Theme: Technologies for proper re-use of wastewater in irrigation

Combining methods for wastewater treatment and proper re-use by water saving irrigation

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Abstract

Globally, agricultural irrigation is the number one user of freshwater. Agriculture consumes about 70% of all water withdrawn worldwide, and up to 95% in some developing countries. When it comes to cutting down freshwater demand, it is therefore logical to focus on agriculture and to investigate options in this sector. A recent study by the think tank Ecologic have assessed agricultural water use in the EU30 and suggests that potential water savings by improving conveyance efficiency in irrigation ranges between 10 and 25%, while potential water savings from improving application efficiency are between 15 and 60%. Additionally, significant savings can be expected from changes in irrigation practices (30%), use of more drought-resistant crops (up to 50%) or reuse of treated sewage effluent (around 10%).

Two EU-projects SAFIR (www.safir4eu.org) and WaterWeb (www.waterweb.dk) are both investigating some of these water saving solutions focusing on reuse of polluted water and new irrigation methods. To ensure food safety and quality, the SAFIR irrigation systems combine state-of-the-art water-cleaning technology with high-efficiency irrigation systems. The water treatments consist of either a membrane bioreactor for recycling of heavily polluted water such as domestic wastewater or a modular system suitable for less polluted surface waters. These small-scale devices supply subsurface irrigation systems at field and farm scale. SAFIR has assembled a multi-disciplinary team, with food safety and quality experts, engineers, agronomists and economists to assess potential risks to farmers and consumers. Heavy metals and pathogens are tracked through the whole chain from low-quality input waters, after pre- treatment, in the soil and, finally, in the food products. The results will be useful not only for ensuring the safety of the specific technologies but will in addition provide data for risk assessment in general of various irrigation practices. This will help in setting standards and be used in defining good agricultural practice for re-use of water for product certification schemes.

The first lesson of SAFIR is that low quality water can be used. European and Chinese field experiments with potatoes and tomatoes grown on treated wastewater (vs. drinking water) indicate that contaminants and pathogens are very low in both the irrigation water delivered to the crops and the final product, and that food quality is good. Both project have further investigated the use of the water saving technique: Partial Root-zone Drying (PRD) in tomatoes and potatoes. In the SAFIR project it was found that water could be used more efficiently. Up to 20% of the irrigation water could be saved in potatoes using PRD irrigation methods, which stimulate the plants' own, biological water saving capability by reducing transpiration. The new irrigation technique even holds more benefits, since the marketable yield of potatoes increases with up to 15%. A meta-analysis of two-year data now shows that this is a very consistent, additional benefit of the PRD technique.