Sustainable **Water treatment** and
Agricultural reuse options in Europe

Info-package 1
Farmers/Irrigators

Fact Sheet 1.4 – **Decision support systems to monitor irrigation patterns and fertilization needs when using reclaimed water: facts and figures**

Implications of using reclaimed water to obtain labels such as global gap | Effects of reclaimed water on crop quality and yield | Irrigation equipment adapted to the use of reclaimed water (e.g. drippers) | **Decision support systems to monitor irrigation patterns and fertilization needs** | Using reclaimed water in organic farming

SUWANU EUROPE is a H2020 project aiming to promote the effective exchange of knowledge, experience and skills among practitioners and relevant actors on the use of reclaimed water in agriculture. This factsheet is part of a total of 5 factsheets in Info-package 1 aimed at famers and irrigators, that describe useful knowledge and efficient management tools (decision support systems) for nutrient management in the use of reclaimed water in agriculture.

1. INTRODUCTION

Reclaimed water contains valuable nutrients ideal for fertigation. However, this is usually difficult to measure by farmers who hence tend to add the same amount of fertilizers as in the conventional irrigation with freshwaters. This common practice leads to extra costs and potential contamination of soils and groundwaters by nutrient excess. Decision making tools can help irrigators to easily and efficiently manage nutrients for their crops when irrigating with reclaimed water, and hence reduce the risks of environment impacts due to the use of unnecessary surplus of fertilizers.

2. FIGARO, Flexible and Precision Irrigation Platform to Improve Farm Scale Water Productivity

http://www.figaro-irrigation.net/

FIGARO, is a European research project, which aims to increase water productivity in major water-demanding crops and develop a cost-effective precision irrigation platform. FIGARO focuses on significantly reducing the use of fresh water on farm level through developing a cost-effective, precision irrigation management platform. The European-wide consortium developed a holistic and structured precision irrigation platform, which offers farmers flexible, crop oriented management tool with DSS (Decision Supporting System) module to optimize irrigation and fertilizers dosing.

The FIGARO decision support system combines crop growth models with data from satellites, weather stations and field-based sensors to recommend optimal water use for individual fields. Most data input is automatic, minimising the set-up time farmers spend with the application.

Advice is calculated on a processing platform that was designed to work with a wide range of crop models and data sources. This gives users the flexibility to start with a small investment in the basic decision support technology, then add sensors and other data sources later for more precise irrigation strategies.

3. SIRRIMED

http://www.sirrimed.org

SIRRIMED project focuses on the sustainable use of water in Mediterranean irrigated agricultural systems, with the overall aim of optimizing irrigation water use. The approach proposed in SIRRIMED for reaching this goal is based on an Integrated Water Irrigation Management (IWIM) where the improved water use efficiency will be considered at farm, irrigation district and watershed scales. These strategies include innovative and more efficient irrigation techniques for improving water productivity and allow savings in water consumption. SIRRIMED considers the development, test and validation of new deficit irrigation strategies, the sustainable and safe use of poor quality waters and the improvement of precise irrigation scheduling using plant sensors.

4. AGRINUPES

https://www.agrinupes.eu/

AGRINUPES EU project has developed an effective integrated and sustainable monitoring and control system with innovative ion selective sensors for nutrients and bio-based sensing of PPP for optimal water and nutrient supply and reuse, minimizing the effects on the environment. The main project result is the design of an improved fertigation Model Predictive Controller (MPC), which incorporates robustness and fault-tolerant features, as it can meet both the crop needs and the grower yield/costs expectations.

5. DRAINUSE

http://www.drainuse.eu/

The aim of the DRAINUSE project is to demonstrate the feasibility of using a full re-circulation systems for soilless culture in the Euro-Mediterranean region, where more than the 60% of Greenhouse production takes place. This aim will be achieved through a modular and scalable pilot system, easily adaptable to most of the agricultural scenarios in south Europe by just modifying the capacity of their components. The demonstration of a pilot system at a 1:10 scale becomes necessary for identifying potential problems, costs, energy consumption, optimization of key steps and software depuration. The system will be dimensioned as a function of the volume of drainages per day that needs to be recirculated.

6. RICHWATER

https://richwater.eu/es/

RichWater treatment system is based on a compact Membrane Bioreactor (MBR) for wastewater treatment. The design of the MBR has been adapted to the use of the effluent for irrigation of crops. The design of the RichWater treatment system allows to produce high quality effluent free of pathogens by the use of Ultrafiltration membranes while maintaining optimal content level of nutrients adapting the biological processes. The MBR is assembled to a mixing unit where the MBR effluent is mixed with clear water and a minimum amount of fertilisers according to the crop demands. With that purpose, the mixing unit integrates a software for nutrient monitoring which is able to calculate the exact amount of nutrients needed considering the existing nutrients in the reclaimed water and the crop demands. This is done through chemical analyses and nutrient balance calculations, allowing farmers and non expert staff to estimate the total of fertilisers required at each time. The mixing unit is assembled to an irrigation system (i.e. fertigation module) which distributes the nutrient rich mixture of reclaimed water and clear water to the crops.

Reference/further readings

- Less does more with smart irrigation: https://ec.europa.eu/programmes/horizon2020/en/news/less-does-more-smart-irrigation
- Fertigation Management and Crops Response to Solution Recycling in Semi-Closed Greenhouses. https://www.researchgate.net/publication/279429047_Fertigation_Management_and_Crops_Response_to_Solution_Recycling_in_Semi-Closed_Greenhouses
- Soil Monitoring, Fertigation, and Irrigation System Using IoT for Agricultural Application: https://link.springer.com/chapter/10.1007/978-981-10-5523-2_7
- Use of a smart irrigation system to study the effects of irrigation management on the agronomic and physiological responses of tomato plants grown under different temperatures regimes https://www.sciencedirect.com/science/article/abs/pii/S0378377416302608

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THIS PROJECT HAS RECEIVED FUNDING FROM THE **EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME** UNDER GRANT AGREEMENT N. 818088