More crop per drop

Cath O'Driscoll

Tomatoes grown with saltwater are surprisingly sweet, according to Ragab Ragab, head of water, soils and landscapes at the UK’s Centre for Ecology & Hydrology. Not only do they have a higher sugar content than tomatoes irrigated with freshwater, but they also help to conserve precious freshwater resources, particularly in regions of the world where supplies are scarce.

Agriculture consumes around two-thirds of the planet’s entire freshwater resources. But with less than 1% of the world’s water available as freshwater, while the rest is saline or frozen, growing more of our fruit and vegetables with non-conventional water resources is increasingly beginning to make good sense, Ragab told delegates at the SCI’s recent ‘More crop per drop’ symposium in London.

Modern irrigation technologies mean that today’s farmers use 30% less water to grow their crops than 30 years ago, Ragab pointed out. An estimated one-tenth of the world’s population already eats food produced using wastewater, with more than 26m ha of crop land believed to be irrigated with urban wastewater. However, the largest water reserves on land are groundwater, which hold the equivalent of 200 years of rainfall; more than half of these are saline, particularly in arid regions where they are needed most for irrigation.

Using the planet’s available water resources more efficiently will be critical in helping to achieve the projected improvements in agricultural productivity demanded in the next few decades, researchers at the SCI event agreed. Indeed, water scarcity, rather than land availability, is increasingly the major constraint for farmers in many parts of the world, according to World Bank adviser Chris Perry, adding that a better definition of agricultural productivity would therefore be to use kg/m² rather than the conventional t/ha.

What is needed, Perry continued, is to maximise production per unit of water consumed, which includes the amount of water used in transpiration as well as the amount of water lost by evaporation after application. In fact, ‘more efficient water irrigation usually consumes more water,’ Perry said.

Around 50% of the water currently applied to crops by gravity irrigation is lost by evaporation, wind drift and run-off, or because of over-watering (C&I, 2012, 12, 11). However, many of these water losses could be prevented by adopting conventional tillage practices, which compact and seal the soil and remove the surrounding ground cover that helps water to infiltrate soil, explained Amir Kassam at the University of Reading, UK.

‘Conservation (or no till) agriculture (CA) is an opportunity to save and make money and improve the planet,’ Kassam said. Currently practiced on 125m ha or 9% of cropped land globally, CA avoids the requirement for heavy farm machinery by directly seeding crops into un-tilled soil covered with mulch, and can reduce fertiliser needs by 30–50%; water needs by 30%; fuel consumption by 70%; and pesticide use by 20%, he added. With around 60% of the world’s ecosystems already classed as ‘severely degraded,’ Kassam believes that CA could be a valuable tool to rehabilitate degraded agricultural land and mitigate against further deterioration expected as a consequence of climate change.

New varieties of drought tolerant crops, together with improved monitoring devices for evaluating precise water needs, and avoiding wastage, are other areas of investigation. At DuPont Pioneer, researchers are pursuing a three-pronged approach to developing new plant varieties, involving hybrid, native and transgenic traits, according to the agronomist’s David Warner. Warner said that the ‘most catastrophic’ losses occur when drought coincides with the flowering of the plants.

‘The largest water reserves on land are groundwater, which hold the equivalent of 200 years of rainfall; more than half of these are saline’

Meanwhile, were one outcome of the EU’s SALT-MED project, Ragab continued – aimed at increasing the productivity of irrigated vegetable cropping in salinity-prone land, particularly in Egypt, Syria and Spain. They owe their sweetness to a high soluble solids content, which allows the plant to counter external salinity levels and so avoid dehydration. Floradade tomatoes grown under the most saline conditions consumed, on average, 40% less water than control plants.

In the UK, Ragab pointed out that researchers are also interested in the potential of other novel drought resistant crops such as quinoa (Chenopodium), and Amaranth, nutritionally valuable grains that also consume relatively low amounts of water. Both cereals are already grown in South America and another EU project, SWUP-Med, is now attempting to grow them in parts of the EU and North Africa, Ragab said, with the suggestion that they may be of interest in low-lying coastal regions of the UK.
SCI Strategic plan 2013 – 15
Seeking members' views
In September 2012, the Board held its annual planning day to review performance and agree draft strategic objectives for SCI over the next three year period.

Our Vision is for SCI to be recognised by key influencers in industry, academia and government as a valuable source of multi-disciplinary knowledge and networking, encouraging innovation based on chemistry and related sciences for the benefit of society.

Our Purpose is for SCI to be an open, multi-disciplinary forum connecting scientists and business people in order to advance the application of chemistry and related sciences for the benefit of society.

