

IRRIGATION



OPERATIONAL GROUPS AND INNOVATIVE PROJECTS



Unión Europea

Fondo Europeo Agrícola
de Desarrollo Rural

Europa invierte en las zonas rurales



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OPERATIONAL GROUPS AND INNOVATIVE PROJECTS

Irrigation

EsRuralEsVital

TABLE OF CONTENTS

▶ National

1. Precision Agriculture in irrigation and fertilisation of citrus crops. Increased efficiency in the use of water and of nutrients in the Valencia Community Region *10*
2. Cereals-Water. Sustainability for water and agriculture in the cereal basins *11*
3. Control over reclaimed water for agricultural use: food security and commercialisation *12*
4. Automatic management of irrigation and fertigation in horticultural farming *13*
5. GO AQUA 4.0. Efficient and sustainable water management for fruit and vegetables with innovative tools *14*
6. Platform for knowledge transfer and innovation in IRRIGATION 2.0 (RIEGO 2.0) *15*

▶ Andalucía

7. Precision agriculture as a competitive edge in the Andalusian fruit and vegetable sector *16*
8. Intelligent Thermography Control *17*
9. DESIG: Developing Information Systems to improve management by Irrigation Communities *18*
10. Sustainable management of irrigation water for fruit and vegetables under plastic in western Almeria *19*
11. Inva-Rega: Evaluation of treatments to keep invasive species under control in irrigation facilities *20*
12. The water footprint in the Andalusian ecological sector *21*
13. Sustainable irrigation model for olive orchards by using reclaimed water (REUTIVAR) *22*
14. Smart Ag Services. Advanced precision agricultural service in Andalusian agrarian associations *23*
15. Efficient use of water for greenhouse crops *24*

▶ Aragón

16. Water partnerships in the Ebro-Aragon basin

25

▶ Cataluña

17. Innovation and optimisation of irrigation management in the viticulture sector

26

▶ Galicia

18. Introduction of sprinkler irrigation systems using the liquid fraction of pig slurry

27

▶ Illes Balears

19. Energy improvement for irrigation

28

▶ Región de Murcia

20. AGRO-EVAPO-CONTROL: system to reduce losses due to evaporation from irrigation reservoirs

29

21. Using machine learning techniques to efficiently manage irrigation for vegetable crops

30

22. GENHIDRO: Efficient management of nutrients and water resources in agriculture

31

▶ Programa Horizonte 2020

23. MASLOWATEN: Market uptake of an innovative irrigation Solution based on LOW WATER-ENERGY consumption

32

24. MOSES: Handling water resources: scarcity and droughts

33

25. Profitability of new technology application to achieve maximum irrigation efficiency in a pilot conventional and organic vineyard farm of 100 ha

34

26. SUWANU EUROPE

35

▶ Proyecto Eureka Eurostars

27. SHIFT! Save Water, Save Energy, Save on Costs! Sustainable Hydropowered Irrigation from an Integrated Turbine Pump

36

Introduction

This publication is a compilation of Operational Groups and Innovative Projects for irrigation in Spain. The National Rural Network (NRN) supports and disseminates innovative initiatives in rural areas and fosters the exchange and transfer of knowledge between the main stakeholders in terms of research and its application in practice.

Today, innovation plays a leading role in European, national and local public policies.

The main instrument to promote innovation in rural areas for agricultural productivity and sustainability is the European Innovation Partnership for agricultural productivity and sustainability or EIP-AGRI. The EIP-AGRI intends to speed up innovation in the agri-food and forestry sector in rural areas, and therefore in rural areas, as well as disseminating successful examples of experience in the territory through specific innovative projects. In addition, it seeks to match the range of science available to the demand from different sectors and help solve specific problems or make the most of opportunities in order to help increase competitiveness and improve living conditions in rural areas.

The Operational Groups (OGs) are groups of stakeholders from different sectors: agriculture, livestock, forestry, agri-food and forest-based industries, from public or private R&D&I centres, training and consultancy centres, technology centres, non-profit institutions and more. These parties get together to solve a problem or make the most of an opportunity by using an innovative, multisectoral and collaborative approach via an innovative project. Their work is subsidised by EAFRD through national and regional rural development programmes to set up the group and prepare its innovation project, as well as to implement it.

Furthermore, in the European context, there are also other policies with synergies appearing out of their commitment to innovation in rural areas. The Horizon 2020 research framework programme covers matters related to the agri-food and forestry sectors. Under this umbrella, there are thematic networks and research projects.

This dossier gives the results from the exchange of experiences between Operational Groups and Innovative Projects on irrigation, organised by the NRN, and information units describing the Operational Groups and Innovative Projects, fostered by Measure 16 of the rural development programme in Spain in this matter, as well as Horizon 2020 projects, whether or not they participated in the conference, in order to help disseminate them and enable the various stakeholders to consult them.

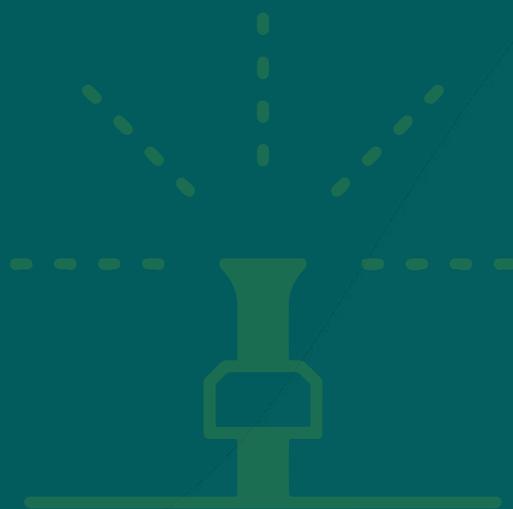
Conference to exchange experiences between Operational Groups and Innovative Projects on the theme of irrigation

On 13 February 2020, the National Rural Network (NRN) organised an exchange of experiences between Operational Groups, innovative projects and others from Horizon 2020 that are working on the matter of irrigation. More than 60 people attended this exchange, representing research centres, agricultural organisations, irrigation communities, cooperatives, companies and different Spanish Autonomous Regions. The conference took place at the El Palomar farm, where the National Centre for Agricultural Training (CENCA) is located.

Objectives addressed:

The meeting was held with the following objectives:

- To put the different parties currently working on innovation in irrigation in touch with each other, compare the projects' different phases of development and foster synergies to tackle the possible problems encountered, seeking to implement solutions and ideas already proven in other territories.
- To help transfer the results obtained from Measure 16 (innovation) of the regional and national Programmes for Rural Development.
- To raise awareness about the results from innovative projects, making the territory familiar with them.
- To foster communication between the EAFRD Operational Groups and the projects being carried out within the context of the H2020 European research programme and Eureka Eurostars on the same matters.



