MANAGING FOR CROP MATURITY IN NORTHERN AUSTRALIA

AUTHOR: PAUL GRUNDY,
COTTONINFO/QDPI

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In rain grown crops in Northern Australia, the onset of the dry season will nearly always induce cut-out before cool conditions can disrupt lint yield and fibre quality.

However, in irrigated crops, managing for crop maturity can be challenging, and a number of factors need to be considered when deciding on the appropriate time for crop cut-out.

An essential factor is the amount time remaining in the season to allow boll setting and subsequent maturity. Ideally, a crop should have at least 60% of the boll load mature prior to the regular onset of cool nights.

Maturity assessment also needs to take into account the boll distribution within the canopy, as shedding and subsequent compensation can lead to an inverted boll load with a higher proportion of bolls in the upper half of the canopy.

Regions such as Kununurra and the Douglas Daly remain warm enough overall throughout the dry season to enable continued cotton growth and development, while the Flinders region of north Queensland (which is further from the coast and a higher latitude) experiences much colder overnight conditions and can even frost from June onwards (Table 1, final page) due to its more arid environment.

Continued growth throughout the dry season in more northerly regions (latitude ≤16°S) is possible, but potential exposure of a large proportion of developing bolls to cool nights (≤11°C) poses a risk for fibre quality discounts, particularly in cooler than average seasons.

Given that no two seasons are the same, the question is how to balance yield potential by making the most of warm sunny conditions after the wet season, before the impact of cold nights begins to outweigh those gains, particularly for crops that need to compensate for wet season losses or that are planted later (after mid-March).

The time for a newly initiated square or open flower to develop into a mature boll can be reliably predicted based on temperature and the accumulation of heat units known as day degrees.

To consider the potential impact of seasonal variability of temperatures on development rates, boll periods can be modelled for each year of historical weather records for each region to determine the likely timing between cut-out (setting of last effective flowers) and maturity.

A desired crop maturity date can then be used to hindcast when the last effective flower or square is likely to have occurred at a given location, and from this the potential risk of cold nights (or even frost) identified.

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Percentiles for each region based on the long-term weather record indicate when the early, typical and late timing of a particular temperature threshold might occur.

For example, looking at cold night risks, the 20% percentile date indicates the earliest this event is likely to happen, 50% indicates the date it would normally begin to occur and 80% means it has likely to have happened by this date.

This information can then be used to balance appetite for risk with the seasonal temperature outlook and decide when a crop might be best managed for cut-out to ensure a given level of crop maturity by the time cool temperature risks might emerge.

If a cooler than average season is forecast it may be prudent to manage last effective flower so that crop maturity is achieved by the 50th percentile date (note these dates are when the last pickable boll would be mature, not the 60-70% maturity of all bolls that have been set).

For an expected warmer than average season the 80th percentile may be appropriate. For example, in Kununurra this would mean achieving cut-out between 17th May and 3rd June for a cooler than average season or 3rd -19th June for a warmer than average forecast to best avoid fibre strength or micronaire issues.

Use Table 1 (final page) to select a desired crop maturity date and then manage for cut-out accordingly, keeping in mind other management factors that also need to be considered.

For example, varietal selection can play a role, as the inherent micronaire and strength characteristics of some varieties might partly offset the usual cool temperature impacts.

Achieving cut-out at the desired time will also depend on managing irrigation, crop nutrition and mepiquat chloride applications as mepiquat alone can be insufficient to bring about cut-out if a crop is experiencing warm conditions with access to high nitrogen and soil moisture.

Carefully managing for timely maturity is essential.

A longer flowering period during sub-optimal conditions not only poses fibre quality risks but also comes with pest management challenges and can also substantially delay picking, creating a knock-on effect for other farm operations.

Picking in October is also less than ideal due to temperature constraints and the increased risk of early season storms.

This information was prepared by Paul Grundy (CottonInfo/QDPI) and utilised boll maturity modelling data provided by Michael Bange (Cotton Seed Distributors).

