New water technology for Spanish agriculture

IRIS treatment converts effluent

By Jeroen Bezem

Irrigating tomatoes and orange trees with partially treated sewage water is the aim of the IRIS project in Murcia in southern Spain. The idea that human waste stays in the water as fertiliser takes some getting used to for many people. The Spanish farmers and horticulturalists can rest assured, however - the IRIS water is better suited for irrigation than the completely clean product from a comparable wastewater treatment plant. Furthermore, it allows savings in surface water, which is scarce (and therefore expensive) in Spain. IRIS was devised in the Netherlands and will be implemented by a Spanish-Dutch consortium.

"It is a shame that the Water Technology Innovation Programme will soon come to an end," says Freddy Dekkers from Mannen van de WIT, a division of the programme. "It facilitated the invention and development of concepts that would otherwise have had little chance." One of the examples he quotes is the Intelligent Reclaim Irrigation System, or IRIS for short. This concept, which he designed, was presented at a workshop during a water and innovation event in Valencia, Spain, in 2009. The workshop explored the possibilities for Dutch-Spanish cooperation in the field of water technology and irrigation, and was organised by NL Agency (the Dutch government's agency for innovation support), theWater Technology Innovation Programme and two parties from Spain, the Spanish Water Partnership and the Centre for the Development of Industrial Technology (CDTI).

Nutrients from waste

The elaboration of this concept has led to a pilot project in Murcia in which several Dutch and Spanish partners are cooperating. Three greenhouses were built on the grounds of regional water treatment company ESAMUR, in which three different types of water are tested for irrigation: Surface water from the Segura river, treated water from the wastewater treatment plant, and irrigation water from the IRIS system. A clear understanding of the potential of IRIS should be gained by September 2014, and Dekker is looking forward to this with confidence: "IRIS is a win-win solution. It solves the wastewater problem in small villages and delivers nutrient-rich irrigation water for local agriculture."

At work:
Three greenhouses in Spain

The pilot project in Murcia is the first large-scale use of IRIS. Three innovative greenhouses were built by Spanish company Rufepa on an undeveloped area of the grounds of regional wastewater treatment company ESAMUR, where plants are irrigated with three different types of water: Surface water, water from a treatment plant and water from the IRIS-system, in which the valuable minerals from raw wastewater are retained. The plant was built by Dutch firm Hellebrekers and the system is based on the lab-on-a-chip technology by another Dutch company, Capilix. This helps make IRIS compact, with the whole system fitting into one ship container. The Spanish company Ritec is responsible for the irrigation technology. The project started in October 2011 and will be completed in September 2014.

to nutritious irrigation water

IRIS only partly treats sewage water. Nitrates and phosphates from human waste remain in the water, which means it is actually enriched with fertiliser for crops. "We use the raw sewage coming in for treatment at the plant," Dekker explains. "The micro-contaminants are removed by leading the water through extra-fine membranes produced in the Netherlands. The challenge was to design the filtering process so that it would not also eliminate nutrients, since we obviously want to leave them in the water. We therefore work with multiple membranes, some of which let the substances through and some don't. After the filtration comes biodegradation and an oxidation step with ozone, UV light or hydrogen peroxide."

Specific conditions

The benefits of this project in the arid south of Spain are obvious, Dekker points out. "The smaller villages in Spain – some 3000 – are obliged by new regulations to treat their own wastewater. Many currently discharge this untreated into surface water. The goal of IRIS is to provide these villages with wastewater treatment and link this to customised treatment of irrigation water, which allows water and minerals to be recovered from wastewater. The project combines Spanish expertise in irrigation and Dutch know-how in water treatment and sensoring."

"As IRIS makes it possible to decentralise the transformation of wastewater to irrigation water, it also offers an economic perspective for smaller communities," Dekker continues. "This type of irrigation makes for more economical agriculture, as minerals from the wastewater no longer go to waste – and this is particularly relevant given the expected future shortages of minerals."

Since the EU's decision that smaller villages must provide for their own wastewater treatment will apply everywhere in Europe, Dekkers expects that IRIS can be commercialised to good effect elsewhere in Europe too. "Especially in eastern Europe there is still some way to go in the field of sanitation."

Spanish-Dutch consortium

The project started in October 2011. The consortium was established within the Innovation Programme for Water Technology (Mannen van de WIT) and consists of the Spanish partners Ritec (for irrigation), Rufepa (greenhouses), CEBAS-CSIC (a research institute) and ESAMUR (the regional water treatment plant), plus the Dutch companies Hellebrekers from Nunspeet (for water treatment and plant technology) and Capilix from Leeuwarden (sensoring).

"These parties would never have come together without the Innovation Programme," Dekkers says. "Hellebrekers, for instance, did not even have plans to export, and it can now successfully distinguish itself from its Spanish competitors thanks to the innovative elements of IRIS. Now that the Innovation Programme is expiring in the Netherlands, we need another way to market Dutch equipment and technology abroad. While we have lots of water technology know-how in this country, we are less good at sales of plants and equipment. The Innovation Programme is like a tree we have planted on which the fruits are now ripened. It would be a shame to let them simply fall to the ground."