FACT SHEET

Water Smart Cotton and Grains

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Water Smart Cotton and Grains is a water use efficiency project that improved knowledge transfer and built capacity within these industries to adopt best irrigation practice. It followed on from the achievements of the 'Knowledge Management in Irrigated Cotton and Grains' and 'Advancing Water Management in NSW' projects to further improve water use efficiency within the cotton and grains industries.

Water Smart Cotton and Grains incorporated a comprehensive capacity building program including training workshops, technology demonstrations, consultant mentoring and dissemination of irrigation information, to increase the knowledge and awareness of irrigation best practice and of new irrigation technologies and to improve on-farm water management and irrigation efficiency within the Australian irrigated cotton and grains industries.

In order to know what change in water use efficiency is occurring, industry needs to know how it is currently performing. An important outcome of this project has been the establishment of irrigation benchmarks for the cotton and grains industries. The average Gross Production WUIfarm for the cotton industry for the 2008/09 season was 1.14 bales per megalitre. It confirmed the 40 per cent improvement that was previously found by NSW DPI, since the last industry estimate 10 years ago.

For irrigated wheat, this is the first industry wide data collected. The average GPWUIfarm for irrigated wheat for the 2008 season was 0.85 tonnes per ML.

The collection of high quality water use efficiency data will enable industry representatives and government policy makers to make sound policy decisions based on facts and not estimates. Establishing water use efficiency benchmarks will enable the irrigated cotton and grains industries to monitor and determine the magnitude of industry water use efficiency gains in coming years.

Thirty irrigation and crop consultants worked with NSW DPI and improved their skill and understanding of a range of irrigation services such as soil moisture monitoring, measuring crop water use, irrigation benchmarking, flow metering and evaluating pump performance.

Irrigation training was a major output of this project with a total of 35 training events delivered to 436 cotton and grains irrigators, consultants, retailers and industry personnel. Evaluation from these workshops shows participants have a better understanding of irrigation best practice and learnt skills that they could apply at home including adoption of irrigation benchmarking techniques, improved management of on-farm irrigation storages and increased understanding of irrigation performance evaluation and methods used for assessment, along with greater management skill in operating and maintaining centre pivot, lateral move and drip irrigation systems.

The project included significant collaboration with irrigation industries, research organisations and other extension services, which improved the capacity building opportunities available to irrigators and consultants. NSW DPI Irrigation Officers have built a wide network including key irrigation organisations and personnel with which they have a strong rapport.

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Benchmarking Water Use Efficiency in the Australian Cotton Industry

In Brief

- Due to criticism for its water use, the Australian cotton industry has been proactive in assessing its water use efficiency.
- Four studies have taken place to assess industry water use efficiency.
- The 2008/09 Cotton Industry GPWUIfarm benchmark is 1.14 bales per megalitre.
- There has been a 40 per cent improvement in Gross Production Water Use Index (Bales/ML) over a 10 year period.
- Irrigation benchmarking is crucial if an irrigation enterprise is going to improve their water use efficiency.
- Knowing how you are performing compared to your region or industry facilitates continuous improvement in management and water use.

The Australian cotton industry has borne heavy criticism for its water use and therefore has been proactive in assessing its water use efficiency including studies conducted by Cameron and Hearn (1997), Tennakoon and Milroy (2003), Payero and Harris (2007) Williams and Montgomery (2008) and most recently Montgomery and Bray (2010).

The earlier studies had subtle differences in definitions and methodologies used in estimating water use efficiencies and in 2007 Payero and Harris pointed out "the lack of good annual and robust benchmarking data as an issue that the cotton industry and irrigation sector as a whole needs to address".

Irrigation benchmarking data has in the past not been well recorded, performance indicators generally not well defined and calculations have not been standardised across the industry. There has been significant variation in the calculation of water use indices due to the lack of consistency in measuring the 'water' term. Cotton irrigators talk about producing so many bales per megalitre, but megalitres of what? The water term must be standardised and defined so it is known what 'water' is being included in the calculation (ie irrigation water, rainfall and/or soil moisture).

