Modern agriculture focuses on increasing crop yield and its quality, which requires an intense use of water and fertilisers. One of the advances of modern agriculture is the use of soilless culture, which allows further increases in productivity. Open hydroponic systems, a type of soilless culture, are widely present in Europe. In The Netherlands, hydroponics accounts for more than 90% of agricultural production, while in other countries it is around 20%. However, in open hydroponic systems, drainage represents an environmental hazard. Drainage water is typically composed of nitrates (31%) and potassium (48%) applied as fertilisers, with the associated pollution and eutrophication of land and water.

The EU has addressed these concerns in several regulations – e.g. the Nitrates Directive (91/676/EEC) and Groundwater Directive (2006/118/EC), which were both integrated in the Water Framework Directive (2000/60/IEC). The Groundwater Directive aims to preserve groundwater as the most sensitive and the largest body of freshwater in the EU, and it identifies a maximum of 50 mg/l of nitrates while the soilless drainage waters contains between 500-1 000 mg/l.

Full re-circulation systems, also known as closed systems, are an environmentally friendly alternative to open hydroponic systems – but the percentage of European producers that use them in their greenhouses is very low, mainly because these systems need to be specifically designed and adjusted to the specific conditions where production is taking place.
Objectives

The LIFE DRAINUSE project will design, construct and demonstrate a full re-circulation pilot system of drainage reuse that is easily adaptable to most agricultural scenarios in southern Europe. The pilot system will be tested in a 500 m² greenhouse (0.05 ha) housing 952 tomato plants at the Experimental Greenhouse of CEBAS-CSIC, a governmental research facility in Murcia, southern Spain.

The pilot system proposed here will be able to collect drainage stemming from the normal irrigation of the tomato plantation. It will then disinfect the drainage water and adjust its nutrient concentration, pH and electrical conductivity with a view to making it re-usable in a new irrigation cycle. The project will also propose a legal and regulatory framework for drainage recirculation to Mediterranean regulatory bodies in Europe.

Expected results:
- Demonstration of the feasibility of the transformation of open soilless production farms into closed soilless production farms;
- 1,700 m³ of water per ha/year reused (19,040 tomato plants/ha x 11/tomato plant/day = 19.04 m³/ha/day x 30% drainage on average = 5.7 m³/ha/day x 300 days of crop/year);
- 165,000 kg crop production/ha in line with open soilless cycle;
- 30-46 kg crop production/m³ water (which represents an increase in Water Use Efficiency of 20-50%);
- 35% of saving of nitrogen fertiliser used per ha;
- 20% of saving of phosphorus fertiliser used per ha;
- 17% of saving of potassium fertiliser used per ha;
- Reduction in the operating costs of the production farms, demonstrating the feasibility of close soilless systems in the south of Europe; and
- Reduced contamination and higher protection of the aquifers and ecological niches from eutrophication.

Results

Top

Environmental issues addressed:

Themes

Industry-Production - Agriculture - Forestry
Water - Water quality improvement

Keywords
water reuse, water quality

Target EU Legislation

- Water
- Land & Soil

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator: Agencia Estatal Consejo Superior de Investigaciones Científicas
Type of organisation: Research institution
Description: The Consejo Superior de Investigaciones Científicas (CSIC) is the largest public multidisciplinary research organisation in Spain.

Partners: FECOAM(Federación de Cooperativas Agrarias de Murcia.), Spain RITEC(RIEGOS Y TECNOLOGIA S.L.), Spain UMU(Universidad de Murcia), Spain

Administrative data:

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