Conference held in three stages:

- **The importance of irrigation** in the agricultural sector throughout Spain was analysed compared to the European Union as a whole. The irrigated area in Spain accounts for 29% of the EU's total.
- The main areas of work carried out by the **National Centre for Irrigation Technology (CENTER)** were described, which concentrate on standardising irrigation equipment and materials, R&D activities on an experimental farm, and training activities to promote technology transfer.
- In order to foster an exchange of innovative solutions in the sphere of irrigation, the attendees were shown a **presentation of 16 Operational Groups, Innovative Projects and H2020 Projects**.



Tour of CENTER by the attendees in the conference organised by the NRN in February 2020

Key ideas drawn:

- The projects presented in the thematic work rooms were at different stages of development, which helped enrich debate and learning arising from the exchange.
- There was a high technical level seen in the projects implemented in the sphere of irrigated agriculture, giving sophisticated solutions to control resources.
- The availability of different existing lines and funding programmes was underlined as an essential feature to carry out projects: NRDP, regional RDPs, Horizon 2020 Programme, Eureka Eurostars, etc.
- A common problem identified was the continuity of the Operational Groups and Innovative Projects.
- An encouraging atmosphere was created among the attendees to collaborate and reflect together on new innovation projects to be carried out in future.

For more information about the conference, click [here](#)



Tour of CENTER by the attendees in the conference organised by the NRN in February 2020

Precision Agriculture in irrigation and fertilisation of citrus crops. Increased efficiency in the use of water and of nutrients in the Valencia Community Region



RURAL DEVELOPMENT PROGRAMME

NRDP - National

YEAR CREATED

2018

PROJECT COORDINATOR

Gil María Campos Alabau

PARTNERS

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Asaja-Málaga

Instituto Valenciano de Investigaciones Agrarias (IVIA)

CEBAS-CSIC

Ignacio Puech

Hemav

Dimagro



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Description

Technology opens up new possibilities for efficient water management, implying a change in habits and organisational relationships in irrigation communities.

The Valencia Community region is the main citrus region in Spain, accounting for 54% of national produce, followed by Andalusia with 31% of the total (MAPA, 2018). Both regions are particularly threatened by climate change and its implications for the availability of irrigation water. Together with the fact that citrus fruits are crops requiring a large amount of irrigation water, this means it is important to use irrigation water efficiently.

This project seeks to implement precision citrus farming by using an efficient irrigation and fertilisation system. This will improve quality and production by using ground sensors and RPAS (Remotely Piloted Aircraft Systems).



Objectives

- Verification of the correlation between practical experience and data from sensorisation on agricultural plots, both in terms of irrigation and fertilisation.
- Creation of a citrus management platform, as well as generating new knowledge and agronomic techniques for planning and managing irrigation and fertilisation.

Expected results

- ▶ Development of technology that is profitable for the owners of the plots, resulting in an improvement in the quality and quantity of the harvest, while reducing or improving the use of water and fertilisers.

“We have learned the great potential there can be in a team where understanding is combined with the desire to improve citrus farming in Spain, as well as the environment and the quality of life of people engaged in agriculture and the communities in which they live”.

Cereals-Water. Sustainability for water and agriculture in the cereal basins

2

RURAL DEVELOPMENT PROGRAMME

NRDP- National

YEAR CREATED

2018

PROJECT COORDINATOR NATIONAL

Ambienta Ingeniería y Servicios Agrarios y Forestales

PARTNERS

Universidad de Córdoba

Universidad de Salamanca

JOGOSA Obras y Servicios

REALIMA S.L.

Confederación Hidrográfica del Duero



<https://ctaex.com/transferecia-tecnologica/GOS-cereal-agua>



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Description

Cereals are an essential crop for the rural economy. Spain, with 23.39 MT of produce and a farmed area of over 6 Mha, is the country with the 4th highest cereal production in the European Union.

This project aims to launch activities for transfer and innovation in monitoring and modelling in three cereal-growing areas: Andalusia, Extremadura and Castilla y León, to achieve a more profitable and sustainable cereal crop.

Objectives

- Increased production, improving quality and profitability, while reducing costs and optimising water usage.
- Improved transfer of science and technology to the agricultural sector, fostering the connections within a theme-based Spanish and European work network.
- Production of healthier crops as alternatives to cereal, in line with the EU's new demands.

Expected results

- ▶ Encouragement for processes of change towards more profitable, sustainable and adapted production.
- ▶ 10% increase in youth and women entering farms.

Creating synergies among the different stakeholders leads to responses being given to tackle the problems in the agricultural sector and the rural environment".



Control over reclaimed water for agricultural use: food security and commercialisation

3

RURAL DEVELOPMENT PROGRAMME

NRDP - National

YEAR CREATED

2018

PROJECT COORDINATOR

Aquambiente Servicios para el sector del agua SAU

PARTNERS

Sociedad Cooperativa Agrícola de San Nicolás de Tolentino

Fundación Cajamar

SAT Las Hortichuelas

Desarrolla Consultores de Investigación y Cálculo SL

Seneca Green Catalyst SL



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Description

South-eastern Spain has a great water deficit. For this reason, the Hydrological Plans include the possibility of recovering and re-using water, at least for use in irrigation. There are currently few kinds of tertiary treatment to purify water that meet the standards of quality for irrigation water, and they are seldom used in wastewater treatment plants.

Through this Operational Group, there are plans to develop a kind of technology or sequence of technologies to provide a solution for treating water to be re-used as irrigation water, at an affordable cost for the agricultural sector.

Objectives

- Solutions found to the environmental problem caused by priority and/or emerging micropollutants in wastewater for re-use in agriculture, watercourses and other water sources.
- Solutions to control and implement renewable energies for water treatment.
- Greater knowledge about the type of emerging contaminant which it is essential to eliminate for each type of crop.

Expected results

- ▶ Coordination in using unconventional water resources and making use of renewable energy resources in the zones where the members of the group are working.
- ▶ Promotion of an agricultural sector that uses water resources efficiently and which is economically viable, productive, competitive and environmentally friendly.
- ▶ Exchange of knowledge and cutting-edge technologies with farmers.
- ▶ A boost to added value given by a closer relationship between research and agriculture in practice.

