



### **Water recycled means water saved**

Important knowledge about water and soil from the EU-project SAFIR, is being tested in southern Europe and other areas with insufficient potable drinking water.



High-value crops can be irrigated with recycled water, thus saving valuable potable drinking water. Photo: Janne Hansen

Clean water to drink is in short supply in many places around the world. Global climate change is making a bad situation even worse. With intelligent water recycling for crop irrigation, life-saving drops of the precious liquid can be saved. Scientists and engineers from Universities and private companies in Denmark, Italy, Switzerland, and Israel are contributing knowledge and solutions to the problem in the SAFIR project.

Up to 80 percent of water consumption in southern European countries such as Spain, Italy and Greece is spent on irrigating agricultural crops. Demand placed on the all-important potable water is increasing as potable water becomes in short supply in these areas. What to do? Should the crops thirst? Or should people thirst?

Neither crops nor people need to go without water if the water resources available are used sensibly. In the comprehensive EU project SAFIR scientists from several countries are investigating how this most valuable resource can be used optimally.

### **Recycling water for irrigation**

One of the methods is to treat and recycle waste and grey water and use it to irrigate high-value agricultural crops – typically vegetables. In SAFIR, the company Grundfos Biobooster A/S, Denmark develop advanced, compact biological-mechanical technology for decentralized treatment of municipal wastewater. Also less polluted water is being treated by a new modular system developed by CER, Italy; EAWAG, Switzerland and Netafim, Israel that can reduce pathogens and heavy metals in e.g. river water. Both treatment systems are able to deliver a sufficiently good water quality to feed the treated water into drip-irrigation systems.

The subsurface drip-irrigation systems are manufactured by the company Netafim, Israel. Recycled water typically contains some remaining particles that may stop the water flow in the drip-tubes as well as pathogens, including bacteria. However, with Netafims self-cleaning drip-

emitters it has been demonstrated that is possible to deliver the water underground consistently and very uniformly to the plants. When the water percolates through the soil, many of the pathogens are held back. How clean the water becomes after its journey through the soil depends on how many pathogens the recycled water contains and on soil properties.

Scientists from other workpackages of SAFIR have quantified these processes. Experiments where they poured water infected with various concentrations of pathogens and fecal bacteria like E. coli, on different soil types in a so-called semi-field facility have shown that pathogens did not reach the ground water. Furthermore, plant nutrients present in the polluted water may be used productively for plant growth instead of posing a costly problem of removal. But what about the quality of the vegetables?

### **Healthy food with recycled water**

The studies have documented how contaminated the water may be, before being applied to various soil types under various conditions. This knowledge is used by Grundfos Biobooster A/S in their development of a water treatment facility to evaluate how thoroughly the water needs to be treated before being used under given conditions. Knowledge that will help to minimize the treatment costs. The aim is to recycle water from towns in local communities for use in crops grown close to the towns – which would typically be the case for vegetables.

The studies also indicate that both treatment systems are able to reduce fecal microorganisms to a large extent. Therefore, when the treated water is distributed to the crops via the subsurface drip systems very few bacteria if any reach the eatable parts of the vegetables. The measurements of fecal contamination of the produce at harvest time have always shown very low levels. Risk assessments with respect to the impact on human health confirm that the consumer is not exposed to a higher risk than usual when eating vegetables irrigated in this way.

The various versions of the new water treatment and irrigation systems have been tested in Italy, Crete, Serbia and China using different types of polluted water, and the cost-effectiveness is now being evaluated by SAFIR economists.

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### **Facts about SAFIR:**

- 7.1 million EUR, including 4.7 million EUR from the EU, has been granted to the project.
- Participating in the project are 17 partners from 10 different countries.
- You can read more about the SAFIR project at <http://www.safir4eu.org/>