Variety and irrigation strategy: Results from a Darling Downs trial

By Jenelle Hare, QDPI&F and Cotton CRC and Simon White, NCEA

In 2006–07 a field scale cotton variety by irrigation demonstration was established on a 25 hectare site (which had grown a failed sorghum crop in the 2005–06 summer). This site was on a commercial farm in the Nandi area near Dalby as part of the Natural Resources and Water funded Rural Water User Efficiency 3 project.

The varieties assessed were Sicot 71B, Sicot 80B and Sicot 43B (Sicot 80B was also sown in a single skip treatment). The three irrigation treatments applied were:

1. Early (Strategy A) — 80 mm deficit;
2. Commercial (Strategy B) — 100 mm deficit; and,
3. Late (Strategy C) — 120 mm deficit.

The deficits were measured using a Diviner capacitance probe (as per commercial practice). A calibrated neutron probe was also used to measure the true deficit.

Soil moisture in each treatment was monitored using a calibrated neutron probe, a Diviner (commercial practice) and an EnviroSCAN (for continuous soil moisture monitoring). All irrigations were measured and evaluated using Irrimate technologies.

Pre-water commenced on October 16, 2006 and took 36 hours — with a net application of 2.0 ML per hectare. The site was sown on the October 31, 2006.

Adverse conditions after sowing (hot windy conditions after sowing followed by cool and cold weather) affected the final plant population — the establishment ranged from seven to nine plants per metre of row.

Cultural operations and insect management of the site were as per normal commercial practice. Two mirid sprays were applied to all plots and a Pix spray to control vegetative growth was applied to the Sicot 80 B plots.

Rainfall recorded at the site for the season was 147 mm (of which only 45 mm was effective — the remainder fell as numerous small shower events).

Throughout the demonstration there was evidence

of Sicot 80B's more indeterminate growth habit and its suitability for adverse (dryland) soil moisture conditions compared to the other varieties. Sicot 80B consistently maintained a more desirable plant water status prior to irrigation and was the only variety requiring an application of growth retardant in mid January.

In later growth stages Sicot 71B appeared to adapt to all conditions imposed extremely well. Its compact growth habit was very supportive of high fruit retention and large bolls and very little shedding occurred during boll fill.

Strategy C and the single skip were defoliated on March 30, 2007. Strategy A and B were defoliated on April 2, 2007. The second defoliation was applied to the whole site in mid April 2007.

IRRIGATIONS

The irrigation strategies were implemented after the first in-crop irrigation. All irrigations were measured and evaluated using Irrimate. The final irrigation was strategically implemented to achieve desired soil moisture conditions at defoliation. Five irrigations were applied to strategy A, four to strategy B and strategy C, and three to single-skip.

Irrigation water applied throughout the season (including pre-water) is shown in Table 1. Overall on average an additional 0.35 ML per hectare of irrigation water was applied to the early strategy compared to the commercial strategy.

TABLE 1: Water applied (ML/ha) to each treatment

	71 B	80 B	43 B	Irrigations
A (Early)	7.0	7.0	6.9	5
B (Commercial)	6.6	6.7	6.6	4
C (Late)	6.5	6.7	6.7	4
Single skip		5.2		3

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YIELD RESULTS

The site was picked on April 26–27, 2007. The yield results for each plot are shown in Table 2.

TABLE 2: Yield (bales/ha) and GPWUI1 (bales/ML) for each treatment

	Yield (b/ha)			GPWUI (bales/ML)		
	71 B	80 B	43 B	71 B	80 B	43 B
A (Early)	12.4	11.5	11.7	1.66	1.54	1.60
B (Commercial)	11.6	10.6	11.0	1.63	1.43	1.50
C (Late)	10.6	9.8	10.0	1.47	1.33	1.36
Single skip		7.8			1.39	

Gross Production Water Use Index (GPWUI) bales/Ml = Yield / Irrigation water applied + effective rainfall + soil moisture used

Across the range of irrigation treatments the same varietal trend existed. Sicot 71B had the highest yield for each irrigation strategy, followed by Sicot 43B.

Improvement in GPWUI was achieved by irrigation earlier at a smaller deficit than current commercial practice. No benefit was found in delaying irrigations past commercial practice for any variety.

WHAT THE CONSULTANT HAD TO SAY

Q: What was the most important thing you learned from this work?

A: It gave me a better understanding of the dynamics of irrigating and field lay out. The benefits of being able to see the effects of differing soil moisture deficits on a large scale trial, along with getting a better understanding of the crop management needed under the differing irrigation strategies.

Q: What will you do because of these results?

A: I will be implementing a change in the soil moisture deficit I use with cotton, to a smaller deficit. This means a bit more crop management over the life of the crop, but I am confident (depending on seasonal environmental factors) that this will mean a better outcome for my growers, which will aid them in long term sustainability and more efficient use of the water that they have available to them.

Q: What was the most challenging aspect of this work?

A: Timing was probably one of the challenging aspects of the work, and there were a few management issues that came to light with the three different strategies — especially plant height and varietal management — that I will draw on with future work.

WHAT THE GROWER HAD TO SAY

Q: What was the most important thing you learned from this work?

A: From the results of the trial we learnt that our current watering practices do not need any major changes. Using a smaller deficit didn't show any savings in water but it did show an increase in yield, therefore improving the WUE.

Q: What will you do because of these results?

A: This coming season we will run with the lower deficit and will be doubling the syphons on another farm to achieve similar flow rates and watering times.