Our draft objectives for 2013-15 are:
1. Inform, influence and interact on issues where SCI has the knowledge and networks to add value to society
2. Inspire and support a growing, active, multi-disciplinary community of members from business, academia and the public sector who will create networks, share knowledge and be ambassadors for SCI
3. Strengthen SCI's reputation as a trusted source of multi-disciplinary knowledge for industry and academia
4. Promote the benefits of the application of chemistry and related sciences to the government, industry, media and the public
5. Enhance the value of our assets (financial, premises, people and IP) to improve the long-term sustainability of SCI

These were shared and feedback sought at the Members’ Forum. We would now like to invite feedback from all members. You can find an overview of the Strategic Plan on the SCI website at http://www.soci.org/About-Us/Strategic-Plan-2013_15. Please send your thoughts and comments to: communications@soci.org

Joanne Lyall
Executive Director

Event review
More crop per drop
Simon Lightfoot

November 29 saw SCI play host to the first of what may hopefully become an annual conference dedicated to raising water use efficiency. The inaugural More Crop Per Drop was organised by SCI’s Bioresources, Environment, and Science and Enterprise Groups in collaboration with Aqua Enviro and supported by SCI journals: Biofuels, Bioproducts and Biorefining (Biofi), Journal of the Science of Food and Agriculture and Pest Management Science, and the Centre for Ecology and Hydrology.

An esteemed panel of experts presented a wide range of enthralling talks. The morning session, introduced by Dr Alan Baylis (Nuvistix), began with Professor Trevor Tanton (University of Southampton) explaining the complexities of increasing crop yields. Chris Perry, advisor to the World Bank, United Nations Food and Agriculture Organisation (FAO) and Asian Development Bank (ADB), then spoke of the importance of understanding the correct terminology involved with water use, explaining that, perhaps counter-intuitively, more efficient irrigation will normally mean more water consumption.

Professor Amir Kassam, from the University of Reading, and advisor to UN FAO, presented the issue of devastating soil erosion caused by tillage. Lancaster University's Professor Bill Davies stated the dilemma: we need to grow more food with less water. He spoke of alternative ways of reducing the yield gap, such as manipulating root growth and functioning, using genetics and crop management.

David Warner from DuPont Pioneer, examined the impact of the vast drought in the US in 2012; speaking of innovative ways to improve drought tolerance, using advanced crop genetics technologies.

The morning session was concluded by Dr Kevin Moran, IFA Corresponding Member, speaking about the importance of crop nutrition optimisation in improving water productivity.

During lunch, delegates were able to peruse the poster competition that also featured. From the particularly high-quality entries, the judges chose the recipients of a £250 cash prize: congratulations to L Evangelou, C Tsadilas and S Stamatiadis for their winning poster Increasing water efficiency by precision agriculture in cotton cultivations of central Greece.

The afternoon session, chaired by Dr Stewart Neal, of Stewart Neal Associates, was kicked off by Professor Peter Cooper, from the University of Reading, who spoke about studying for evidence-based adaptations to climate change in East Africa.

Dr Paul Hendley, from Syngenta Crop Protection then encouraged us to 'Think globally – act locally', talking about intensive agriculture and strategies to reduce its environmental footprint.

The final talk was from Dr Ragab Ragab, of the Centre for Ecology and Hydrology, who summed up the overriding message of the day nicely when putting out a call for a 'Blue Revolution'.

The eye-opening series of presentations was followed by a lively debate amongst the large, enthusiastic crowd as to whether we will be able to meet the global demand for food in 50 and 100 years’ time. We’ll have to wait and see...

Event group review
Group merger planned
Steve Waller and Prof K. Clive Thompson

During 2012, the Environment Group and the Health and Safety Group committees have been in discussion relating to a merger of the two groups to form a single Environment Health and Safety Group. Both committees have given their unanimous approval at recent committee meetings for this to be completed. The proposal has also been approved by the Membership Affairs Committee and the Board of Trustees.

The merger will take effect from January 2013. The merger is a reflection of how many organisations manage issues relating to health, safety and the environment. The majority of organisations consider issues in any one of these areas under one remit.

The newly merged committee will be able to maximise their resources, in particular the time of the very active committee members, and provide organisational efficiencies for the Society. All external relationships will be retained by the merged groups.

The committee plans to develop its use of electronic communications, initially with the introduction of a web forum for the combined group.

If you are interested in joining the committee, please contact the chairman Steve Waller at steve.waller@stopford.co.uk. Being on the committee will enable you to develop your network of contacts and gain experiences to enhance your CV while contributing to the work and aims of the Society.