

Germinating ideas

By CSD Extension and Development Team

Welcome to the first edition of Germinating Ideas for 2009. As the important part of the season fast approaches, this edition will examine late season crop management, the timing of the last irrigation and preparations for defoliation.

Late season crop management

Many crops have maintained very high fruit loads (90 per cent retention or more) this season and have now moved beyond the last effective flower stage. This is a period when a lot of fruit are filling and a lot are most susceptible to shedding. High temperatures and daily crop water demands mean there is little margin for error in the timing of irrigations.

Cotton bolls take about eight weeks of warm weather (750 day degrees) to open. This represents about five weeks of effective flowering and a further three weeks to complete fibre elongation. Any factors that limit the availability of plant resources during this time may reduce staple length, boll weight and boll number (as a result of fruit shedding). From a management perspective, avoiding moisture stress will be most critical in optimising crop performance.

The opportunity for later fruit to make a greater contribution to final yield and quality has become a feature of Bollgard II cotton crops in recent seasons. This can also be the case in conventional cotton crops with a favourable warm finish and light late season pressure from *Helicoverpa spp.*

Deciding how late a crop can be pushed is always a calculated risk. Any delays in picking due to cooler and potentially wetter conditions can seriously affect fibre quality. It is also important to ensure there are adequate resources available to properly finish the crop. Knowing the last effective flower date for the region can assist in working out the amount of later season inputs required.

The plant growth regulator mepiquat chloride (Pix) may assist in a more pre-

cise methodology for defoliation timing. The application of high rates of mepiquat chloride at the last effective square stage has become common practice in many regions to optimise plant size and boll set. This aims to minimise late flowering and crop regrowth so that plant resources are used to produce fruit which will mature in time for harvest.

Ongoing monitoring of inputs is important right through to crop maturity. Excessive nitrogen levels can encourage crop regrowth, inhibit successful defoliation and delay crop maturity. Delays in picking can expose the crop to weather damage including boll rots and other diseases.

Insect monitoring

Careful insect monitoring is required until well into crop maturity. Late season aphid or silverleaf whitefly infestations can result in honeydew contamination. As penalties for sticky cotton are severe, thresholds after first open boll aim to limit contamination to trace amounts. Carefully monitor mite populations until the crop exceeds 20 per cent open bolls.

Mirids, green vegetable bugs and other sucking pests feeding on bolls may cause them to shed (less than 10 day old bolls) or reduce boll size and lint yield (up to 24 day old bolls). Cutting open 12-15 day-old bolls and checking for warty growths or brown staining of lint can indicate the level of damage occurring.

Last irrigation

The timing of the last irrigation is a balance between ensuring that boll maturity is completed without water stress and dry enough to assist with defoliation and limit regrowth. The implications of incorrect timing of the last irrigation and defoliation date are summarised in Table 1.

At the time of the last irrigation, all bolls have been set, vegetative growth is limited and the majority of plant carbohydrates are being used to satisfy boll demands.

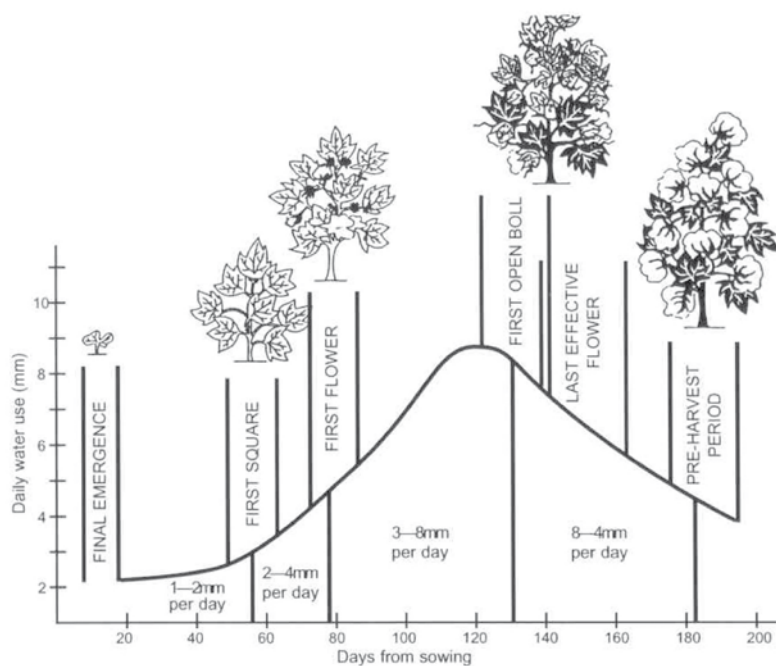
Once a boll reaches 10 to 14 days after flowering it will not shed but if the crop is not fully resourced, fibre quality may be affected. The 'cut-out' boll will generally be between six and four nodes from the ...50▷