“Creating synergies among the different stakeholders leads to responses being given to tackle the problems in the agricultural sector and the rural environment”.

Automatic management of irrigation and fertigation in horticultural farming

4

RURAL DEVELOPMENT PROGRAMME

NRDP - National

YEAR CREATED

2017

PROJECT COORDINATOR

Asociación de Organizaciones de Productores de Frutas y Hortalizas de Almería (COEXPHAL)

PARTNERS

Fundación Cajamar | HaciendasBio S.A. | LabFerrer | Aigües del Segarra Garrigues S.A. | Grupo Desarrolla Progrés S.A. | Institut de Recerca I Tecnologia Agroalimentaries (IRTA) | Universidad de Almería | Centro de Investigaciones Científicas y Tecnológicas de Extremadura (CICYTEX)



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Description

The fruit and vegetable sector in south-eastern Spain is seriously threatened by periods of water deficit due to low rainfall, which restricts its productivity. In this regard, research organisations and public entities have been gathering knowledge about how to use water efficiently and adapt irrigation to water needs. However, this knowledge has not been transferred very much to fruit and vegetable farms.

This project proposes to advise irrigators about irrigation management and fertilisation. To do so, there are plans to develop an IT tool to integrate and apply all the agricultural knowledge gathered until now.



Objectives

- Integrating the available agronomic knowledge into a technological tool, using climate data, data from sensors, and information and communication technologies (ICT).
- Drawing up plans for seasonal irrigation and fertigation for the main irrigated crops in the area.
- Introducing the matter of spatial variability into strategies to manage and fertilise commercial plots of land.
- Creation of an automated programming interface for irrigation apps commercially.

Expected results

- ▶ Creation of a computer tool that alleviates some of the workload related to irrigation scheduling tasks.

“It is necessary to appreciate the needs of irrigated farms by developing innovation aimed at them”.

GO AQUA 4.0. Efficient and sustainable water management for fruit and vegetables with innovative tools

5

RURAL DEVELOPMENT PROGRAMME

NRDP - National

YEAR CREATED

2018

PROJECT COORDINATOR

Asociación de Organizaciones de Productores de Frutas y Hortalizas de Almería (COEXPHAL)

PARTNERS

Asociación de Productores y Exportadores de Frutas y Hortalizas de Murcia (Proexport)

Universidad de Almería (UAL)

Proyecta Ingenio

Fundación Cajamar

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Description

The effects of climate change on the distribution and amount of rainfall pose a threat to irrigated fruit and vegetable farms in western Almería. In this context of the irrigation sector's necessary climatic adaptation, technological tools present an opportunity.

GO AQUA 4.0 seeks to optimise integrated management of water and increase the efficiency of its use in irrigation systems for intensive, open-air farming in the south-east of Spain by using innovative technological tools such as big data and the IoT (Internet of Things), thereby enabling the agricultural sector to obtain real-time data to take decisions.

Objectives

- Learning the factors related to the irrigation water's chemical, mechanical and hydraulic properties (pH, conductivity, water groundwater levels, pressure in the water supply system, etc.) to increase efficiency in using it.
- Taking complex decisions based on information with multiple variables.

Expected results

- ▶ An improvement in the integrated management of irrigation water in irrigation communities and in the supply sources (desalinated, reclaimed and rainwater).
- ▶ A reduction in the irrigation system's water, energy and economic footprint, and consequently in the fruit and vegetable production system.
- ▶ An improvement in adaptation to climate change.

"We believe in the importance of conveying results to the sector in a transparent, orderly way, appreciating recommendations from the end users".



Platform for knowledge transfer and innovation in IRRIGATION 2.0 (RIEGO 2.0)

6

RURAL DEVELOPMENT PROGRAMME

NRDP - National

YEAR CREATED

2018

PROJECT COORDINATOR

Universidad Internacional de Riego
(International University of Irrigation)

PARTNERS

Asaja Nacional | José Alberto Benito | David Jorquera | Instituto Andaluz de Investigación y Formación Agraria, Pesquera, Alimentaria y de la Producción Ecológica (IFAPA) | Federación Nacional de Comunidades de Regantes de España (FENACORE) | Instituto Regional y Desarrollo Agroalimentario y Forestal de Castilla La Mancha (IRIAF) | Instituto de Agricultura Sostenible (IAS) | Rivulis Eurodrip



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Description

It is necessary to train people who work in agriculture and introduce new techniques, technologies and crops on farms in order to take on the continual changes in the sector. This Operational Group aims to improve training for agricultural farmers, which will improve the competitiveness of the crops, and particularly of irrigated agriculture. Such knowledge transfer will be carried out through the digital platform known as the Universidad del Riego (University of Irrigation).

Objectives

- Training people who work in agriculture to improve the competitiveness of crops and farms.
- Getting the innovative scientific community involved, meaning R&D&I centres, universities and technology manufacturers, to ensure there is quality knowledge transfer.
- Having a digital platform to provide subsidised online training for professionals and companies in the agricultural sector.
- Designing new activities for knowledge transfer, both on the digital platform and in person throughout Spain.

“Knowledge transfer is the main source of innovation in rural areas”.

Expected results

- ▶ Improved training for the agricultural sector about efficient use of water, ensuring that knowledge arising from research of interest to the sector’s activity is communicated.

“The main challenge we are taking on is to involve all the stakeholders in the sector to participate in the project, efficiently channelling the transfer of technology”.

Precision agriculture as a competitive edge in the Andalusian fruit and vegetable sector

7

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

Asociación de Organizaciones de Productores de Frutas y Hortalizas de Almería (COEXPHAL)

PARTNERS

WISE IRRISISTEM SL

CAPARRÓS NATURE SL

PROYECTA INGENIO SL

Universidad de Almería



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Description

The scarcity of water for irrigation is currently a growing problem, and the market is demanding greater efficiency in agriculture when using it.

The water footprint is an environmental indicator that defines the total volume of fresh water used to produce goods and services; in other words, it tells us how much water it takes us to manufacture a product. These types of indicators are used in certification processes that guarantee the environmental sustainability of agricultural products, such as Global GAP.

This project is intended to support the achievement of sustainable, competitive agriculture, providing the fruit and vegetable sector with a method for calculating its water footprint that enables a crop's impact in terms of water to be recorded, and enabling it to be environmentally certified.



Objectives

- Development of a protocol for calculating the water footprint, fostering the inclusion of Andalusian irrigation farmers in certification processes such as Global GAP, which guarantee that good agricultural practices are being applied.
- Adapting farms to be more sustainable in line with market demands.

