
Operational Group

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www.betatechcenter.com

www.linkedin.com/company/betatc



GEOGRAPHICAL LOCATION

Catalonia (Spain)

TYPES OF PARTNERS INVOLVED:

Pig and cattle slaughterhouses, regional industrial cluster for livestock, meat and alternative protein production and research centre.

PROJECT BUDGET:

214,157.74€

WATER CIRCULARITY APPROACH:

Apply the concept of circular economy in industrial slaughterhouses to recover high quality water for either on-site reuse (e.g. truck cleaning) or irrigation.

DESCRIPTION OF THE INNOVATION:

The project proposes the implementation of post-treatment technologies (membrane systems and advanced oxidation processes) to meet the required quality for water reuse, taking into account the risk assessment associated with the presence of emerging organic compounds.

MAIN OUTCOMES:

The proposed technologies are very efficient in producing high quality water by reducing the risks associated with the reuse of reclaimed water at an acceptable treatment cost.

MAIN CHALLENGES:

The main challenge lies in the current regulation, which excludes the reuse of treated water from industrial sources for irrigation. In addition, there is no standardised methodology for quantitative risk assessment to guarantee the quality of reused water.

NEXT STEPS: To develop a technical reference guide under the supervision and validation of the public administration to promote water reuse in the meat sector.



REDWINE



www.redwineproject.eu

www.linkedin.com/redwine



REDWINE

Miguel Cachão
miguel.cachao@avipe.pt



WATER CIRCULARITY APPROACH:

According to some estimations, water consumption in wineries could be between 3-10l of water per liter of wine. Mainly use for hygienization of the tanks, water is then conducted for treatment stations or sewage.

DESCRIPTION OF THE INNOVATION:

REDWINE project aims to reuse 80m³ of wine effluents on the production of algae (*Chlorella vulgaris*) biomass. This amount reflects the water used for a production of 20 000l of wine.

Protein extracts from algae biomass produced from wine effluents will be used for biostimulants on vineyards to study its effects against heat stress, biofungicide capacity, enhance flowering stage and increase of N content on grapes.

MAIN OUTCOMES:

In order to make lab tests, 1m³ of wine effluents have been stored. It has been possible to grow algae and metagenomic analysis are been done to understand its microbiological composition.

MAIN CHALLENGES:

There's a need to dilute the effluent due to its intense colour.

GEOGRAPHICAL LOCATION

Palmela, Portugal

TYPES OF PARTNERS INVOLVED:

Farmers' association

Academia

Research centers

PROJECT BUDGET:

7 525 555€

NEXT STEPS: Heat stress trials have demonstrated promising results but more tests are needed. It's also interesting to study how much clean is the effluent after the use of Algae. Metagenomic analysis will bring useful information.



Study of the water cycle in pig farms - Operational Group

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GEOGRAPHICAL LOCATION

Catalonia (Spain)

TYPES OF PARTNERS INVOLVED:

- Pig farms
- Technological center

PROJECT BUDGET:

135,761.91 €

WATER CIRCULARITY APPROACH:

Recovery of water from pig slurry with a suitable quality to be reused on the farms (for example for cleaning purposes) and/or for irrigation of crops in agriculture.

DESCRIPTION OF THE INNOVATION:

This project was focused on evaluating the application of innovative technologies such as electro dialysis and ozonation for the treatment of pig slurry in farms in order to obtain high-quality water for its potential on-site reuse.

MAIN OUTCOMES:

The application of the two technologies in cascade allowed: i) to recover up to 85% of water from pig slurry, ii) to eliminate emerging contaminants of veterinary origin (~99%) and iii) to obtain water that meets the requirements of quality established in the regulations in force for water reuse on farms for cleaning purposes and for agricultural irrigation.

MAIN CHALLENGES:

To overcome legal barriers when it comes to obtain the authorization for reuse of the reclaimed water from slurry due to its origin.

NEXT STEPS: Joint collaboration between public administration, companies and research centers to ensure that there is no risk associated with the reuse of reclaimed water from pig slurry.

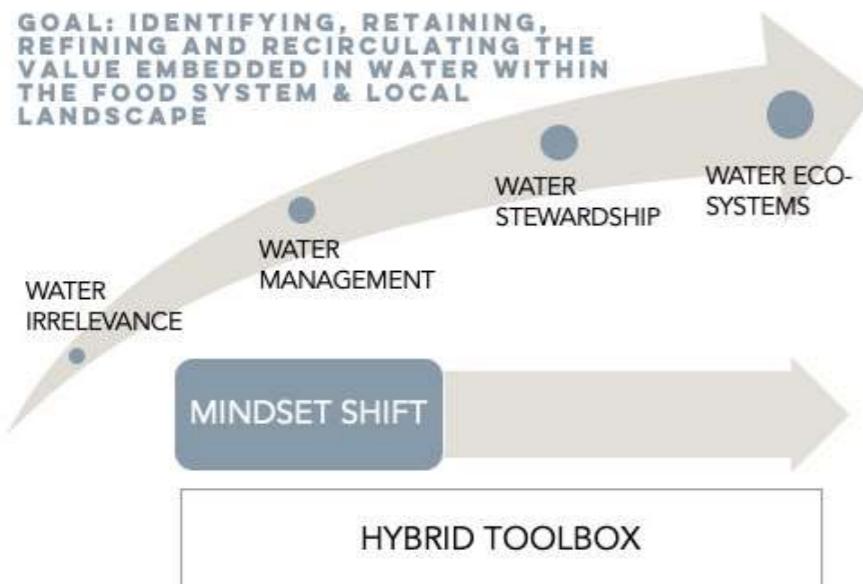


Water-Smart Food System, NextGenerationEU

Johanna Tanhuanpää (Invenire)

Jaakko Kapanen (FWF)

<https://www.hungryforland.fi/watersmart>



WATER CIRCULARITY APPROACH:

Creating a hybrid toolbox of technology-based and nature-based solutions to help food companies and farms with water circularity.

