

# Changing number of suitable days for initiating mango flowering in the Northern Territory



The Earth Systems and Climate Change Hub and Northern Territory Department of Primary Industry and Resources assessed the impact of the changing climate on threshold temperatures for initiation of mango flowering in the Territory.

The mango industry will become increasingly vulnerable as rising temperatures reduce the number of days suitable to trigger flowering in key commercial cultivars.

Actions to reduce the impacts of these changes need to be considered now to ensure the ongoing sustainability of individual enterprises and the industry as a whole.



## Mango flowering and temperature triggers

Mango flowering leads to fruit development and determines the timing of fruit harvest. Flowering also has broader market implications – with the earliest flowering of all mango production regions in Australia, mangoes from the Darwin region are the first to reach the Australian market each season.

In the Northern Territory, flowering is triggered by the arrival of cooler dry season temperatures around April each year. Flowering can occur any time between April and August and is promoted by low night time (minimum) temperatures and can be inhibited by high day time (maximum) temperatures.

## Rising temperatures

Maximum and minimum temperatures in the Northern Territory have increased over the past 100 years, and this warming trend is set to continue. The warming will see temperature thresholds for flower induction crossed, reducing the number of inductive days (the minimum number of days were flower induction can occur) and consequently flowering and fruiting.

## Assessing the impact of a changing climate

With an understanding of flower initiation temperature thresholds from six mango cultivars – Kensington Pride, Calypso®, Honey Gold and three cultivars from the National Mango Breeding Program – we were able to look at climate change projections for key production areas at different points in the future to see when the thresholds would be crossed.

This information gives us an indication of which cultivars will be viable in which areas in the near future (relevant to the current planting), the middle of the century (relevant to the next planting) and late and end parts of this century (relevant for breeding and development programs).

## Impact timeline

In the near future (2016–2045), all cultivars assessed in this study except Calypso® and Kensington Pride may become vulnerable to the impacts of the declining number of inductive days between May and August. The Darwin growing region will be more vulnerable than Katherine and Kununurra. The number of inductive days in Central Australia may begin to increase.

Towards the middle of the century (2036–2065), production in Katherine and Kununurra could become more vulnerable but not to the same degree as in Darwin. All cultivars may experience a marked reduction in inductive days while the indirect effects of warmer conditions on pollen viability, fruit set and fruit growth are likely.

Late in the century (2056–2085), in a high emissions future, mango production is likely to be drastically impacted, with the maximum number of inductive days reduced to around 40% in some areas. Under a lower emissions scenario, Calypso® and Kensington Pride may experience enough inductive days to flower but only in the Kununurra region.

At the end of the century (2075–2104), the assessed cultivars are all expected to be severely limited by extreme reductions in inductive days. Only under a lower emissions scenario will conditions allow for some flowering in Calypso® and Kensington Pride in the Kununurra and Katherine regions.

## Implications for industry

The ongoing sustainability of the mango industry in the Northern Territory will require on-farm adaptation actions from growers, including canopy management, transition to new cultivars, orchard relocation and orchard cooling practices. Attention will also need to be given to the health and safety of farm workers as extreme heat becomes more prevalent.

Grower actions need to be supported by an industry response that may include education and extension, commercialisation of new cultivars, market development for resilient cultivars, and management of changes in fruit supply to market.

Grower and industry activity will need to be supported by policies and regulations at all levels of government that are considerate of short-term transformational change, while also accounting for the incremental change required to address longer term climate challenges.

Policy and practice will both be well served by ongoing research to better understand climate-resilient genotypes, the climatic limits of artificial chemical flower induction, protective cropping, mango genetic adaptation and development in a changing climate, harvest timing and new production sites.

## About this impact assessment

The assessment considers six mango cultivars – Kensington Pride, Calypso®, Honey Gold and National Mango Breeding Program cultivars 1201, 1243 and 4069 – across 11 production areas in the Northern Territory as well as Kununurra in Western Australia. The production areas were grouped into four growing regions: Darwin (Batchelor, Berry Springs, Bynoe, Tipperary, Greater Darwin, Noonamah and Marrakai); Katherine (Katherine, Mataranka and Pine Creek); Central Australia (Ali Curung) and Kununurra.

Temperature thresholds under both moderate (RCP4.5) and high (RCP8.5) emissions futures were considered for four 30-year periods centred on 2030, 2050, 2070 and 2090. The analysis is based on the projected number of days per month that are under minimum threshold temperatures (18°C, 20°C) and over maximum threshold temperatures (32°C, 35°C) for May, June, July, and August.

It is important to note that only the impact of temperature thresholds on flower induction was considered. Other variables that may also impact induction, such as water stress, leaf age, tree age and health, were not assessed.

*The full report is available on the Earth Systems and Climate Change Hub website at [www.nespclimate.com.au](http://www.nespclimate.com.au).*

For more information about finding and using climate change information, please contact Mandy Hopkins (ESCC Hub) on 03 9239 4649 or [mandy.hopkins@csiro.au](mailto:mandy.hopkins@csiro.au).

For information on research about impacts of climate change on mango production, please contact Maddison Clonan (NT DPIR) on 08 8999 2293 or [maddison.clonan@nt.gov.au](mailto:maddison.clonan@nt.gov.au).