“The project can be replicated in all areas of Spain and for all producers, helping to calculate the water footprint for each of them”.

Expected results

- ▶ A record of the impact crops have in terms of water.
- ▶ Learning the impact of a fruit and vegetable crop in terms of water, saving at least 25% of the water used for irrigation.
- ▶ Improved competitiveness for the Andalusian fruit and vegetable sector.
- ▶ Economic diversification for rural areas.

Intelligent Thermography Control

8

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

Asaja - Sevilla

PARTNERS

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COMUNIDAD DE REGANTES DEL VALLE
INFERIOR DEL GUADALQUIVIR

CSIC IRNA

ASAJA Andalucía



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Description

The agricultural sector needs to innovate to ensure farms' profitability while using sustainable practices that safeguard the future of soil and water resources.

This Operational Group aims to improve the irrigation method based on the crop's temperature, known as Intelligent Thermography Control (CIT in Spanish). CIT is a measurement system that uses a camera with sensors to map the entire farm, obtaining thermographic data about the crop to learn its water needs in detail and optimise water consumption.



Objectives

- An improvement on the existing CIT cameras on the market, making them adaptable to any vehicle and adding a computer app to them.
- Providing those who work in agricultural with tools to take immediate decisions about irrigation.

Expected outcomes

- ▶ A contribution to the optimal use of water, energy-saving and a reduction in groundwater pollution.
- ▶ Assured productivity for farms.
- ▶ Soil erosion minimised, respecting the environment.
- ▶ Increased competitiveness for farms.

"To develop this type of project it is essential to offer information and economic aid, and to have efficient and effective employees".

DESIG: Developing Information Systems to improve management by Irrigation Communities.

9

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2017

PROJECT COORDINATOR

Asociación de Comunidades de Regantes de Andalucía, FERAGUA

PARTNERS

IAS-CSIC

Sistemas Abiertos de Información Geográfica S.L.



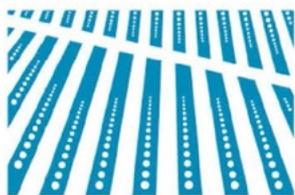
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Description

Modern irrigation management based on information will result in progressive improvements in the efficiency and sustainability of irrigation, and in general of the service provided by irrigation communities. The use and analysis of massive data about water usage and consumption in irrigation communities has significant potential, but simple analysis tools are required.

DESIG has been set up to create a new tool to improve water accounting, management and traceability.

“In remote sensing projects for irrigation, it is essential to implement, maintain and manage GIS, which requires suitably trained, qualified technicians in the irrigation communities.”



FERAGUA

Asociación de Comunidades de Regantes de Andalucía

Objectives

- Identifying technological innovations that can improve the information systems informing the support systems for water management in the irrigation communities.
- Identifying the irrigation communities' demands in order to modernise their management.
- Creation of a new tool to process satellite images.

Expected outcomes

- ▶ Increased digitalisation and automation of the irrigation communities' daily activities by using remote control systems, automatic irrigation programming, remote control of incidents, precise control of consumption and the introduction of geographic information systems (GIS) into irrigation management.

“It is essential to involve the irrigators as end users in innovation projects for implementing new technologies in agriculture so as to achieve greater irrigation efficiency and better management and competitiveness in the markets”.

Sustainable management of irrigation water for fruit and vegetables under plastic in western Almería

10

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

Asociación de Organizaciones de Productores de Frutas y Hortalizas de Almería (COEXPHAL)

PARTNERS

Universidad de Almería

Fundación Cajamar

Junta Central de Usuarios del Acuífero del Poniente Almeriense

Federación de Regantes de Almería



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Description

Fruit and vegetable crops under plastic are widespread in western Almería. The availability of water sources for irrigation and its efficient usage is a necessity on which the future of the sector depends.

This project seeks to evaluate the available water resources, optimise their usage, and carry out experimental studies in plots of land on fertigation strategies with low-quality water that prevent salts from accumulating.

Objectives

- Identifying and defining the characteristics of all available water sources.
- Creation of a Geographic Information System (GIS) at the level of plots of land based on the data collected by users (irrigation communities and the Central Board of Western Almeria).
- Drawing up irrigation and solarisation strategies.

- Fostering a fair yet profitable price for water.

Expected outcomes

- ▶ Fostering the use of GIS in the irrigation communities and the Central Board of Western Almeria.
- ▶ Sustainable management of water and aquifers.
- ▶ Rationalisation of irrigation management in terms of economics, energy, hydraulics and the water itself.
- ▶ Measurement of fruit and vegetable producers' water footprint.
- ▶ Improved productivity for farms.

“By integrating information about the crop's needs, provided by sensors and agricultural management, irrigators can get to know their farm's true situation, enabling irrigation optimisation strategies to be introduced”.



Inva-Rega: Evaluation of treatments to keep invasive species under control in irrigation facilities

11

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

Asociación FERAGUA de comunidades de regantes de Andalucía

PARTNERS

Fundación Pública CENTA

Fundación Caja Rural del Sur

ceiA3



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Description

Invasive alien species are a real threat to biodiversity and the economy. Irrigation infrastructures provide the ideal habitat for such species to take hold, colonising irrigation reservoirs and distribution pipes, and leading to additional costs due to maintenance and greater water and energy consumption.

Inva-Rega aims to improve the irrigation systems being used by applying more effective and efficient physical and chemical treatment to prevent and control the three main invasive species found in Andalusian irrigation: the Asian clam, zebra mussel and bryozoans.

“The potential threat posed by invasive species for Andalusian irrigation comes to 72 million euros, covering energy cost overruns, labour and treatment.”

Objectives

- Testing innovative types of treatment, first in the laboratory and then in the field, using chemical methods (sulphurous acid, chlorination and other oxidants and biocides) and physical ones (antifouling paints, ultrasound and desiccation).

- An evaluation of the effectiveness and economic viability of the different treatment techniques.
- Providing action protocols to better manage the fight against invasive species and improve water usage.
- An estimation of the costs of applying them in the current water system in each of the irrigation communities participating in the Operational Group, based on the dosage of each product applied, volumes of water in regulation ponds, flows, pressures, speeds, etc. in order to verify their economic viability.

Expected results

- ▶ Prevention and control of damage caused by invasive species in Andalusian irrigation, particularly Asian clams, zebra mussels and bryozoans.
- ▶ An improvement in working conditions for traditional procedures in irrigation communities in their daily fight against invasive species.
- ▶ A reduction in water and energy losses in terms of cleaning filters and maintaining water distribution systems.
- ▶ An overall improvement in economic and environmental results in terms of restoring, preserving and improving biodiversity by reducing the effects of invasive species on it.

