

Germinating ideas

Compiled by the
CSD Extension and Development Team

WELCOME to this edition of Germinating Ideas, where we will discuss some of the important parameters leading to high yield potential.

Most cotton crops have now been firmly established and are developing slowly towards squaring and into flowering. Some of the early planted crops in Central Queensland are well into flowering and approaching cut out. As a critical milestone in the development of the cotton plant, attention should now turn to how the crop should look at first flower.

At first flower the water use and nutrient uptake of the crop increases, and management becomes a juggling act to prolong the duration of flowering by balancing vegetative growth and fruit load. One approach is to minimise the effects of crop stress for as long as possible. In the lead up to first flower assessments can be made on the crop's progress and adjustments through management can be made to achieve goals.

During the past couple of seasons, the CSD E&D team presented data from the highest yielding Bollgard II variety trials and those from the CSD Ambassador Network. This included highlighting where these crops were placed at first flower and the subsequent high yields obtained. It should be highlighted that a high NAWF at first flower is not a guarantee for high yields, but it indicates the capacity and also the resilience in the plant to handle minor stresses and setbacks.

Table 1 is a summary of this monitoring. The highest yielding fields all had good plant structure at first flower – the majority were at 16 nodes or above, the average being 16.7 across the three data sets with a range from 14.6 to 19.0 nodes. All crops were above 8 NAWF with an average of 8.82, and flowering 60–70 days from planting. These crops had good size and architecture and the high NAWF demonstrated how well these

crops were growing and also giving these crops the ability to handle stress, especially that from the hot conditions experienced during January 2014 and 2015, and then be in a position to take advantage of the excellent growing conditions experienced in the later parts of the past two seasons.

What you should be aiming for at first flower

TABLE 2: Key cotton growth metrics at first flower to promote high yield potential.

Nodes	16
NAWF	8+
Height	50–60 cm
1st Pos Ret % (north)	80+%
1st Pos Ret % (south)	90%
Growth per node	5 cm

There are a couple of tangible metrics against which cotton growers and consultants can benchmark their crops to see how they are progressing.

Total nodes and plant height

The aim is to have the plant growing healthily up to and through first flower. At first flower the aim should be to have more than 15–16 nodes (6–7 Vegetative nodes; 8–10 Fruiting branches). But caution is warranted not to have the plant growing too vegetative or excessively. Monitoring growth rates during this time helps decisions regarding the use of growth regulators to be made objectively.

TABLE 1: First flower snapshot of high yielding CSD variety trials 2013–14 and top yielding Ambassador Network Sites 2014–17 seasons

	High Yielding CSD Variety Trials 2014–15			Highest Yielding CSD Ambassador Sites 2014–15			Highest Yielding CSD Ambassador Sites 2015–16			Highest Yielding CSD Ambassador Sites 2016–17		
	Yield b/ha	Nodes @ 1st Flower	NAWF @ 1st Flower	Yield b/ha	Nodes @ 1st Flower	NAWF @ 1st Flower	Yield b/ha	Nodes @ 1st Flower	NAWF @ 1st Flower	Yield b/ha	Nodes @ 1st Flower	NAWF @ 1st Flower
A	13.1	16.3	8.3	15.0	17.9	10	16.0	16.1	8.7	13.5	16.6	9.0
B	13.2	16.7	9.4	15.2	17.7	9.7	16.2	15.6	8.5	13.4	17.9	8.0
C	13.3	17.2	9.2	15.2	16.7	8.4	16.3	15.5	8.8	12.9	19.0	8.0
D	13.5	16.4	9.4	15.5	16.8	8.2	16.4	18.0	8.3	12.8	17.3	9.3
E	14.6	15.9	8.5	15.8	16.4	8.4	16.5	18.0	8.9	12.8	17.2	9.2
F	14.8	14.6	8.4	16.2	17.2	9.1	16.8	18.1	8.6	12.3	18.8	8.2

FIGURE 1: Node production in the pre-flowering period – CSD Variety trials and Ambassador Network data 2014–17

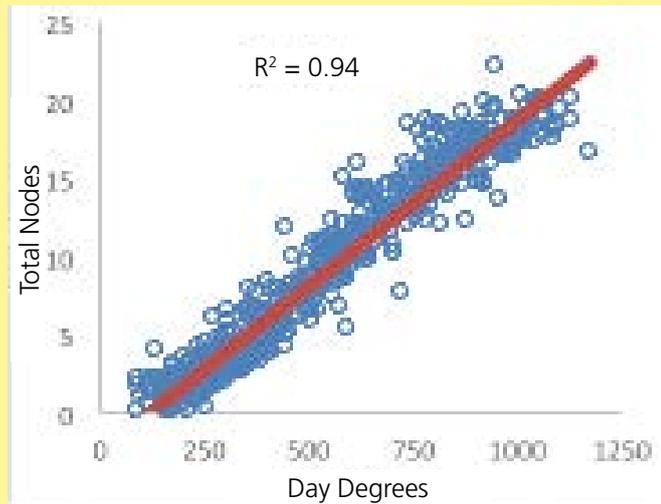


Figure 1 shows CSD data collected from crops over the entire Australian cotton industry. The data has been quite consistent whether it comes from Emerald or Darlington Point.

At first flower, plant height is expected to be about 50–60 cm, (although height is less important than overall plant health) aiming to have a frame that will support a high fruit load during the flowering period. New node vegetative growth rate should not exceed six to seven cm per node at this time.

First square normally occurs at approximately 505 day degrees'

post planting and that square should flower approximately 270 day degrees after this. In reality first square may occur a little bit slower than this, dependent on the average temperature experienced, number of cold shock events and setbacks from seedling diseases or insect damage.