DESCRIPTION OF THE INNOVATION:

Creating and testing a transferable and replicable operating model for enhancing the water-smartness of food systems. The operating model is based on Finnish water technology expertise and knowhow, combined with understanding of regenerative farming and food systems.

MAIN OUTCOMES:

Operating model for enhancing water-smartness. Pilot cases with Åland food system actors.

MAIN CHALLENGES:

Fostering collaboration and a mindset for change.

GEOGRAPHICAL LOCATION

Finland, Åland Islands

TYPES OF PARTNERS INVOLVED:

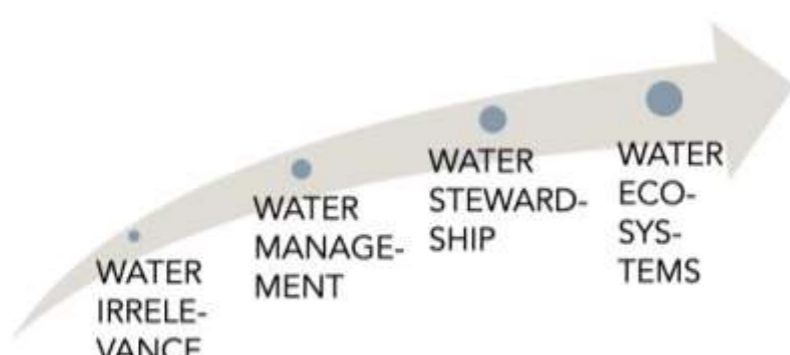
SME: Invenire Market Intelligence Oy

NGO: Finnish Water Forum

PROJECT BUDGET:

190.000 €

NEXT STEPS: The project runs until spring 2025. Next steps within the project are to establish pilot cases with Åland food system actors to help define, test and refine the operating model.

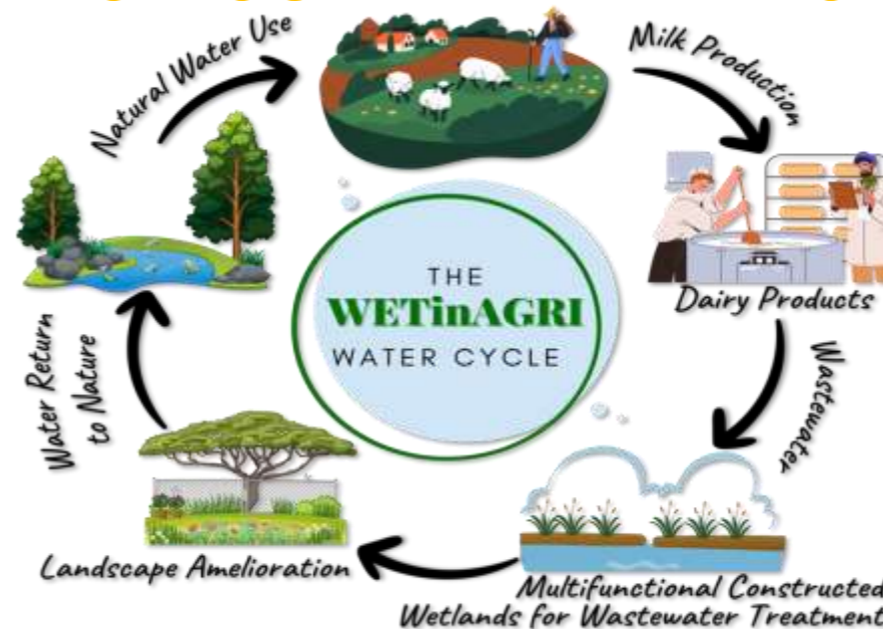


WETinAGRI
Multifunctional systems of constructed wetlands
for the control of pollution from agri-livestock
industry - Operational Group

Dr. Vasileios Takavakoglou



WATER CIRCULARITY APPROACH:



DESCRIPTION OF THE INNOVATION:

The WETinAGRI project aims at demonstrating and documenting the use of a **modular constructed wetlands system** (floating and subsurface flow) as Nature-based Solution (NbS) for the wastewater treatment of small milk processing units (cheese dairies) and the reuse of reclaimed water for landscape amelioration.

MAIN OUTCOMES:

In the context of circular economy and resource efficiency, the proposed eco-engineering approach seeks to achieve:

- ✓ Effective treatment of wastewater with significant hydraulic and pollutants' variability.
- ✓ Reduction of wastewater treatment cost due to lower operation and maintenance cost of the treatment system.
- ✓ Lower energy demands for wastewater treatment and thus lower carbon footprint of the cheese dairy.
- ✓ Non-Conventional Water Resource addressing local water demands and reduced water availability in Mediterranean.
- ✓ Enhancement of landscape biodiversity.
- ✓ Environmental awareness of factory visitors and local society.
- ✓ Opportunities for environmental education in cooperation with NGOs schools and research organizations.
- ✓ Contribution to the goals of EU and National Strategies and Programmes (CAP, WFD, Circular Economy, etc.).

MAIN CHALLENGES:

Limited timeframe of the project; Ensuring the sustainability/replicability of the action; Improvement of national legislative framework and integration of NbSs in policy planning.

GEOGRAPHICAL LOCATION

Region of Eastern Macedonia and Thrace, GREECE

TYPES OF PARTNERS INVOLVED:

- "MENOIKIO" Agricultural Cooperative
- Aristotle University of Thessaloniki, School of Agriculture, Department of Hydraulics, Soil Science and Agricultural Engineering
- Hellenic Agricultural Organization "DIMITRA", Soil and Water Resources Institute (SWRI)
- AgriEnt - NGO

PROJECT BUDGET:
€145.000



NEXT STEPS: Explore hybrid systems of wastewater treatment with focus on emerging pollutants. Assess the potential of wastewater reuse in crop/fodder production, Integration of a WEFE NEXUS approaches.