“It is essential to identify effective and efficient treatments against invasive species for Andalusian irrigation”.

The water footprint in the Andalusian ecological sector



H2020 RESEARCH AND INNOVATION PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

ECOVALIA

PARTNERS

UCO-CeiA3

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Ecovalia



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Description

The organic produce sector is aware that sustainability is necessary for its long-term development, especially as regards water and soil. Such sustainability is necessary from the point of view of farmers, who have to ensure that their capacity for production is not limited by a lack of resources over time, and also from the point of view of organic consumers, who appreciate coherent water management in particular.

Many farmers are already making an effort to improve water sustainability in their farms and industries, but their work is not being recognised in the market. A growing demand for environmental information about agri-food products has been identified, and the sector wants to get the tools to enable it to evaluate and demonstrate an efficient use of water with organic crops by using standardised indicators recognised by the market. To do so, the ISO 14046 water footprint has been put forward as a standardised, recognised indicator for evaluation.

Objectives

- Creation of an efficient irrigation management system for organic horticultural, citrus, olive and berry crops to enable the ISO 14046 standard water footprint calculation indicator to be applied in a standardised, reliable way. This system will allow the amount of water needed by the crops to be used at the necessary time, using the information recorded by remote sensors within the crop plots and transmitted via ICTs to mobile and Internet apps to process the data and take decisions.

Expected results

- ▶ More sustainable production and efficient management of water resources.

“It is possible to broaden the scope of activity to the agri-food industry, in addition to extending the results of the project to other crops”.

Sustainable irrigation model for olive orchards by using reclaimed water (REUTIVAR)

13

ERA-NET PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

Asociación FERAGUA de comunidades de regantes de Andalucía

PARTNERS

Fundación Pública CENTA

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Comunidad de Regantes de Tintín



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Description

Olives are an essential crop in Andalusia, accounting for 55% of the irrigated area. In rural areas, they are the backbone of the social fabric and the motor of the economic fabric. However, there is a downward trend in forecasts for water resources for irrigation due to climate change, which will therefore worsen the water deficit in the Andalusian basins, meaning that new sources of water will have to be tapped for crops of great economic and social importance such as olives.

In addition to opening up new horizons for sustainable development of the Andalusian olive crops by improving the use of reclaimed water and adapting it to this crop, REUTIVAR has also achieved valuable environmental results in line with the aims of the circular economy.

Objectives

- Development of a precision fertigation system based on remote sensors and the use of ICTs.
- Re-use of nutrients with the resulting reduction in diffuse pollution.
- A reduction in the risks associated with reclaimed water by using the "multi-barrier" approach.

"The use of reclaimed water implies a commitment to the circular economy by optimising water, energy and nutrient resources".

Expected results

- ▶ Improved irrigation efficiency.
- ▶ Optimisation and determination of the benefits obtained in terms of lesser use of irrigation water, savings on fertilisers and the impact on productivity.
- ▶ Contribution to the implementation of the current Hydrological Plans in Andalusia.
- ▶ Fostering synergies to transfer knowledge and innovation among the sector's stakeholders.

"We want to extrapolate the results achieved by this project to other rural areas in Andalusia".



Smart Ag Services. Advanced precision agricultural service in Andalusian agrarian associations

14

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2018

PROJECT COORDINATOR

GDR Campiña y Alcores de Sevilla

PARTNERS

GDR Gran Vega de Sevilla

Universidad de Sevilla

Universidad de Córdoba

ASAJA-Sevilla



<http://institucional.us.es/smartag>



grupooperativo@grupooperativo.campialcores.org

Description

Intensive, unsustainable agricultural practices can lead to high consumption of irrigation water and great nitrate pollution of aquifers.

This Operational Group launched the Smart Ag Services project with the aim of making affordable technology available and achieving advanced precision in irrigation and fertilisation techniques, thereby preventing pollution of water flows and underground aquifers.

Objectives

- Using technological tools in the agricultural sector such as wireless sensors, multispectral images, thermal images captured by micro-UAVs (unmanned aerial vehicles or drones), big data and artificial intelligence algorithms.
- Obtaining data and information to take decisions.
- Drawing up irrigation and fertilisation plans to reduce production costs.

"The pilot project is being carried out on wheat, corn and citrus crops".

Expected results

- ▶ Introduction of computer tools to enable data and information to be obtained about farms.
- ▶ Minimisation of soil pollutants.
- ▶ Improved quality and food safety.

"With the introduction of tools like sensors and big data, farmers can make better decisions about what to grow and the right time and place for seeding".



Smart Ag
Services

Efficient use of water for greenhouse crops

15

RURAL DEVELOPMENT PROGRAMME

RDP - Andalucía

YEAR CREATED

2016

PROJECT COORDINATOR

Cooperativas Agro-alimentarias de Andalucía

PARTNERS

Eurocastell Caña, S. L.,

Tecnova

Centro Tecnológico de Investigación y Desarrollo del Alimento Funcional (CIDAF)

Instituto Andaluz de Investigación y Formación Agraria, Pesquera, Alimentaria (IFAPA)



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Description

Localised irrigation is the tool most used to optimise water usage, particularly in arid areas. This irrigation technique allows the volume of water supplied to be adjusted in the vicinity of the roots, leaving more than 70% of the remaining soil area without watering.

This Operational Group plans to set up irrigation strategies to minimise water consumption in greenhouse horticultural crops with low-cost sensors. It proposes to implement different drip irrigation strategies to improve water management substantially while reducing consumption with the following techniques: underground irrigation; high-frequency, low-rate watering; and irrigation with drainage recirculation (in crops in substrate).



Objectives

- Designing and setting up the different localised irrigation techniques.
- Definition of a protocol for timing localised irrigation.
- Studying the crops' organoleptic properties according to the techniques and protocol used in their irrigation management.
- Dissemination and raising awareness about the results obtained among farmers and technicians in the field.

Expected outcome

- ▶ Progress in localised irrigation systems, optimising the use of water by 20% and reducing its consumption by 50%.
- ▶ Simplifying the farmer's work in irrigation tasks.
- ▶ Reduction in excesses of leached water.
- ▶ Improvement in farms' productivity and sustainability.
- ▶ Tastier products by using a good irrigation strategy.

"The synergies among the members of the Operational Group have been one of the keys to the project's success".