TABLE 1: Implications of incorrect timing of the last irrigation and defoliation

	Too early	Too late
Last irrigation	<p>Not enough moisture to complete maturity of last bolls.</p> <p>Yield loss:</p> <ul style="list-style-type: none"> • 2–13% at 20% bolls open • 10–23% 6–8 days prior to boll opening <p>Fibre quality:</p> <ul style="list-style-type: none"> • Reduced micronaire 	<p>Soil profile still wet after boll maturation is complete:</p> <ul style="list-style-type: none"> • Soil compaction at picking • Less 'buffer' if rainfall occurs • Regrowth and defoliation problems
Defoliation	<p>Reduced leaf area reduces carbohydrate supply to final bolls. Possibility of regrowth if picking is delayed. Later maturing bolls opened prematurely.</p> <p>Yield loss:</p> <ul style="list-style-type: none"> • Reduced boll weights <p>Fibre quality:</p> <ul style="list-style-type: none"> • Reduced micronaire • Increased neps 	<p>Greater opportunity for weather damage. Regrowth and trash leading to grade discounts.</p>

Yield reduction from withholding 1 or 2 irrigations estimated from Ozcot cotton crop simulation model, developed by CSIRO Narrabri (Source: D. Gibb).

FIGURE 1: Cotton crop water use through the season



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terminal and is the last harvestable boll on the plant.

Crops coming under moisture stress prior to defoliation (70 per cent open or four Nodes Above Cracked Boll) can have a negative impact on yield and fibre quality – the longer the stress the greater the impact.

There are a number of factors to consider in the determination of the last irrigation date for Bollgard II crops:

- Days to defoliation;
- Boll maturity;
- Crop water use;
- Plant available water; and,
- Soil moisture objective.

Days to defoliation involves an estimation of the time to defoliation (when Nodes Above Cracked Boll = 4) based on the calculation of the rate of boll opening. It takes 42 day degrees, or around three days (four days in cooler regions) for each new boll on each new fruiting branch to open on each new fruiting branch. The days to defoliation can be determined from the number nodes between the cracked boll and the last harvestable boll (first position in each case):

$$\text{Days to defoliation} = (\text{Total NACB} - 4) \times 3$$

When the crop reaches four NACB, the top boll will have reached ‘effective’ maturity. Fibre development on all bolls is complete and defoliation can occur without risk of reducing yield and quality.

Boll maturity is subject to in-field variability due to soil type, slope, gappy plant stands, tipping out and other factors. In these situations NACB does not accurately reflect crop maturity. Sampling bolls below the cut-out boll is important to validate the extent and uniformity of boll maturity. In more variable fields, the number of sampling sites should increase to ensure the irrigation timing and defoliation decision best represents the majority of the field.

Crop water use should continue to be monitored after cut-out, especially during warm weather and if there is a heavy top crop. Those with moisture probes can use real time data, while those without will have to estimate. At the time of first open boll, crop water use may be five to seven mm per day and may decline to around four mm per day prior to defoliation (Figure 1).

Plant available water will be influenced by soil type and structure combined with depth of root activity. At the end of the season the crop may be able to extract moisture below the normal irrigation refill point if deeper root activity is observed.

Soil moisture should aim to be at refill point at the time of defoliation. The number and timing of the final irrigation will depend on the soil water holding capacity (the difference between full and refill point) and the daily crop water use. For early crops maturing in relatively warm conditions, the water use may be high up to defoliation.

More information on the last irrigation and defoliation timing is available on the Cotton CRC's website (www.cottoncrc.org.au) and CSD's Info Centre (www.csd.net.au)



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