This poster was presented at the European CAP Network Workshop 'Circular water management' – March 2024
More information: <https://eu-cap-network.ec.europa.eu/>

ROUND 2: Re-use at farm level

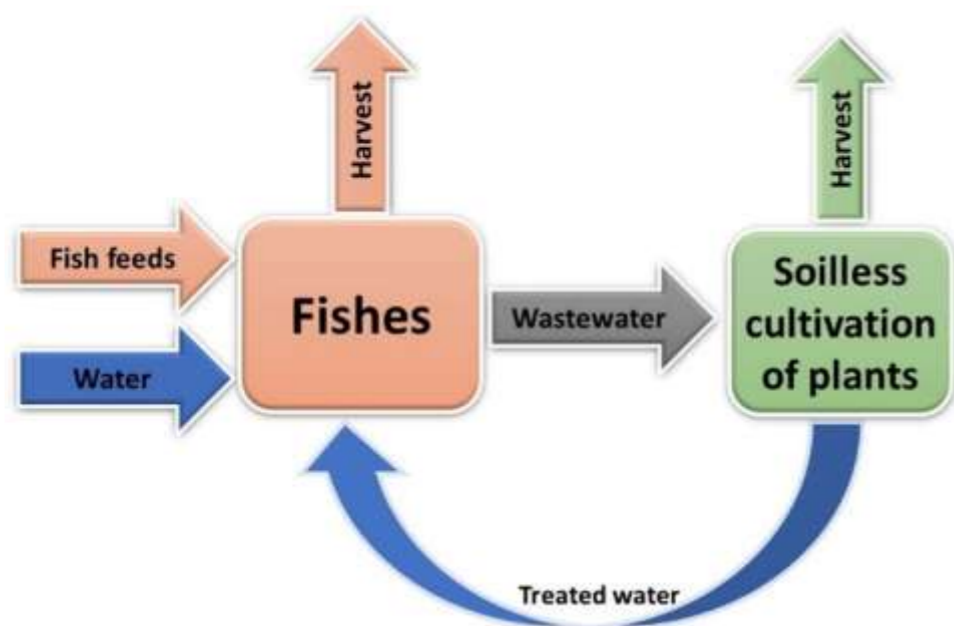


BlueCycling
ERA-Net Cofund FOSC

Sarah Milliken

<https://bluecycling.org>

<https://www.linkedin.com/company/blue-cycling/>



WATER CIRCULARITY APPROACH:

BlueCycling focuses on the circular management of water, nutrients and waste for integrated aquaculture and horticulture, both in coupled aquaponic systems and by finding synergies with local agri-food systems (decoupled aquaponics).

DESCRIPTION OF THE INNOVATION:

Aquaculture wastewater can be used as a growing medium for microalgae such as spirulina. The algal biomass can then be used to partially replace fishmeal in the fish diet, and the bioremediated water returned to the aquaculture tanks.

MAIN OUTCOMES:

Fish meal in a diet for Nile tilapia can be substituted up to 45% by spirulina without adversely affecting the yield or quality of the plants (basil and chilli) or the fish in a coupled aquaponic system.

MAIN CHALLENGES:

The Life Cycle Assessment of the spirulina fish feed revealed environmental costs related to energy use and greenhouse gas emissions.

GEOGRAPHICAL LOCATION

Europe and Africa

TYPES OF PARTNERS INVOLVED:

Universities and research institutes

PROJECT BUDGET:

€1,869,300

NEXT STEPS: The effect of different types of wastewater on the nutrient content of microalgae needs to be evaluated. Circular resource management strategies need to consider potential trade-offs in the food-energy-water nexus.



**CLEANLEACH PROJECT/SYSTEM.
ECO-INNOVATION PROGRAMME**

rafaela.caceres@irta.cat
IRTA

<https://www.youtube.com/watch?v=qx7Rbn0HBDw>

<https://twitter.com/Cleanleach>



WATER CIRCULARITY APPROACH:

System to reuse water and nutrients from leachates in nurseries and/or its purification

DESCRIPTION OF THE INNOVATION:

Horizontal slow sand filter (under pot plants in nurseries) to collect the leachates, **and constructed wetland** for further purification.

MAIN OUTCOMES:

- Full scale implementation
- Constructed wetland: denitrification using liquid or solid carbon source
- Sand filter: plant pathogen propagules retention.
- Full circularity (water, fertilizers, biomass)

MAIN CHALLENGES:

- To develop a cheap system for nutrient monitoring (inlet and outlet of both systems).
- To substitute part of the sand (in horizontal sand filter).
- To replicate the improved system.

**GEOGRAPHICAL
LOCATION**

St Andreu Llavaneres
(Vivers Sala Graupera),
Cabrils (IRTA). Barcelona
province

**TYPES OF PARTNERS
INVOLVED:**

Bioengineering
(Naturalea, Salix), Plant
Architecture
(BuresInnova), Research
Institution (IRTA)

PROJECT BUDGET:

724.125€

NEXT STEPS: Available for implementation, research/demonstration for cope with the mentioned challenges.

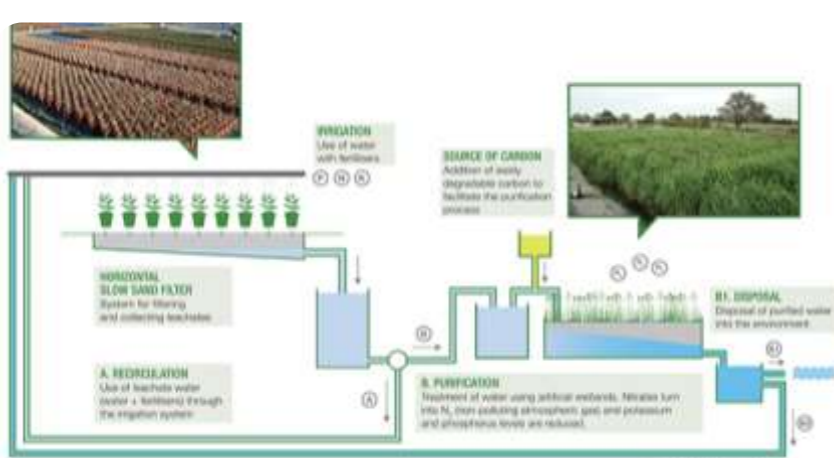


Fig. 3. Web application interface to monitor the constructed wetlands (CW) through the internet (a) and mobile web app to monitor the...