Water partnerships in the Ebro-Aragon basin

16

RURAL DEVELOPMENT PROGRAMME

RDP - Aragón

YEAR CREATED

2017

PROJECT COORDINATOR

Colegio Oficial de Ingenieros Agrónomos de Aragón, Navarra y País Vasco

PARTNERS

Colegio Oficial de Ingenieros Técnicos Agrícolas de Aragón
UAGA-COAG
Riegos del Alto Aragón



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secretariotecnico@coiaanpv.org

Description

The sector of irrigated agriculture faces numerous challenges: defining and communicating the role of irrigation; reconciling the different uses of water; adapting European Union legislation to semi-arid zones; and ensuring governance and involvement from society.

This Operational Group was launched with the aim of re-defining these challenges as regards water in participatory terms, involving all the stakeholders with an interest in managing them.

“Dynamics are created in which of all the parties in the sphere of irrigation (technicians, irrigation communities, companies and environmental organisations) communicate in groups to share knowledge, obtaining many ideas, with a very interesting cooperative approach emerging”.

Objectives

- Creation of an attractive participatory model for all stakeholders.
- Generating a database of knowledge and innovative practices for water management in Aragón.
- Disseminating the results to the whole of society, and for them to also serve to back up public policies.

Expected results

- ▶ Improved efficiency in water usage.
- ▶ Economic viability for farms.
- ▶ Support for innovative irrigation policies.
- ▶ A social impact in irrigable zones and in society in general.

“Public participation is fundamental for the parties involved in the activities to consider the results of the projects to be their own”.

Innovation and optimisation of irrigation management in the viticulture sector **17**

RURAL DEVELOPMENT PROGRAMME

RDP - Catalunya

YEAR CREATED

2018

PROJECT COORDINATOR

INNOVI

PARTNERS

Catalan Water Partnership (CWP)



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Description

In the mid-1990s, a ban on irrigating grapevines was lifted as effective rainfall decreased. This led to stances for and against irrigation in the sector. Today, due to the effects of climate change, the vineyards have been converted to irrigation in several zones. This practice is spreading due to studies that stress that the key lies in optimising irrigation management in the sector.

This Operational Group aims to learn what opportunities there are to improve and innovate linked to water management in the Catalan viticulture sector.

Objectives

- Carrying out a study to optimise irrigation management in the viticulture sector, based on the perspective of reducing water consumption, and on innovation in terms of re-using water.
- Making proposals for innovative projects that will enable a more efficient use of water to be achieved.

Expected results

- ▶ Creation of a water cycle management plan in Catalonia.
- ▶ Identification of innovative strategies linked to Industry 4.0 that will enable integrated management of irrigation features.
- ▶ Re-use of water in the viticulture sector.

“Climate change will force us to adapt all farming systems, whether they are of the irrigated or rainfed type”.

Introduction of sprinkler irrigation systems using the liquid fraction of pig slurry

18

RURAL DEVELOPMENT PROGRAMME

RDP - Galicia

YEAR CREATED

2017

PROJECT COORDINATOR

Cooperativas Orensanas (Coren)

PARTNERS

Enxeñería e Xestión Agrorural Azul e Verde SL

Centro Tecnolóxico da Carne



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Description

The nitrogen content of pig slurry means it is a recurrently used fertiliser for different crops. The liquid part of this slurry can be used via an irrigation system.

This project proposes to fertilise plantations through a sprinkler irrigation system using pig slurry. The pig slurry is transformed, separating the solid and liquid parts. The solid part is used for composting whereas the liquid part, which is water with nitrogen, is used to fertilise the crop. This project follows the principles of the circular economy whereby available resources such as manure are used as much as possible within the production cycle.



Objectives

- Avoidance of chemical overfertilisation.
- Extending the period of use for fertiliser made from liquid manure.
- Reduction in costs associated with fertilisers.

Expected results

- ▶ An improvement in farms' profitability.
- ▶ Synergies generated among sectors such as research, engineering, livestock and agriculture.
- ▶ Fostering the circular economy by eliminating restrictions on the use of pig slurry.

"It is important to set up a circular economy system, not only in the agricultural sphere, but in all economic sectors, in order to ensure sustainable development and environmental protection".

RURAL DEVELOPMENT PROGRAMME

RDP - Illes Balears

YEAR CREATED

2016

PROJECT COORDINATOR

Miguel Galmés S.L.

PARTNERS

AGROVER SAT

Catalina Galmés Andreu

Inderen S.L.



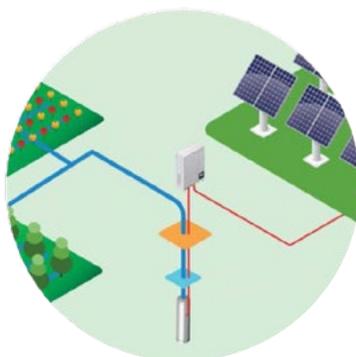
 r.romaguera@inderen.es

Description

The fixed costs of irrigated farms are heavily influenced by the price of fossil fuels. However, environmental and economic sustainability can be given a boost by introducing a renewable energy source.

This project intends to develop an irrigation system using photovoltaic solar panels to generate the energy needed to pump water from wells.

“The progressive increase in the efficiency and performance of photovoltaic solar panels, as well as their falling price in recent years, makes photovoltaic solar technology a very competitive source of energy”.



Objectives

- Development of a direct solar irrigation system.
- Making use of existing mechanical and electrical components, thus optimising costs.
- An evaluation of past and present costs of energy consumption, monitoring of the installation of new features, and an assessment of the system’s technical limitations and the possibilities for it to be replicated on new farms.

Expected results

- ▶ Savings of up to 80% on the energy needed to irrigate by making use of photovoltaic energy instead of fossil fuels.
- ▶ Raising awareness of photovoltaic systems in irrigated farms by organising tours by farmers, professionals and other interested people to the experimental farms.

“In the near future, it is foreseeable that any irrigation project may be associated with the use of photovoltaic solar energy”.

AGRO-EVAPO-CONTROL: system to reduce losses due to evaporation from irrigation reservoirs

20

RURAL DEVELOPMENT PROGRAMME

RDP - Región de Murcia

YEAR CREATED

2018

PROJECT COORDINATOR

Arana Water Management

PARTNERS

ARADA INGENIERÍA

PLANTIAGRO



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Description

The Region of Murcia has some 14,000 irrigation reservoirs for agriculture, though it has been estimated that they lose around 60 hm³ of water per year through evaporation.

