

**Senate Standing Committee on Economics**  
**ANSWERS TO QUESTIONS ON NOTICE**  
Innovation, Industry, Science and Research Portfolio  
Supplementary Budget Estimates Hearing 2010-11  
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**AGENCY/DEPARTMENT:** COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION

**TOPIC:** Crop yields

**REFERENCE:** Written Question–Senator Xenophon

**QUESTION NO:** SI-24

1. What research has the CSIRO done in relation to crop yields versus water consumption in different areas of Australia?

- If not are there plans to conduct research into this area?

2. Is this research included in the recent Guide to the Draft Basin Plan by the Murray Darling Basin Authority?

3. What further research will the CSIRO being doing in this area?

**ANSWER**

1. CSIRO and other research agencies have a long history of research and development focused on improving crop yields in the face of constrained water inputs. The work has focused on both dry-land and irrigated farming systems.

Dry-land systems

In dry-land farming systems, the efficiency with which rainfall is transformed to grain and fibre yields is central to the research effort which includes both the development of new varieties and improved farming practices. The varietal work has sought to identify water use efficiency traits in cotton, wheat, grapes. The wheat varieties Drysdale and Rees released by CSIRO exhibit a trait for enhanced water use efficiency. The farming practices work has supported gains in water use efficiency associated with sowing time, stubble retention and minimum tillage, fertilisation practices, seasonal climate forecasting, crop rotations and farming systems design issues to optimise water use within acceptable risk parameters. Currently, CSIRO leads a national Water Use Efficiency Program for the grains industry with funding support from the Grains Research and Development Corporation (GRDC). This effort supports partnerships with 17 regional grower groups and state agencies in all Australian grain growing regions and seeks to raise water use efficiency on Australian grain farms by 10 per cent over the next five years.

For more detail of this initiative, see: <http://www.csiro.au/science/Water-Use-Efficiency.html> and <<[http://www.grdc.com.au/director/events/groundcover?item\\_id=A3BCD243B56150EEA147870C422298AE&pageNumber=2](http://www.grdc.com.au/director/events/groundcover?item_id=A3BCD243B56150EEA147870C422298AE&pageNumber=2)>>

Irrigated systems

The water use efficiency research effort within irrigated systems has focused on cotton and grapes with some recent enhanced activity directed towards irrigated grains and whole of farm design and optimisation. In addition to the efficiency with which crops use the water provided to them, other research has focussed on the efficiency with which water diverted from rivers is conveyed to the crop through the irrigation system.

The IrriSATSMS system developed by CSIRO scientists as part of the Irrigation Futures CRC is an example of technology development that offers potential to improve irrigation water use efficiency. IrriSATSMS combines satellite data on crop development with local weather data to provide irrigation farmers with daily crop water requirements that are delivered over farmer's mobile phones. The system is currently being evaluated in different irrigation regions. This approach has two main aims, firstly to provide growers with an easy to use and understandable daily irrigation water management service and secondly to provide a benchmarking and auditing mechanism to be used by growers and water providers. Further information is available from: <<<http://www.irrigationfutures.org.au/news.asp?catID=8&ID=988>>>

Water use efficiency of irrigated cotton has increased substantially in the past two decades and far exceeds the water use efficiency of all other major cotton producing countries. Major drivers include improved yield levels being achieved with CSIRO's variety program and improved irrigation scheduling and on-farm design.

In grapes, development of new rootstocks and work around partial root-zone drying and deficit irrigation has provided the industry with clear ways of reducing water applications by 30-50%. While this reduces yield, the quality of grapes (colour, tannins etc) is much better and typically gets a higher price point.