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More information: <https://eu-cap-network.ec.europa.eu/>

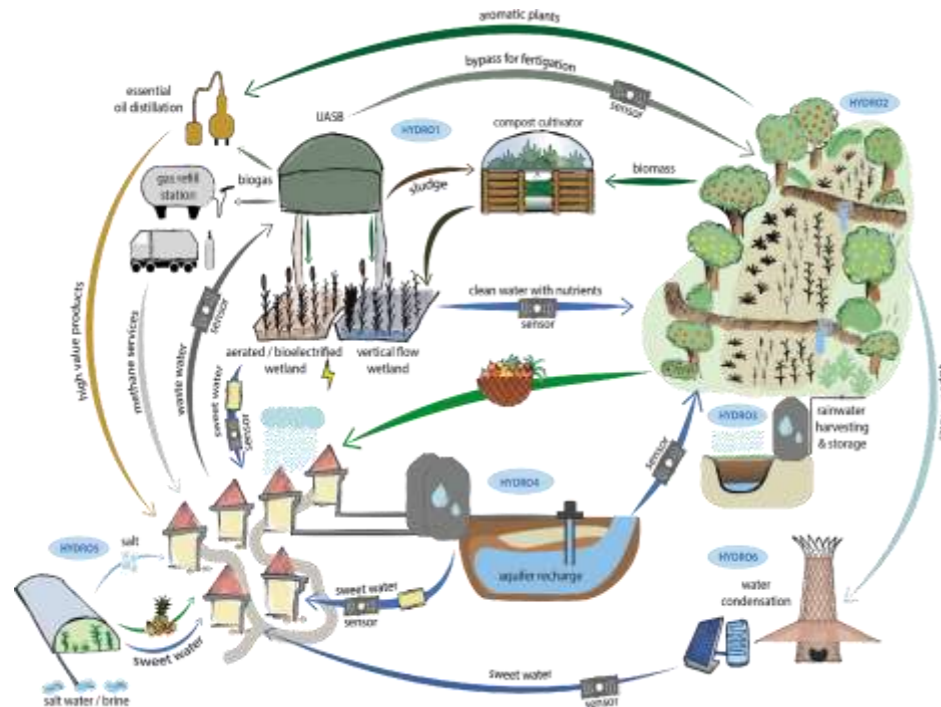
HYDROUSA - Horizon 2020
(Grant Agreement No 776643)

Pinelopi Papadopoulou
piniapap@gmail.com

Coordinator: Simos Malamis
malamis.simos@gmail.com

www.hydrousa.org

Twitter: @HydrousaProject



WATER CIRCULARITY APPROACH:

HYDROUSA revolutionized water value chains in Mediterranean areas and beyond, from water abstraction to sewage treatment and reuse. HYDROUSA water loops valorized water from non-conventional sources including wastewater, rainwater, seawater, groundwater and vapor water, all resulting in recovered and marketable products.

DESCRIPTION OF THE INNOVATION:

The demonstration site was a 1ha agroforestry system that was fertigated using reclaimed water with a high nutrient content that was the result/output from a wastewater treatment system applying anaerobic treatment, constructed wetlands and UV disinfection. The agroforestry was divided into 3 main groups: (1) trees for fruit production, (2) orchards bushes; and (3) herbs and annual crops. The demonstration site combined the regenerative capacities of agroforestry with the use of reclaimed water and nutrients. The irrigation of the agroforestry system was implemented through drip irrigation using an automated precision irrigation system. Up to 100 m³ of reclaimed water per day (in summertime) was available for irrigation.

GEOGRAPHICAL LOCATION

Greece - 6 demonstration sites: Lesvos, Mykonos, Tinos Islands

Agroforestry → Lesvos Island

PARTNERS INVOLVED:



PROJECT BUDGET:

€12,015,448.75

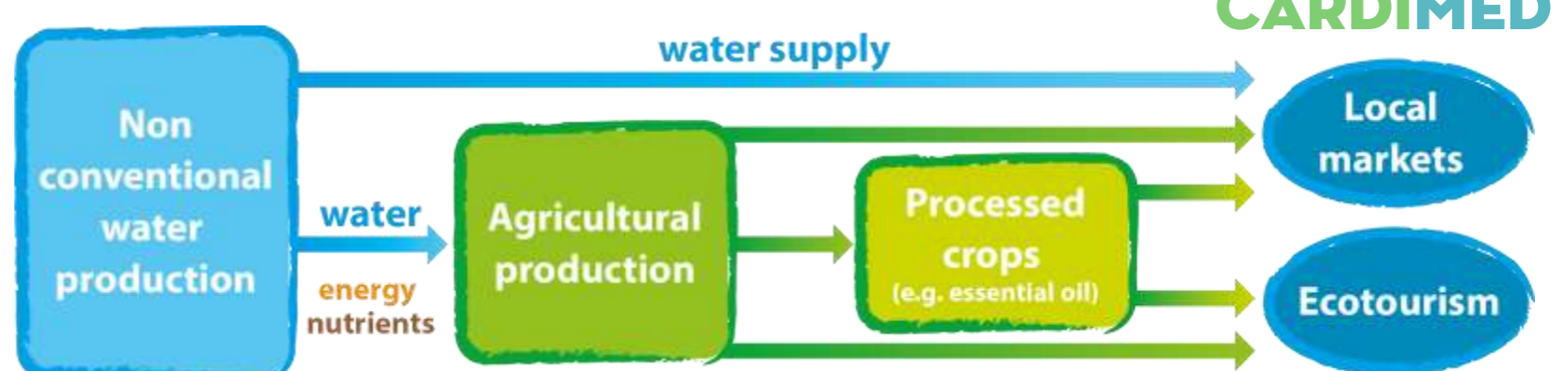
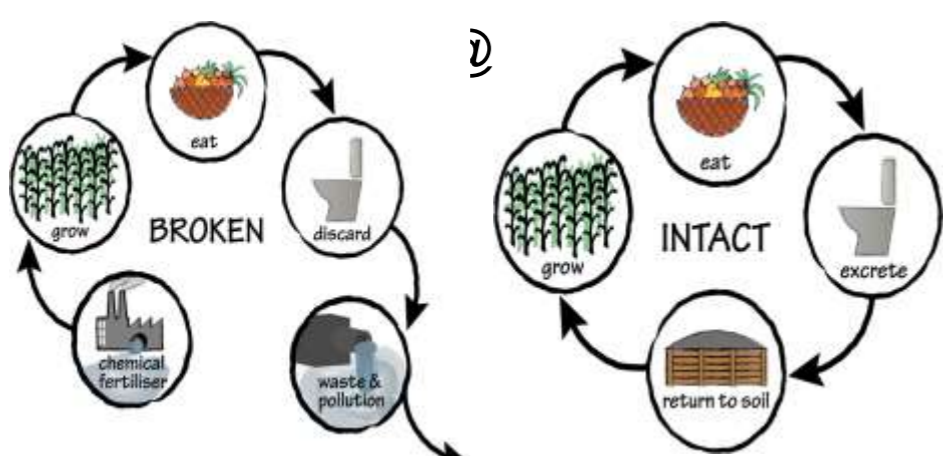
MAIN OUTCOMES:

Establishment of WEFE nexus + Circular water management + Resource recovery + Energy efficient technology development and deployment + Minimization of chemical inputs to crops (i.e. fertilizers) + Social perception

MAIN CHALLENGES:

Social perception + Weather related impacts + Covid-19 (construction/plantation delays)

NEXT STEPS: Replication of the demo sites + New Horizon Europe project: CARDIMED (83 interventions across 10 regions and 20 locations)



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More information: <https://eu-cap-network.ec.europa.eu/>

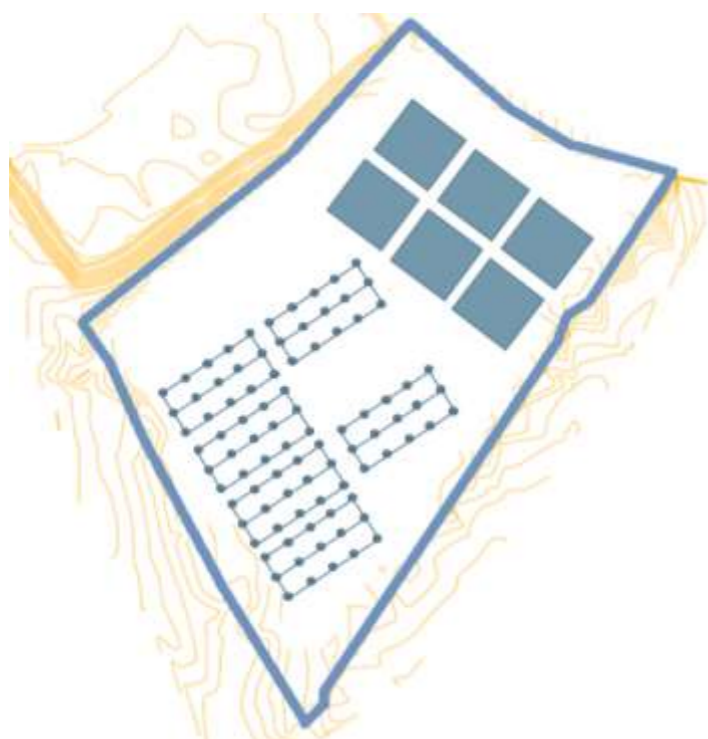
“SOSTENIBILIDAD, AGUA Y AGRICULTURA EN EL SIGLO XXI - SOS AGUA XXI

María Muñoz Villalón

<https://tepro.es/>

<https://es.linkedin.com/company/tepro>

<https://www.facebook.com/Tepro.Consultores>



GEOGRAPHICAL LOCATION:

Sevilla, Spain

Avda. San Francisco Javier, 24.
Edificio Sevilla 1. Planta 3

CENTA (Carrión de los Céspedes)

TYPES OF PARTNERS INVOLVED:

Sacyr Agua, Valoriza Medioambiente, Bosonit, Tepro, Regenera, Aeromedia, föra forest technologies y Aqua Advise

PROJECT BUDGET:

6.039.214,00€

WATER CIRCULARITY APPROACH:

This project seeks to research technological solutions for the development of efficient water resource management and treatment strategies for the agricultural sector through the use of new intelligent technologies that enable the use of reused water.

DESCRIPTION OF THE INNOVATION:

Technological solutions to the challenges raised by the use of non-conventional water resources, such as the use of reclaimed water for irrigation of certain crops, allowing the development of strategies for the efficient management and treatment of water resources for the agricultural sector.

MAIN OUTCOMES:

- Reclaimed water used for irrigation complies with existing regulations.
- Data on the application of drip irrigation with reclaimed water on rice and cork oak trees, which are still under evaluation.

MAIN CHALLENGES:

- Presence of emerging pollutants in reclaimed water and sludge for agriculture
- Disinfection of reclaimed water

NEXT STEPS: Study, analyse and evaluate the results obtained in the case studies to compare the response of crops to the use of reclaimed water on different parameters, such as crop growth, yield and quality, among others.