AGRO-EVAPO-CONTROL aims to use a system to cover such reservoirs made of floating modules to reduce their evaporation losses, thereby also improving the quality of the water by preventing the build-up of algae in them.

Objectives

- A demonstration of the efficiency of the proposed system in real conditions.
- Designing and manufacturing floating modules, adapting the product and machinery to enable mass production.
- Installation and monitoring of a 600 m² reservoir to check on how it performs.
- Modules made with recyclable material.
- Analysis and dissemination of results.

“Water is a resource that needs responsibility. Making use of it is our challenge”.

Expected results

- ▶ A reduction of 4-5% in the water consumed in crop irrigation, which would mean a reduction in consumption of 50 hm³ per year for the Segura river basin and economic savings of €15 million per year.
- ▶ A reduction in CO₂ emissions by reducing the consumption of energy used in extracting and pumping water. The savings of 50 hm³ a year would mean 2,677.5 metric tonnes less of CO₂ emissions every year.
- ▶ Lower environmental impact thanks to the use of recyclable modules.

“Adapting today’s water needs tackles the challenges of the future”.

Using machine learning techniques to efficiently manage irrigation for vegetable crops



RURAL DEVELOPMENT PROGRAMME

RDP - Región de Murcia

YEAR CREATED

2018

PROJECT COORDINATOR

Jimbofresh Internacional

PARTNERS

Agrícola la Asomada

Agrícola León



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Description

The scarcity of water resources, together with the continual increase in their cost, has fostered more efficient and rational uses of irrigation water. Improper irrigation management, with excessive use of water and nitrogenous fertilisers, leads to an increase in the concentration of nitrate ions in both surface and groundwater, creating a significant source of diffuse pollution by nitrates.

This project aims to implement and verify a tool for monitoring and intelligent back-up for decisions, capable of maintaining optimal water conditions for soil in horticulture so the crop can develop properly while minimising water losses through drainage and preventing nutrients from leaching from the soil, which in addition to impoverishing it, pollutes aquifers.

Objectives

- Installation of a sensor system enabling the soil's water conditions (matric tension and volumetric humidity) and the irrigation flow to be measured, as well as carrying out ongoing maintenance to correct possible incidents.
- Implementation of an intelligent, automatic decision support system to help field technicians draw up reports, making them simpler and more efficient, and allowing a large amount of information to be included.

"The project is replicable for other territories and types of crops."

Expected results

- ▶ A reduction in the volume of water consumed. The reduction achieved so far is:
 - Cauliflower: 30%
 - Iceberg lettuce: 40-45%
 - Mini romaine lettuce: 30%
- ▶ Lower energy consumption.
- ▶ A reduction in fertiliser consumption and therefore in diffuse pollution caused by nitrates leaching into groundwater.

"By interpreting the information gathered by the sensors and issuing reports with recommendations for irrigation, it is becoming possible to reduce water usage".

GENHIDRO: Efficient management of nutrients and water resources in agriculture



RURAL DEVELOPMENT PROGRAMME

RDP - Región de Murcia

YEAR CREATED

2019

PROJECT COORDINATOR

Manuel Soler Méndez

PARTNERS

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Oficar-Agro

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Universidad Politécnica de Cartagena



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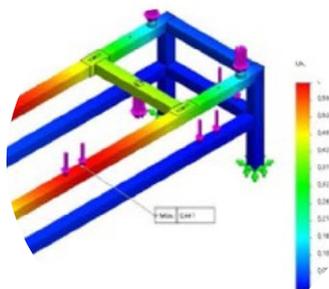


Description

This project was launched in order to achieve sustainable agriculture in terms of water, energy and fertiliser consumption.

GENHIDRO has put forward a system based on a weight lysimeter that measures both the consumption of irrigation water and the fertilisers necessary for the crop. The system can measure variables such as evapotranspiration, soil conductivity, salinity and nutrients in the water, and even the evolution of crop growth. Furthermore, they are developing software to automatically monitor crop irrigation in real time.

The Operational Group includes academic experts, companies and farmers.



Objectives

- Building a fertilisation control device based on weight lysimetry.
- Adapting the electronic systems, software and the communications protocol to control the electrohydraulic circuits.
- Creation of an online platform to improve the management of irrigation and fertilisers.
- Validation of the system developed to manage irrigation and fertilisers in various horticultural crops.

Expected results

- ▶ An increase in gross crop production per cubic metre of irrigation water.
- ▶ A reduction in nitrates.
- ▶ A decrease in economic costs per hectare.

“Cooperation between stakeholders is making it possible to address the difficulties involved in introducing and adapting new technologies to the real conditions of crops, combining all of the parties’ technical, scientific and practical knowledge”.

MASLOWATEN: Market uptake of an innovative irrigation Solution based on LOW WATER-ENERGY consumption

23

RURAL DEVELOPMENT PROGRAMME

Horizon 2020 Programme

YEAR CREATED

2016

PROJECT COORDINATOR

Universidad Politécnica de Madrid

PARTNERS

RKD Irrigación SL | Domus ingeniería energética SL | Sistemas electrónicos progres, S.A | Asociación de investigación para la mejora del cultivo de la remolacha azucarera | Euromediterranean irrigators community


<https://maslowaten.eu/>

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Description

The high cost of electricity associated with irrigation systems on farms has an influence on the competitiveness of irrigated agriculture. The MASLOWATEN project has identified the opportunity to use photovoltaic pumps for agricultural irrigation, thereby increasing both water savings and solar energy consumption.

Objectives

- Verification of the technical and economic feasibility of large-scale photovoltaic continuous pumping systems, using 100% renewable energy for irrigation.
- A reduction in water consumption by using automation, ICT and other precision solutions.
- Introducing photovoltaic irrigation pumps into the market.

Expected results

- ▶ Elimination of electricity consumption from conventional sources in irrigated agriculture.
- ▶ Introduction of large-scale photovoltaic pumping systems.
- ▶ A 30% reduction in water consumption in irrigated agriculture.
- ▶ Improved competitiveness for the companies participating in the project.

“The communication strategy is important to reach end users”.



MOSES: Handling water resources: scarcity and droughts

24

RURAL DEVELOPMENT PROGRAMME

Horizon 2020 Programme

YEAR CREATED

2015

PROJECT COORDINATOR

ESRI ITALIA SPA

The consortium is composed of 16 partners from six countries: Spain, Belgium, the Netherlands, Italy, Romania and Morocco

SPANISH PARTNERS

Universidad de Castilla-La Mancha

Agencia Estatal de Meteorología

Asociación de Comunidades de Regantes de Andalucía (FERAGUA)

Aliara Agrícola S.L.