Recent work on irrigation options at a whole of farm level in Riverina demonstrate the potential to re-optimize broad acre irrigated farming systems based on low security water in the face of reduced irrigation water availability in ways that can maintain or even grow farm profitability. More detail at: <<<http://www.nccarf.edu.au/conference2010/wp-content/uploads/Donald-Gaydon.pdf>>>

While rice and cotton have traditionally provided highest returns to irrigation farms, CSIRO research support by the GRDC is showing significant potential for inclusion of irrigated grains in the farming system in response to years of reduced irrigation water availability. These changes in turn are stimulating new agronomic research to adapt the farming systems to the new constraints and opportunities. The Australian Production Systems Simulator (APSIM) and APSFarm models developed by CSIRO and partners are proving to be invaluable tools which enable farmers to explore the re-optimisation of their farming system and farm business in the face of changed irrigation water availability. Further detail at:

<<[http://www.grdc.com.au/director/events/groundcover?item\\_id=A3BB3CD2FE639E8F76F924680EB0E1BE&article\\_id=C17A49DCB46A02E185953AC72C8738B4](http://www.grdc.com.au/director/events/groundcover?item_id=A3BB3CD2FE639E8F76F924680EB0E1BE&article_id=C17A49DCB46A02E185953AC72C8738B4)>>

CSIRO has conducted much research on the efficiency of irrigation systems – that is, the proportion of water diverted from a river which actually reaches the crop. The Pratt Water study examined losses in the Murrumbidgee catchment, and concluded that considerable water savings are possible. Details may be found at <<<http://www.csiro.au/science/Murrumbidgee-water-savings.html>>>. Further work on water savings has been conducted to support the Australian Government's Water for the Future program, through the Irrigation Hotspots Project.

<<<http://www.environment.gov.au/water/publications/action/irrigation-hotspots.html>>> CSIRO has

also examined the economics of saving water through infrastructure improvement (see <<<http://www.csiro.au/science/Murray-Darling-Basin-water-incentive-policies.html>>>).

2. The Murray-Darling Basin Authority (MDBA) acknowledge in Volume 1, Section 7 of the Guide to the Draft Basin Plan that:

- A reduction in current water diversions of 3,000-4,000 GL/y (or greater than 29%) would represent a reduction in gross value of irrigated agricultural production of around 13-17%, or \$0.8-1.1 billion per year.
- The Authority anticipates that in the long run, innovation in irrigated and dryland agricultural practices, which would improve yields, reduce water requirements and improve environmental sustainability, would go some way to offsetting the impact of water reductions

See: <<<http://www.thebasinplan.mdba.gov.au/guide/guide.php?document=the-murray-darling-basin&chapter=social-and-economic-considerations>>>

Hence, innovation in water use efficiency is explicitly acknowledged in the Basin Plan as a desirable avenue to reduce the social and economic impacts of reduced water diversions. Section 7.1 of Volume 1 of the Draft Plan explores how shifts in water use towards agricultural industries of higher value might take place over time.

Section 15.7 of Volume 1 of the Draft Plan does explore the potential scope of an “ongoing knowledge and research program” – but no mention is made of knowledge and research to support on-farm water use efficiency improvements.

<<<http://www.thebasinplan.mdba.gov.au/guide/guide.php?document=the-murray-darling-basin&chapter=issues-beyond-the-scope>>>

3. CSIRO believes significant opportunities continue to exist to substantially improve yields and financial returns from irrigation water usage in the Murray-Darling Basin (MDB). Some good research and development (R&D) progress relevant to on-farm water use efficiency has already been made and examples are provided above. The development of formal water markets and greater market values associated with irrigation water resources are likely to be a continuing stimulus for enhanced irrigation water use efficiency. Subject to budgetary constraints, CSIRO aims to maintain and grow where possible our research effort directed at innovation in on-farm water use efficiency in the MDB. We see this being best achieved through strengthened R&D partnerships with innovative farmers and regional irrigation industries covering issues of technology development/adoption, irrigated farming systems optimisation and in some cases knowledge based support for industry restructuring. CSIRO is interested in strengthening such R&D partnerships and is currently exploring what interest exists in the MDBA and other institutions (such as the Rural R&D Corporations) for a program of co-investment in knowledge and research services directed towards lifting on-farm water use efficiency across the Basin.