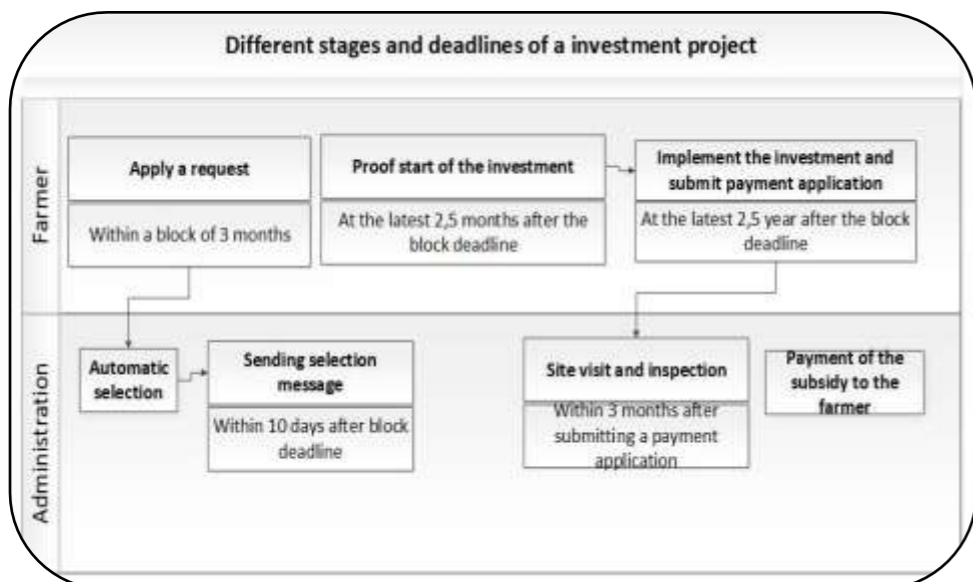


Support of circular water management investments in Flanders



AGENCY
FOR AGRICULTURE & FISHERIES

Marleen Mertens



WATER CIRCULARITY APPROACH:

Giving financial support for sustainable water investments due to the major restrictions on the use of ground water and surface water in Flanders and the ban of the discharge of used water

DESCRIPTION OF THE INNOVATION:

Placing all (new) types of purification systems for use or reuse of rainwater on the eligible investment list based on research results, e.g. for recycling used water by different purification systems in greenhouse crop production or using rainwater as drinking water for chickens (40 % support) (purification train)

MAIN OUTCOMES:

Farmers can apply for 40 % support for water treatment and water purification equipment via an application (only for rainwater). After an automatic selection (according to certain criteria) and implementation of the investment, a payment application can be submitted. After inspection, the aid is given to the farmer.

MAIN CHALLENGES:

Cost price of new technologies, license to use the systems

GEOGRAPHICAL LOCATION

Flanders - Belgium

TYPES OF PARTNERS INVOLVED:

Management Authority CAP Flanders (VLIF)

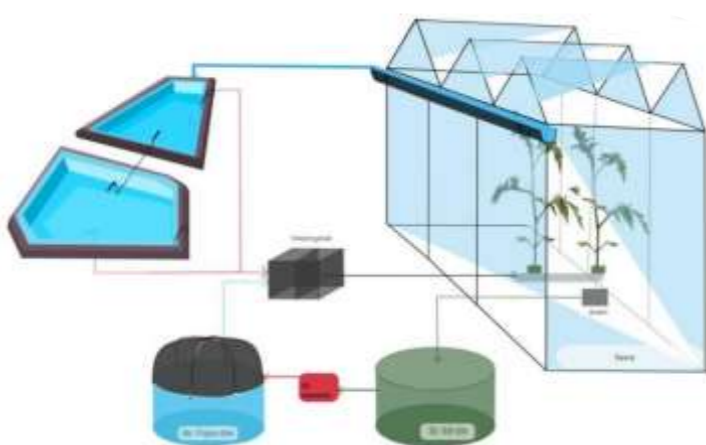
Farmers / growers

Research centers Flanders for research in sustainable water projects

PROJECT BUDGET:

2 M euro support for purification systems per year

NEXT STEPS: update of new investment types based on results of EIP-projects and Horizon Europe projects (e.g. Life Aclima)



ROUND 3

Circular water management



Examples of Finnish approach to water circularity and resilience

Pekka Parkkila



GEOGRAPHICAL LOCATION

Finland (South-West)

TYPES OF PARTNERS INVOLVED:

Turku Region Water Ltd

Local NCO:s

Municipalities

PROJECT BUDGET:

Groundwater 188,7 mill. €

Watershed approach 225 000 €

NEXT STEPS: Wider utilization of the different methods



<https://turunseudunvesi.fi/en/water-journey/>

<https://www.finnishwaterforum.fi/wp/en/>

<https://twitter.com/FinWaterForum>



WATER CIRCULARITY APPROACHES:

- Holistic watershed approach to water retention with nature-based solutions
- Artificial groundwater
- Irrigation water harvest and recycling

DESCRIPTION OF THE INNOVATION:

- Retaining springs meltwaters in a chain of nature-based structures to improve early summer flows in the main waterbody and relieve stress caused by irrigation.
- Pretreated surface water is pumped to an esker aquifer, where water filters into the esker and turns in to a groundwater. Water is then collected and pumped 90 km to serve the 300 000 customer of Turku Region Water Ltd.
- Collecting water from subsurface irrigation and returning it to the upstream to be used again in crop irrigation

MAIN OUTCOMES:

Steady flow of purest drinking water in the world.
Win-win solutions for water utilization and nature conservation

MAIN CHALLENGES:

