

Recommendation

The Parliament place greater emphasis on research and development related to water use efficiency in Australian Agriculture. A longer term strategic approach is where the Parliament could show leadership.

Background

I have attached a scientific paper that provides a technical and scientific chronology of cotton irrigation research and water use efficiency. Cotton is the dominant irrigated crop in the northern basin. The link to the paper is here; <http://www.publish.csiro.au/CP/issue/6658> and the abstract is reprinted below.

Abstract. The aim of this review was to report changes in irrigated cotton water use from research projects and on-farm practice-change programs in Australia, in relation to both plant-based and irrigation engineering disciplines. At least 80% of the Australian cotton-growing area is irrigated using gravity surface-irrigation systems. This review found that, over 23 years, cotton crops utilise 6–7 ML/ha of irrigation water, depending on the amount of seasonal rain received. The seasonal evapotranspiration of surface-irrigated crops averaged 729mm over this period. **Over the past decade, water-use productivity by Australian cotton growers has improved by 40%. This has been achieved by both yield increases and more efficient water-management systems. The whole-farm irrigation efficiency index improved from 57% to 70%, and the crop water use index is >3 kg/mm.ha, high by international standards.** Yield increases over the last decade can be attributed to plant-breeding advances, the adoption of genetically modified varieties, and improved crop management. Also, there has been increased use of irrigation scheduling tools and furrow-irrigation system optimisation evaluations. This has reduced in-field deep-drainage losses. The largest loss component of the farm water balance on cotton farms is evaporation from on-farm water storages.

Some farmers are changing to alternative systems such as centre pivots and lateral-move machines, and increasing numbers of these alternatives are expected. These systems can achieve considerable labour and water savings, but have significantly higher energy costs associated with water pumping and machine operation. The optimisation of interactions between water, soils, labour, carbon emissions and energy efficiency requires more research and on-farm evaluations.

Standardisation of water-use efficiency measures and improved water measurement techniques for surface irrigation are important research outcomes to enable valid irrigation benchmarks to be established and compared. Water-use performance is highly variable between cotton farmers and farming fields and across regions. Therefore, site-specific measurement is important. The range in the presented datasets indicates potential for further improvement in water-use efficiency and productivity on Australian cotton farms.

A long strategic approach is where the Parliament could show leadership

- Water is the major limiting factor to Australia's agricultural productivity yet we do not have a long term strategic Research and Development investment for it.
- The water reform agenda such as the Murray Darling Basin Plan, competing water uses from mining and urban growth, and Australia's highly variable climate patterns are placing record pressure on water use in agriculture.
- Energy prices have increased by 250% since 2000 changing the context of agricultural production systems. Energy costs are a major driver of water use practice.
- There is growing interest in the development of precision and smart irrigation and farming systems which are energy efficient, offer labour savings and maximise input efficiency and profitability.
- Irrigation with poor quality water is becoming a key issue (e.g. CSG water or treated waste water) as is rehabilitation of disturbed agricultural land. This needs investigation.
- Food security and production is now a key part of the policy agenda and there is renewed interest in expansion (e.g. Northern Australia & Tasmania) and transformation of existing irrigation areas.
- Evaporation from farm dams is the major loss pathway and is an international problem requiring innovation for solutions.
- Irrigation is the largest use of water in Australia.
- Infrastructure, technology & engineering solutions alone will not provide the outcomes required - new knowledge; learning sites, adaptation and adoption of current knowledge; and improvement in the skills and capabilities of water suppliers, environmental managers and farmers are crucial to achieving long-term, continuing improvement.
- It is not all about water. For example there are complex interactions between water, energy, labour, nutrient use, crop agronomy, soils, salinity and the water balance that need to be better understood.
- The Governments National Water Use in Agriculture RD&E Committee have discussed similar concepts <http://www.agriculture.gov.au/ag-farm-food/innovation/national-primary-industries>

We need to:

- **Increase Adoption** – putting research into practice more quickly through new approaches such as farmer led network of learning sites to increase farm profitability.
- **Boost Water use efficiency, profitability and productivity** – growing more with less, balancing energy, and other inputs across all scales, markets and uses.
- **Grow technical human capacity and skills** – increased skills base in industry, policy and research sector, effective frameworks for a coordinated, focused, critical mass in research, education, communication and adoption.
- **Develop new innovations and practices** to enable Australia to become the global irrigation leader.
- **Better understand northern MDB river systems with local research and knowledge.**

Future Benefits and Outcomes

- 25% improvement in water productivity over 5 years;
- 25% improvement in irrigation water use efficiency over 5 years;
- Grow regional skills and knowledge and business that contribute to stability and resilience of regional communities.
- Develop new innovations and practices to enable Australia to become the global irrigation leader

A way forward

- The Commonwealth could establish a National Water Use Innovation Network as a joint venture between the Australian Government and key stakeholder groups. This would have several regional hubs in key irrigation areas around Australia.
- This will deliver Government commitments to boost agriculture profitability, improve water management, synergise the water reform agenda and foster prosperous regional communities. Boosting productivity per unit of water used will facilitate socio economic adjustments.
- In essence, it would require a specific \$5-10 million per year to stimulate matched contributions from partners, industry and the States. This additional funding is essential to promote collaboration across the industry sectors as well as the diverse range of research providers from Government agencies, universities and the private sector. It will provide a significant incentive to collaborate and gain efficiencies in Research and development pathways and hence the foundation to address one of Australia's most important issues, producing more from our scarce

water. There are a number of potential programs in different portfolios where this could be prioritised.

- It could be managed by an agreed partner with an independent end user focused Board. It could use some current investments such as the Smarter Irrigation for profit project as a springboard.
- It will provide a 25% improvement in water productivity, efficiency and productivity over 5 years, develop new innovations and practices to enable Australia to become the global water technology leader in agriculture and grow regional skills and business. All this will boost the profitability of farms and regional economies.
- Given many stakeholders are also questioning the lack of science around rural and environmental water management an option could also be to include a program of environmental water research although this would be more complex.
- The Minister could appoint a small oversight implementation committee and host a technical science forum to develop specific RD&E priorities and develop the formal plan. This could be done via the Government's National Water use in Agriculture RD&E committee.

About Dr Guy Roth, Narrabri, NSW

Dr Guy Roth lives in Narrabri, NSW and is currently the Director of Northern Agriculture for The University of Sydney's regional facilities. Guy has worked for 25 years as a scientist, research manager and educator in agriculture. He is Chair of the National Primary Industries Water Use in Agriculture, Research and Development & Extension strategy and leads the Smarter Irrigation for Profit project related to the cotton, dairy, rice and sugarcane industries. Guy was formerly the Chief Executive Officer of the Cotton Catchment Communities Cooperative Research Centre and Program Manager for the National Program for Sustainable Irrigation. In 2016 Guy was awarded the Cotton Industry's Researcher of the Year Award.