Why NAWF is important at First Flower

15th Dec 2017

FACTS ON FRIDAY

A critical milestone in the development of the cotton plant is the production of the first flower. At this time the plant starts to generate yield. Additionally, the water use and nutrient uptake of the crop increases, and management becomes a juggling act to prolong the duration of flowering by minimising crop stress for as long as possible. At this time assessments can be made on the crop's progress (Table 1) and adjustments can be made to management to achieve yield goals.

A general aim to maximise yield potential should be to extend the flowering period for as a long as seasonal and climatic conditions dictate. The more flowers produced then generally the higher the number of bolls and therefore higher yield potential.

Table 1: Key cotton growth metrics at first flower to promote high yield potential.

Nodes	16
NAWF	8+
1st Pos Ret % (north)	80+%
1st Pos Ret % (south)	90%
Growth per Node	5cm

First square, in theory, occurs at approximately 505 day degrees post planting, and that square should flower approximately 270 day degrees after this. For a calculation of the day degrees your crop has experienced, go to www.cottassist.com.au. The changes in the NAWF measurement captures the rate of new node development along with the period between squaring and flowering. Less nodes above the last white flower means that there has been less growth occurring whilst that the last white flower has developed from a square to a flower. In practice, the plant normally flowers at approximately 70 days post planting or 900 day degrees.

What to look for:

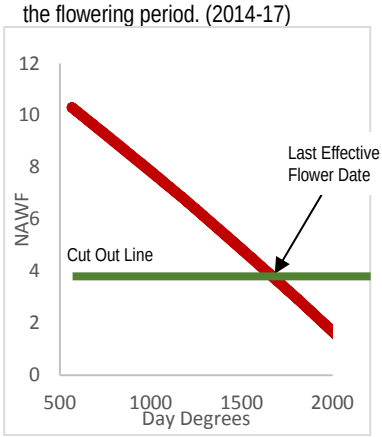
The cotton flower extends from within the square, and in most cases it is fertilised before the white flower opens. Once fertilisation occurs, the flower turns pink, withers and falls to the ground leaving a developing boll.

It's important to get into the crop and begin monitoring for NAWF prior to flowering. First flower occurs when approximately half the plants have a pink or white flower on the lowest 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 5-10 cent piece.

What you should be aiming for:

At first flower, the aim is to have a plant structure which has 8+ NAWF. Over the following months the number of nodes above white flower will decrease, normally at a rate of 0.5 to 1 node per week. Once the NAWF reaches 4 then the plant has effectively stopped producing new fruiting sites. At this stage, the carbohydrate demand by the plant from developing fruit out-matches supply from the leaves.

Figure 1: Average decline of NAWF for CSD Ambassador Network crops during the flowering period. (2014-17)



The carbohydrate supply versus demand relationship is why the NAWF can indicate crop growth or the impact of stress, whether it be active or slowing. Using Figure 1 as an example, crops with NAWF above the line are progressing well, while those below the line are suffering from a stress of some sort and may require extra management input.

The Crop Development Tool located on the CottASSIST website has refined monitoring of NAWF. The tool now enables the management of NAWF and cutout based on last effective flower (LEF), or it allows users to define their own NAWF target line based on NAWF measurements and their own LEF date for a season or region. It can highlight the time to cease maintaining an actively growing crop depending on the date of the LEF for your location. This will obviously vary from season to season and region to region, so using a long-term average date is a good guide to how a crop is tracking in the first instance. Producing fruiting sites after the date of last effective flower can be inefficient in terms of resource use, and these bolls can have difficulty maturing, contributing fibre quality issues without any yield gain.

Having a high NAWF indicates that the plant is actively growing and will continue to retain fruit on the upper and outer fruiting branches. Additionally, a high NAWF can be used as a 'shock absorber', enabling crops to cope with minor setbacks and stresses such as a couple of days of hot temperatures. When stress hits a crop with NAWF below six, it can be difficult to regain growth, as the crop can quickly cut out prior to remedial action.

Table 2: CSD Variety and Ambassador Network data concerning the length of flowering (2014-17)

	Days of Flowering	DD of Flowering	Yield (b/ha/DOF)	Yield (Kg Lint/DDOF)	Ave. Yield (b/ha)
2013/14	40	632	0.29	4.2	11.7
2014/15	44	640	0.31	4.9	13.4
2015/16	47	679	0.29	4.6	13.8
2016/17	35	588	0.31	3.8	10.3

As mentioned earlier, the longer the flowering period the more potential to set more bolls so the yield potential increases. Table 2 shows data collected from CSD variety trials and Ambassador Network sites in the past four seasons. Remembering that this is data collected from right across the Australian cotton industry and averages can hide a lot of variability, it shows that the consistent figure in generation of yield when measured on days or day degrees of flowering. The data set highlights how extending the flowering period within seasonal constraints can increase yield potential. Encouragingly, in the time span of the analysis, the length of days and day degrees flowering has increased each year

This data suggests that to obtain yields greater than 12.5 bales/ha, the crop needs to be flowering for 40 to 50 days. This is not to say that high yields cannot be achieved in shorter flowering windows, as there is a high level of variability in this data. Remember, yield is a function of boll number and weight and encouraging healthy growth of heavier bolls helps to achieve high yield outcomes.

COMPILED BY THE CSD EXTENSION & DEVELOPMENT TEAM, FOR MORE INFORMATION CONTACT

James Quinn	Robert Eveleigh	Bob Ford	Jorian Millyard	Chris Teague	Chris Barry	Sam Lee	Alice Devlin	Craig McDonald
0428 950 028	0427 915 921	0428 950 015	0428 950 009	0428 950 021	0491 212 705	0427 437 236	0418 818 142	0484 513 566
jquinn@csd.net.au	roberte@csd.net.au	bford@csd.net.au	jmillyard@csd.net.au	cteague@csd.net.au	cbarry@csd.net.au	saml@csd.net.au	adevlin@csd.net.au	cmcdonald@csd.net.au

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In the early flowering period, cotton with less than 8 NAWF may respond to additional inputs such as nitrogen and more frequent irrigations. Where the number of NAWF is decreasing, generally the use of Pix will not be necessary, and early applications prior to cutout in these cases may be detrimental to yield. Alternately, if NAWF is above 8 and the boll load is low, late Pix applications may be required mid-season to slow vegetative growth and allow optimal fruit production.

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jquinn@csd.net.au	roberte@csd.net.au	bford@csd.net.au	jmillyard@csd.net.au	cteague@csd.net.au	cbarry@csd.net.au	saml@csd.net.au	adevlin@csd.net.au	cmcdonald@csd.net.au