Managing for crop maturity in Northern Australia

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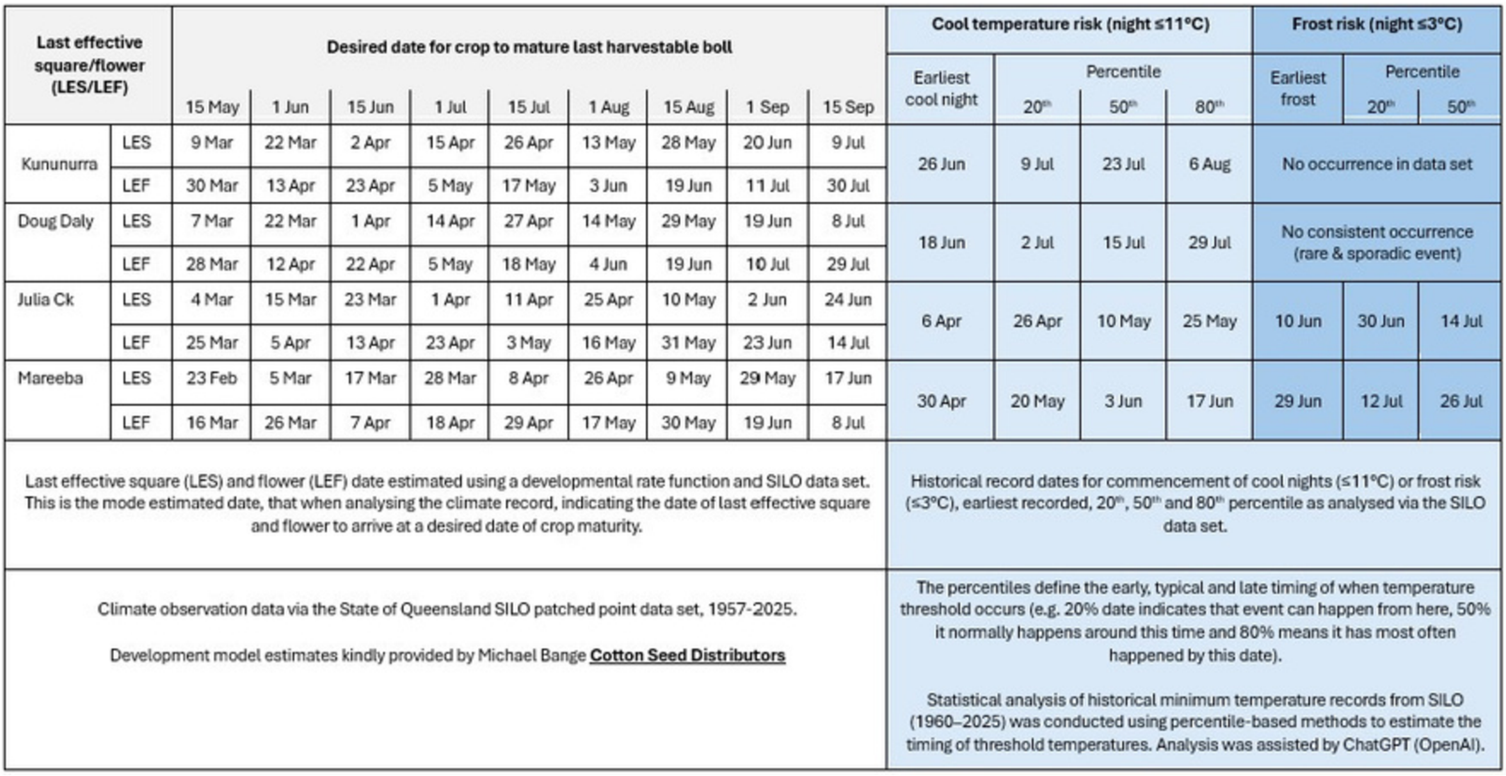
TABLE 1.

Average date of last effective square and flower (optimal cut-out date) for various locations based on the desired date for the last harvestable boll to be fully mature. Also included are the dates and risk profile for when cool temperatures (≤11°C) and frost may occur. The last harvestable boll should mature prior to any frost risk. Having a large proportion of immature bolls still developing when night temperatures are ≤11°C negatively impacts boll size and fibre quality and hence yield potential and fibre grade.



Last effective square/flower (LES/LEF)		Desired date for crop to mature last harvestable boll									Cool temperature risk (night ≤11°C)				Frost risk (night ≤3°C)		
											Earliest cool night	Percentile			Earliest frost	Percentile	
		15 May	1 Jun	15 Jun	1 Jul	15 Jul	1 Aug	15 Aug	1 Sep	15 Sep		20th	50th	80th		20th	50th
Kununurra	LES	9 Mar	22 Mar	2 Apr	15 Apr	26 Apr	13 May	28 May	20 Jun	9 Jul	26 Jun	9 Jul	23 Jul	6 Aug	No occurrence in data set		
	LEF	30 Mar	13 Apr	23 Apr	5 May	17 May	3 Jun	19 Jun	11 Jul	30 Jul							
Doug Daly	LES	7 Mar	22 Mar	1 Apr	14 Apr	27 Apr	14 May	29 May	19 Jun	8 Jul	18 Jun	2 Jul	15 Jul	29 Jul	No consistent occurrence (rare & sporadic event)		
	LEF	28 Mar	12 Apr	22 Apr	5 May	18 May	4 Jun	19 Jun	10 Jul	29 Jul							
Julia Ck	LES	4 Mar	15 Mar	23 Mar	1 Apr	11 Apr	25 Apr	10 May	2 Jun	24 Jun	6 Apr	26 Apr	10 May	25 May	10 Jun	30 Jun	14 Jul
	LEF	25 Mar	5 Apr	13 Apr	23 Apr	3 May	16 May	31 May	23 Jun	14 Jul							
Mareeba	LES	23 Feb	5 Mar	17 Mar	28 Mar	8 Apr	26 Apr	9 May	29 May	17 Jun	30 Apr	20 May	3 Jun	17 Jun	29 Jun	12 Jul	26 Jul
	LEF	16 Mar	26 Mar	7 Apr	18 Apr	29 Apr	17 May	30 May	19 Jun	8 Jul							

Last effective square (LES) and flower (LEF) date estimated using a developmental rate function and SILO data set. This is the mode estimated date, that when analysing the climate record, indicating the date of last effective square and flower to arrive at a desired date of crop maturity.

Historical record dates for commencement of cool nights (≤11°C) or frost risk (≤3°C), earliest recorded, 20th, 50th and 80th percentile as analysed via the SILO data set.

Climate observation data via the State of Queensland SILO patched point data set, 1957-2025.

Development model estimates kindly provided by Michael Bange **Cotton Seed Distributors**

The percentiles define the early, typical and late timing of when temperature threshold occurs (e.g. 20% date indicates that event can happen from here, 50% it normally happens around this time and 80% means it has most often happened by this date).

Statistical analysis of historical minimum temperature records from SILO (1960–2025) was conducted using percentile-based methods to estimate the timing of threshold temperatures. Analysis was assisted by ChatGPT (OpenAI).

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For further information:

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For further queries, contact CottonInfo Technical Lead for Northern Australia Paul Grundy on 0427929172 or paul.grundy@dpi.qld.gov.au