Description

Digitalisation and automation are essential to make progress in the agricultural sector's efficiency. Specifically, to achieve sustainable development for irrigation, the use of technologies such as remote sensing will enable more appropriate decisions to be made for efficient water management.

The project has been set up to provide a service for the Mediterranean areas of Europe, generating a technological platform that includes satellite images, weather forecasts and mathematical models to calculate crops' water needs.



 info@feragua.com

Objectives

- Development of an interactive map and dashboard to determine the most efficient distribution of water in terms of time and space.
- Efficient management of water and other resources necessary for irrigation work.

Expected results

- ▶ Developing crop classification methods suited to the zone and estimating the water needs of crops so as to manage water efficiently.
- ▶ The results have served as the basis for the DIANA H2020 project, which has made progress possible in developing and studying remote sensing techniques.
- ▶ Fostering the use of remote sensing technologies to improve and optimise the management of irrigation water for irrigators as well as for managers of irrigation systems and river basins.

“Cooperation between countries helps understand Europe's diversity and the need for greater integration of the methods used so as to apply new technologies extensively”.

Profitability in applying new technologies to achieve irrigation with the utmost water efficiency on a pilot ecological and conventional vineyard farm of 100 ha

25

RURAL DEVELOPMENT PROGRAMME

Horizon 2020 Programme

YEAR CREATED

2015 - Finished

PROJECT COORDINATOR

Instituto de Investigación y Tecnología Agroalimentarias (IRTA)

PARTNERS

Codorniu

Comunidad de Regantes de Raimat



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Description

A need was identified in vine cultivation to achieve a balance between the berries' yield and their composition, so as to ensure maximum income from winemaking while also seeking maximum efficiency in water usage.

This project, which has now been completed, has demonstrated how to manage irrigation on a large commercial farm effectively and practically, achieving maximum water efficiency. The method used combines the use of geographic information tools, remote sensing, and crop and irrigation simulation models.

Objectives

- Controlling water stress in plants for each irrigation sector on a pilot farm of 100 ha.

Expected results

- ▶ Savings of 25% in water compared to previous years by using precision irrigation.
- ▶ A reduction in usage of plant protection products and fertilisers by converting to organic grape production.
- ▶ An improvement in the grapes' productive yield and quality.

"The project benefits the viticulture sector by increasing efficiency in the use of water and improving the grapes' yield and composition".

RURAL DEVELOPMENT PROGRAMME

Horizon 2020 Programme

YEAR CREATED

2019

PROJECT COORDINATOR

BIOAZUL

PARTNERS

FENACORE

ASERSA

WEARE - UCO

CECU


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Description

There is a situation of water scarcity in Europe affecting Mediterranean countries above all. Reclaimed water is therefore of interest as an alternative source of water supply, which has been identified in the main international, European and national strategies on this matter.

The SUWANU EUROPE European project aims to improve competitiveness in the sphere of re-using water in agriculture by exchanging knowledge, experience and skills among the main stakeholders so that the organisational and technological solutions already available become widespread and balanced throughout Europe. This will result in a more resilient agricultural sector that can cope with water scarcity and the effects of climate change.



Objectives

- Setting up a participatory process in eight target regions.
- Developing strategies and recommendations for implementation as regards the re-use of water in the agricultural sector.
- Creation of regional networks to support the implementation and adoption of organisational and technological solutions.

Expected results

- ▶ A regional analysis of the factors hindering greater expansion in the use of reclaimed water in the eight target regions.
- ▶ Building up a stable exchange network.

“It is essential to understand that complex problems require multidisciplinary solutions involving different points of view. It is often thought that technology can solve problems by itself, but a combination of many aspects is necessary, such as proper governance or overcoming possible barriers of social perception”.

SHIFT! Save Water, Save Energy, Save Cost! Sustainable Hydropowered Irrigation from Integrated Turbine Pump

27

RURAL DEVELOPMENT PROGRAMME

Eureka Eurostars

YEAR CREATED

2019

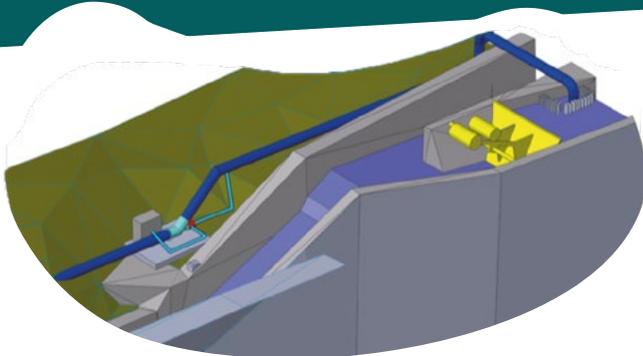
PROJECT COORDINATOR

aQysta Holding BV (Holanda)

PARTNERS

Technische Universiteit Delft (Holanda)

Jogosa Obras y Servicios, S.L.U. (España)



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Description

The most efficient water irrigation systems, such as drip or sprinkler irrigation, need pressure that is usually provided by a pump. These pumps' consumption of electricity or petroleum-based fuels entails high operating costs and greenhouse gas (GHG) emissions for the agricultural sector. The Integral Turbine Pump (ITP) solves both problems, as it is capable of generating enough pressure for water-efficient irrigation using only the energy from small hydraulic jumps.

The ITP mechanically combines a turbine and a pump, thus optimising costs, space, materials and maintenance. The device has been designed for different locations, taking advantage of a small waterfall or artificially creating a minimal one. In addition, it has remote control and monitoring systems.



Objectives

- Serving today's clients (irrigation communities and river basin authorities), enabling them to convert their irrigation more efficiently without increasing running costs.

Expected results

- ▶ Notable savings in production costs with a lower environmental impact than traditional alternatives.
- ▶ Development of a business model to sell pressurised water as a service.

"It is expected to be possible to introduce the pump in industrialised countries as well as in those with fewer resources, since it allows access to efficient irrigation without the need for large facilities".

The NRN is the hub connecting all of the people and entities related to the rural environment with the aim of raising awareness of Rural Development Programmes and providing access to them. At the same time, its purpose is to make the population aware of the importance of the rural environment for our present and our future.

The unit responsible for the NRN is the Subdirectorate General for Rural Revitalization within the Directorate General of Rural Development, Innovation and Agrifood Training of the Ministry of Agriculture, Fisheries and Food.

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IRRIGATION



Unión Europea

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