In order to rectify the lack of "robust benchmarking data" in 2008, NSW Department of Primary Industries (NSW DPI) gained funding from the Cotton Research and Development Corporation, Cotton Catchment Communities CRC and the Namoi and Border Rivers – Gwydir Catchment Management Authorities to benchmark irrigation water use for the 2006/2007 cotton season using WatertrackTM Rapid (Williams and Montgomery 2008). WatertrackTM Rapid is an online irrigation benchmarking tool that evaluates water use and irrigation performance using a range of water use indices, such as Gross Production Water Use Index (GPWUI), Irrigation Water Use Index (IWUI) and Crop Water Use Index (CWUI). It also calculates crop water use and provides an estimation of on-farm water losses. Importantly it produces standardised results that enable meaningful comparison.

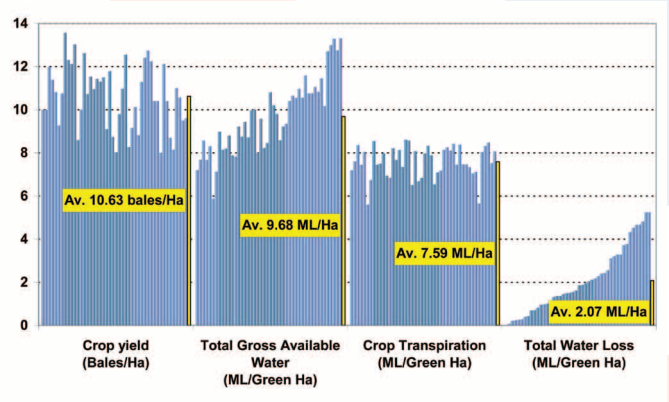
Data was collected from 37 irrigated cotton farms located from Hillston in southern NSW to Emerald in central Qld. The average Irrigation Water Use Index (IWUIfarm) was 1.31 bales/ML and the Gross Production Water Use Index (GPWUIfarm) was 1.13 bales/ML. The data collected in this survey for 2006/2007 showed a significant increase in GPWUIfarm of around 40 per cent since the last attempt carried Tennakoon and Milroy (2003) ten years ago.

NSW DPI received further funding from CRDC to benchmark irrigation water use for the 2008/09 cotton season. Again water use figures were collected from 46 cotton farms located from Hillston to Emerald using Watertrack Rapid™ to provide standardised and comparable irrigation benchmarks.

Like the 2006/07 survey, the 2008/09 data showed a wide range of irrigation performance and water volume estimation and measurement across the industry. It found the average GPWUIfarm for the cotton industry was 1.14 bales per megalitre. This figure is a representative benchmark for the cotton industry for 2008/2009 and confirmed the 40 per cent improvement previously revealed by NSW DPI, since the last industry estimate 10 years ago.

The results for the 2008/09 survey are presented in Figures 1 and 2. Figures 1 shows the results from the 46 cotton farms ranked by their Total Water Loss per Hectare. Each farm is in the same position for each grouping. Also shown are the Crop Yield (bales/Ha or tonnes/Ha), Total Gross Available Water (ML/Green Ha) and Crop Transpiration (ML/Green Ha).

Figure 1



Variation in Total Water Loss compared to Yield, Total Gross Available Water (includes water diverted, harvested, used from storages, rainfall and soil water) and Crop Transpiration for the Australian Cotton Industry in 2008/09