CSD, in partnership with Syngenta, has developed resources and tools which highlight and promote early season growth through the FastStart program. Figure 2 shows the schematic of how the cotton plant should look. The metrics are also shown in Table 1 and are a guide to crop development.

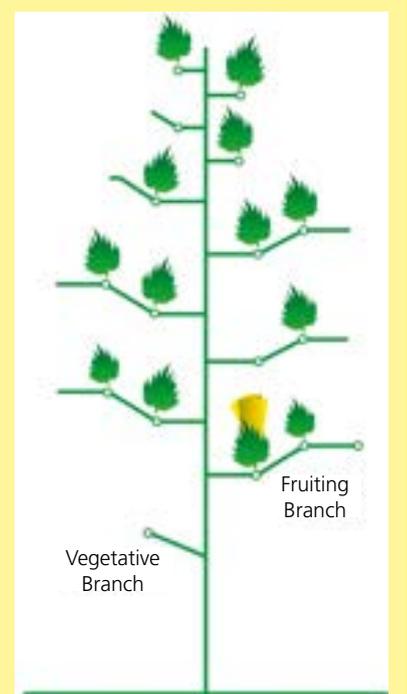
Table 3 shows a breakdown of the mid-squaring and first flower, first position fruit retention. As more nodes are put on, there is normally a lift in the first position fruit retention at first flower. Of note were the lower retention figures recorded in 2016–17 because of the higher insect pressure experienced. Additionally, the levels of first flower retention is higher in the higher (12.5+ bales per hectare) yielding fields compared to the crops which yielded 10–12.5 bales per hectare

TABLE 3: The first position retention percentages recorded pre-and at first flower for CSD Ambassador Network Crops 2014–17

	Mid Squaring Snapshot	1st Flower Snapshot
@ Day Degrees	700	900
2014–15 Season	74.4%	83.8%
2015–16 Season	81.5%	83.7%
2016–17 Season	60.5%	71.6%
High Yield Data Set		
Yields b/w 10–12.5 b/ha	65.8%	72.8%
Yields > 12.5 b/ha	80.3%	83.5%

At first flower, crops should carry between 60 to 80 fruits per metre depending on the plant stand. Higher fruit loads at this time will have a tendency to burden the plant and management will need to recognise this and respond with water and nutrients before this boll load slows crop growth.

FIGURE 2: Schematic of the CSD Ambassador Network/FastStart Cotton snapshot targets



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Nodes above white flower (NAWF)

The NAWF measurement is a function of the rate of growth from first square to first flower. At first flower the aim should be to have the NAWF value in excess of eight. High NAWF values can be used as a shock absorber, enabling the crop to better cope with minor setbacks and stress such as a couple of days of hot temperatures. If it is lower than this value, the crop will need careful management through the flowering period to prolong the reproductive life of the crop.

Higher NAWF figures can mean excessive growth but the values should be considered in conjunction with plant height and node ratios and the fruit load to see if further management is required to slightly check the plant with growth regulators.

Begin monitoring for NAWF when approximately half the plants have a pink or white flower on a fruiting branch. Count the number of nodes above the highest first position white flower, including the node nearest the terminal with an associated unfurled leaf approximately the size of a five or 10 cent piece.

NAWF should continue to be monitored throughout the flowering period to help assess the performance of the crop. The

longer the period that crops can be kept flowering, the higher their yield potential.

One thing you cannot plan for is the climatic conditions. All you can do is have the plant in the best possible shape to perform to its potential, no matter what the season throws at you. Having a plant conforming to these ideals will assist, regardless of the seasonal conditions – the crop will be able to absorb and rebound from stress.

Irrigation timing

Irrigation trials over previous seasons have shown that irrigation management is extremely important in setting up the crop for high yields.

The timing of the irrigation is critical and a delicate balancing act in keeping the crop growing healthily without hindering root expansion and ensuring minimal waterlogging. Irrigation timing also has the ability to extend the flowering period, as well as rescue struggling crops, temporally boosting NAWF directly after an irrigation event.

The irrigation around first flower is a critical decision not only for the reasons stated above, but it also plays an important role in ensuring the growth targets desired at first flower are met.

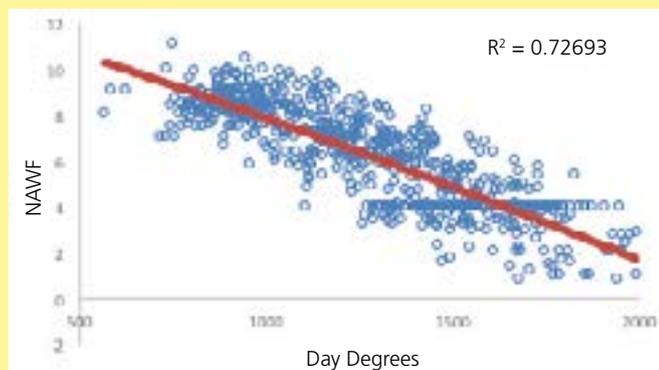
There is a difference between non Bollgard and Bollgard crops. Table 3 shows the comparison in stress tolerance. In Bollgard II crops there is greater impact of mistiming the early irrigations around squaring and first flower, due to the higher fruit retention level and fruit load which requires careful management and monitoring.

When looking at the utilisation and timing of limited water, growers should try to concentrate irrigation water to where it will generate the most yield.

For further information in relation to any of the topics mentioned in this article, please contact your local CSD Extension and Development Agronomist or visit the CSD website (www.csd.net.au).

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FIGURE 3: Average decline of NAWF for CSD Ambassador Network crops during the flowering period (2014–17).



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