Legislation, funding



Groundwater recharge Innovation project

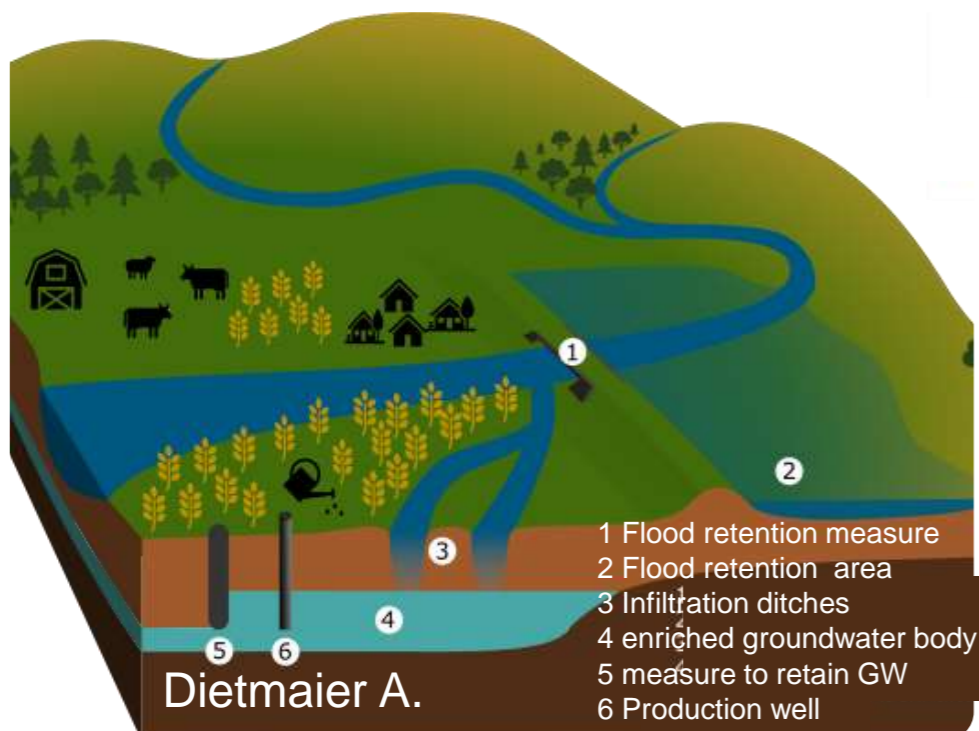
L. Käsbauer, L. Augustin,
A. Dietmaier, T. Baumann

www.smart-sws.de



farmtastic
consulting

www.farmtastic.consulting



GEOGRAPHICAL LOCATION

Germany,
Bavaria,
Straubing-Bogen

TYPES OF PARTNERS INVOLVED:

Farmers,
agricultural consultants,
scientists

PROJECT BUDGET:

80.000 €

WATER CIRCULARITY APPROACH: Long-lasting drought periods, interrupted by short, intense precipitation events, are characteristic of climate change. Agriculture is particularly affected by this, as the soil is no longer able to fully absorb heavy rainfall after extended dry periods, and an increasing portion of the rainfall quickly runs off the surface instead of being stored in groundwater. This water is removed from the local landscape water balance.

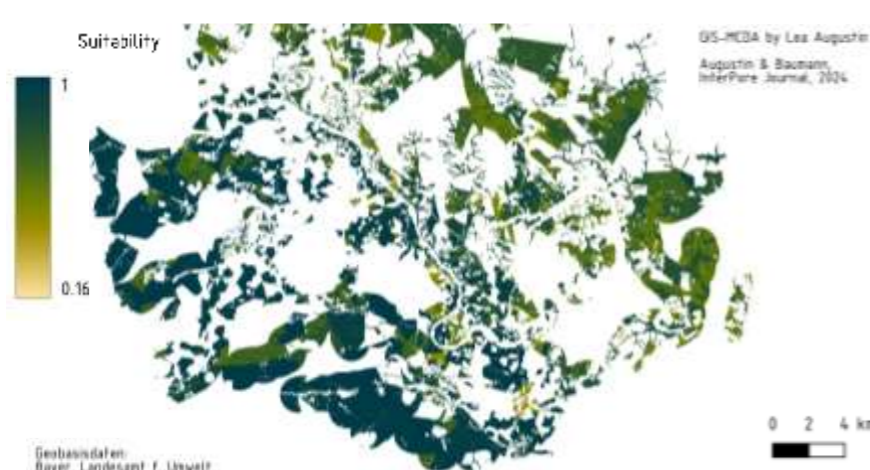
DESCRIPTION OF THE INNOVATION: The project idea intervenes in this scenario with technical measures facilitating the infiltration of surface waters into local groundwater aquifers. This supports the currently stressed groundwater aquifers and evens out the water supply. Simultaneously, the idea strengthens flood protection and prevents soil erosion as well as crop damage. these decentralized systems have to be considered in a regional and multiannual context and require a long-term strategy for augmented water management.

MAIN OUTCOMES: A transfer of the Smart-SWS concept to two farms in Bavaria

MAIN CHALLENGES:

- a) resolve different timelines of precipitation infiltration, storage, and demand for irrigation water
- b) maintain water quality for infiltrated waters in a holistic context
- c) maintain the functionality of the infiltration system during long dry periods
- d) develop incentives to implement recharge systems.

NEXT STEPS: Implementation of the concept („bottom-up“) at two farms. For this purpose, determination of water balance, definition of environmentally sustainable runoff, financial assessment, and researching legal issues are carried out.



A "bottom-up project based on Smart-SWS funded by the Federal Ministry of Education and Research"

FONA
Forschung für Nachhaltigkeit

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

WaXo
Wasser-Extremereignisse

SPEKTER QUASOIL
TECHNISCHE HOCHSCHULE TUM TUM



LIFE H₂OLOCK

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linkedin.com/company/life-h2olock/



GEOGRAPHICAL LOCATION

Murcia (Spain)

Palmela (Portugal)

TYPES OF PARTNERS INVOLVED:

Irrigators' Community of Lorca
Farmers' Association: AVIPE
Technological Center: CTC
Innovative Companies: ARANA, ARADA & GFI

PROJECT BUDGET:

1,8 M€ | 3 years

WATER CIRCULARITY APPROACH:

The **LIFE H₂OLOCK project** aims to achieve up to 80-85% control over water evaporation, suppress algae growth completely without algaecides, and generate renewable energy for irrigation in medium to large agricultural reservoirs. This comes with the corresponding reduction in the carbon and water footprint associated with this activity in hydrologically challenged regions.

DESCRIPTION OF THE INNOVATION:

- (a) New **Self-Righting Modules-based System** for efficient coverage of water reservoirs.
- (b) **Advanced mooring concepts** to procure stability in modular floating systems.
- (c) **IT + AI Monitoring Systems** for remote control of the circularity system's efficiency.
- (d) **New Concept of Floating PV Flexible Layout** adapting various floating blankets

MAIN OUTCOMES:

Water Evaporation Reduction up to **80%**

Algae Growth Suppression in **100%**

77% reduction in CO₂ emissions from irrigation activities

5% decrease in energy use surrounds the pond

MAIN CHALLENGES:

Ensuring that the **self-righting** mechanism of the modules is both robust and effective.