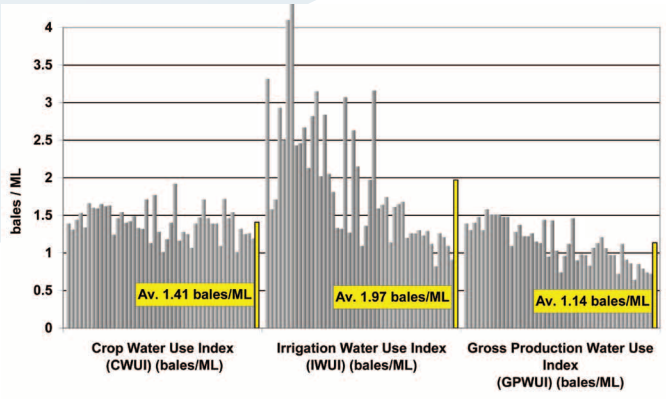
The industry average cotton yield was 10.63 bales/Ha ranging between 8.0 and 13.57 bales/ha. On average the total amount of water used on farm for that crop, shown as Total Gross Available Water in Figure 1 was 9.68 ML/ha, ranging between 5.88 and 13.31 ML/ha. The average crop transpiration was 7.59 ML/ha.

On-farm water losses averaged 2.07 ML/ha. This was around 21 per cent of all water used on farm for the crop which includes water diverted from river and/or bores, water harvested on farm, effective rainfall and stored soil moisture used during the season. Therefore on average, the farms were able to utilise around 80 percent of their water through the plant productively. In this survey, the 6 farms with the highest combined farm water losses were only averaging around 60 percent of their total water through the crop in a productive manner.

WatertrackTM Rapid allows irrigators to quantify the magnitude of water losses and identify if further investigation of a particular component of their irrigation system is required.

Three water use indices, Crop Water Use Index (CWUI), Irrigation Water Use Index (IWUIfarm) and Gross Production Water Use Index (GPWUIfarm) calculated for each cotton farm for the 2008/09 season are presented in Figure 2.

Figure 2



A Comparison of the Water Use Indices calculated using WatertrackTM Rapid for the Australian Cotton Industry in 2008/09

The average CWUI for cotton was 1.41 bales/ML. Crop Water Use Index (CWUI) relates total production to the amount of water consumed by the crop (transpiration). Although not such a useful index for irrigation benchmarking, it is useful for estimating potential crop water use.

IWUIfarm relates total production only to the amount of irrigation water supplied. The average IWUIfarm for the cotton industry was 1.97 bales/ML ranging between 0.82 and 5.72 bales/ML. This figure for the 2008/09 season is significantly higher than the 2006/07 season IWUIfarm figure of 1.31 bales/ML. In-crop rainfall was much higher in the 2008/09 season meaning less irrigation water was used to produce the crop. The 2006/07 season was extremely dry with little in crop rainfall, irrigation water made up on average 88 per cent of the total water supplied to the crop, whereas in 2008/09 the average irrigation water supplied was only 64 per cent of the total gross available water.

The differences in the IWUIfarm between these two seasons illustrate the influence that rainfall has on this index. IWUIfarm can be used to compare between nearby fields or farms in the same season, but as rainfall is not included it is not useful for comparing over significant distances or between seasons.

A more meaningful water use index for comparing irrigation water use between farms and regions and across seasons is the Gross Production Water Use Index (GPWUIfarm). It relates total production to the total amount of water used – all sources i.e. irrigation water, effective rainfall and soil moisture. The average GPWUIfarm for the Cotton Industry in the 2008/09 season was 1.14 bales/ML, ranging between 0.64 and 1.58 bales/ML.

The irrigation benchmarks obtained are very useful at all levels of the industry. They have been crucial is showing how water use efficiency has improved over time. The established benchmarks will continue to be used for future comparisons of water use indices.

Continued collection of this data over time will enable both the cotton (irrigation) industry and individual irrigators to show their rate of improvement in water use efficiency and to also identify potential performance targets.

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Further Reading on Irrigated Cotton and Grains Extension

This NPSI research project aimed to determine how information and knowledge about water management is used by irrigated cotton and grains farmers and advisers.
http://npsi.gov.au/products/pr040957

Funding Acknowledgements

The Final report of this project is on **www.npsi.gov.au**

Grains Research and Development Corporation
www.grdc.com.au

Cotton Research and development Corporation
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