The entire system must maintain stability and functionality even in the face of **harsh weather conditions**.

NEXT STEPS:

- (1) To finalize the Spanish site demonstrator and commence the installation of the Portuguese one
- (2) Verify and assess the KPIs fulfillment



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More information: <https://eu-cap-network.ec.europa.eu/>

LIFE-MICACC

CsabaVaszkó

Klara Kerpely

<https://vizmegtartomegoldasok.bm.hu/en>

<https://www.linkedin.com/in/csaba-vaszko-10180018/>



WATER CIRCULARITY APPROACH:

Local authorities own/manage landscape morphological features where Natural Water Retention Measures can be applied, including the retention of treated wastewater, discharges from water utilities, rainwater or peak flows from flash floods.

DESCRIPTION OF THE INNOVATION:

Engaging local authorities as new stakeholders in climate adaptation; using municipal owned/managed landscape features to improve hydrological conditions; retaining water from various sources to reduce the risks of drought, inundation and flash floods.

MAIN OUTCOMES:

NWRM applied in five pilot sites: retaining rainwater in clay pits; retaining treated wastewater in sandy areas, flash flood storage in mountain areas; retaining inland excess water

MAIN CHALLENGES:

Agriculture based on drainage; over-burdened local governments; over-emphasis on irrigation; fragmented regulatory environment.

GEOGRAPHICAL LOCATION

Hungary, 5 pilot sites:
Ruzsa, Püspökszilágy,
Tiszatarján, Bática,
Rákócziújfaló

TYPES OF PARTNERS INVOLVED:

Government, NGOs, local municipalities, water management authority

PROJECT BUDGET:

Total Budget: 2,546,783 €
EU

Contribution: 1,528,069 €

NEXT STEPS:

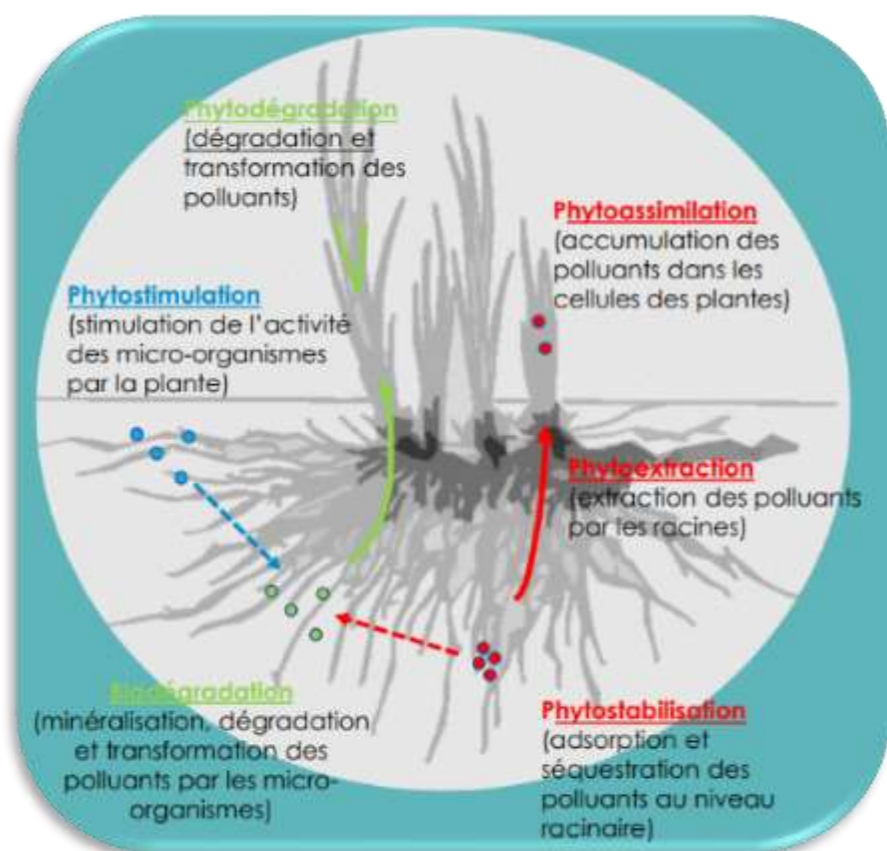
Expand pilot activities at catchment level, in cooperation with land users;
Segmentation and integration of NWRM solutions into agricultural practices



Reuse of run-off water in ornamental horticulture

GRENET Alain

<https://www.agri-lyon-dardilly-ecully.fr/je-suis-acheteur-des-serres/>



WATER CIRCULARITY APPROACH:

- 1) **Better collect** roof and drainage waters
- 2) **Depollute** these run-off waters with a swale
- 3) Improve **irrigation capacity** from stored water rather than drinking water

DESCRIPTION OF THE INNOVATION:

Close the **water loop** at the farm level thanks to nature-based depollution and recycling system : collection → swale → pound → irrigation

Low cost, nature-based but highly engineered solution rather heavy earthworks or high-maintenance cleaning system.

MAIN OUTCOMES:

Improve water **storage capacity & quality**

Reduce drinking water usage

MAIN CHALLENGES:

Various pollutions : CMR, highway, football...

Appropriately **size the solution** : clean the stream or the pound ?

Keep the solution **nature-based & low maintenance** for long term sustainability

GEOGRAPHICAL LOCATION

France – Rhône (69) - Dardilly

TYPES OF PARTNERS INVOLVED:

Public Horticulture School – National Water Agency – Engineering consultancy service : Biotec

PROJECT BUDGET:

About 25k € for detailed technical studies

NEXT STEPS:

Finance the earthmoving works + plantations



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EU CAP Network Workshop 'Circular water management'

12-13 March 2024

Seville, Spain

All information on the workshop is available
on the event webpage:

<https://eu-cap-network.ec.europa.eu/events/eu-cap-network-workshop-circular-water-management>