5th Australian Almond Research & Development Forum & Field Day

Managing almond production in a variable and changing climate

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October 30th - 31st, 2019

HOSTED BY: Almond Board of Australia

SPONSORED BY: Stoller Australia

SUPPORTED BY: Hort Innovation Australia

australian almond RESEARCH & DEVELOPMENT FORUM & FIELD DAY

Project AL14006 (2015-2019)
Funded by HIA, ABA, IRSP-SARMS, Government of South Australia

Themes

1. Identify weather and climate risks and Management options
2. Field trials
3. Develop crop development (Phenology) model

1. Identify weather and climate risks and Management options

Outputs

Booklets for five almond growing regions describing the regions climate strengths and challenges for almond growing.

They describe the year-to-year variability in climate and compare these to other locations;

the use of seasonal climate drivers to aid management decisions;

and of the altered chances of undesirable conditions in projected future climates.

The booklets detail management options for each risk

The Riverland Climate for Almond production: Analysis of strengths and challenges.

Dane Thomas, Peter Hayman

SARDI, Adelaide, Australia

21 May 2019

https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/al14006-climate-strengths-and-challenges---riverland.pdf

Main weather and climate risks from almond perspective

RISK	IMPACT	EXPECTATIONS
Accumulated cold	Insufficient chill Non-synchronous flowering	Decline in winter chill Uncertain impact on synchronicity of flowering
Night temperature	Frost	Decline on longer term although may increase in shorter term
Accumulated heat	Greater growing degree days affecting development	Increased mean temperature will increase heat accumulation
Day temperature	Heatwaves (hot days and hot nights) Too cold for effective pollination	Increase
Accumulated rain Accumulated evapotranspiration	Insufficient irrigation water or winter rain	Likely that water declines while evapotranspiration increases Prudent to plan for water constraints and higher evaporative demand
Rain and evaporation	Rainy days near harvesting Excessive rain and humidity leading to disease	Uncertain

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Trends and learning from other locations

Your location

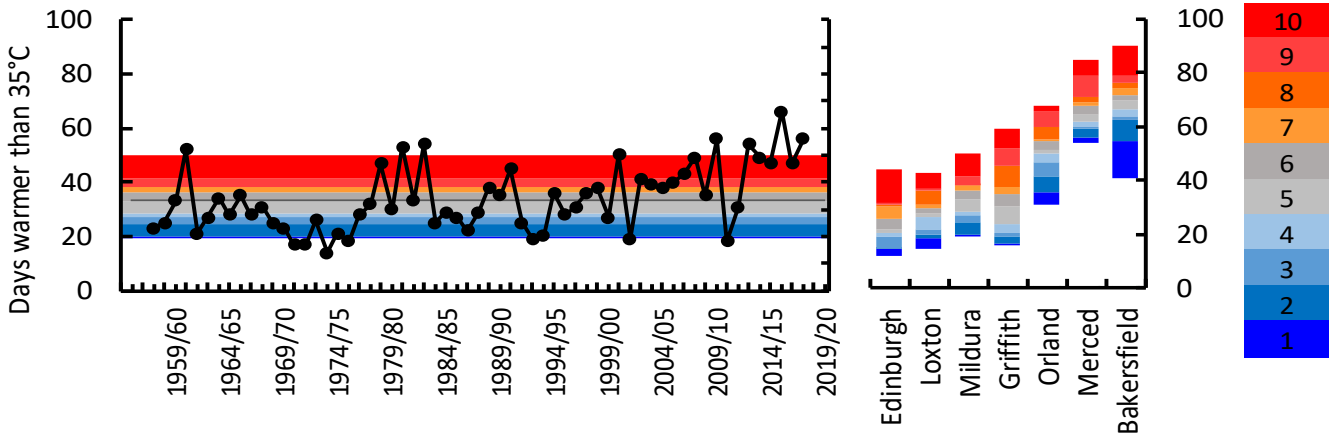
Black line shows history

Coloured ribbon shows variability (deciles)

Other locations

Coloured bars shows variability at these locations

Mildura



Colours represent deciles.
1 is lowest 10% of years,
10 is highest 10% of years.
Deciles calculated for 20 years from 1986 to 2005

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Accumulated heat

Alter development lifecycle (phenology)

Generally poor understanding of critical temperature thresholds

Heatwaves

Irrigation

Leaf surface covers

Growth regulators

Soil structure

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Accumulated rain and evapotranspiration

Prudent to expect a water constrained future with higher evaporative demand, and fluctuations in the quantity of irrigation water

Irrigation scheduling and efficiency

Orchard design

Soil quality

Heatwaves

Pests and diseases

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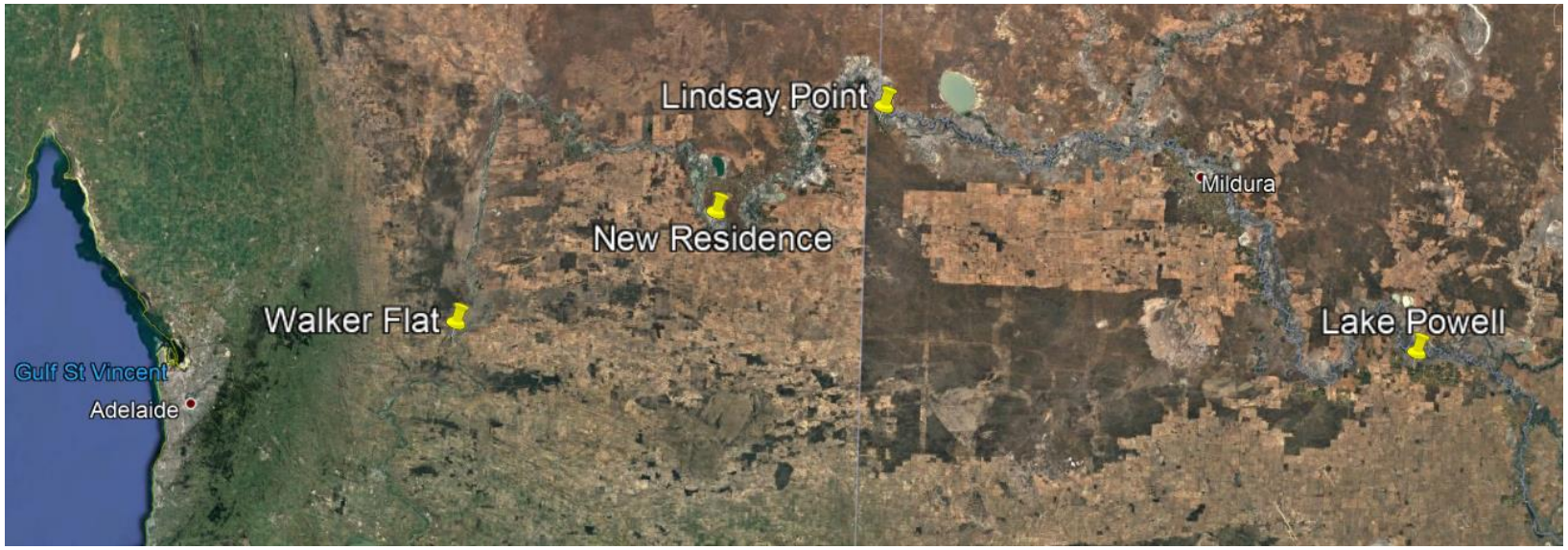
2. Field trials

4 years, 4 orchards, 3 to 4 sites (meso-sites) within each orchard

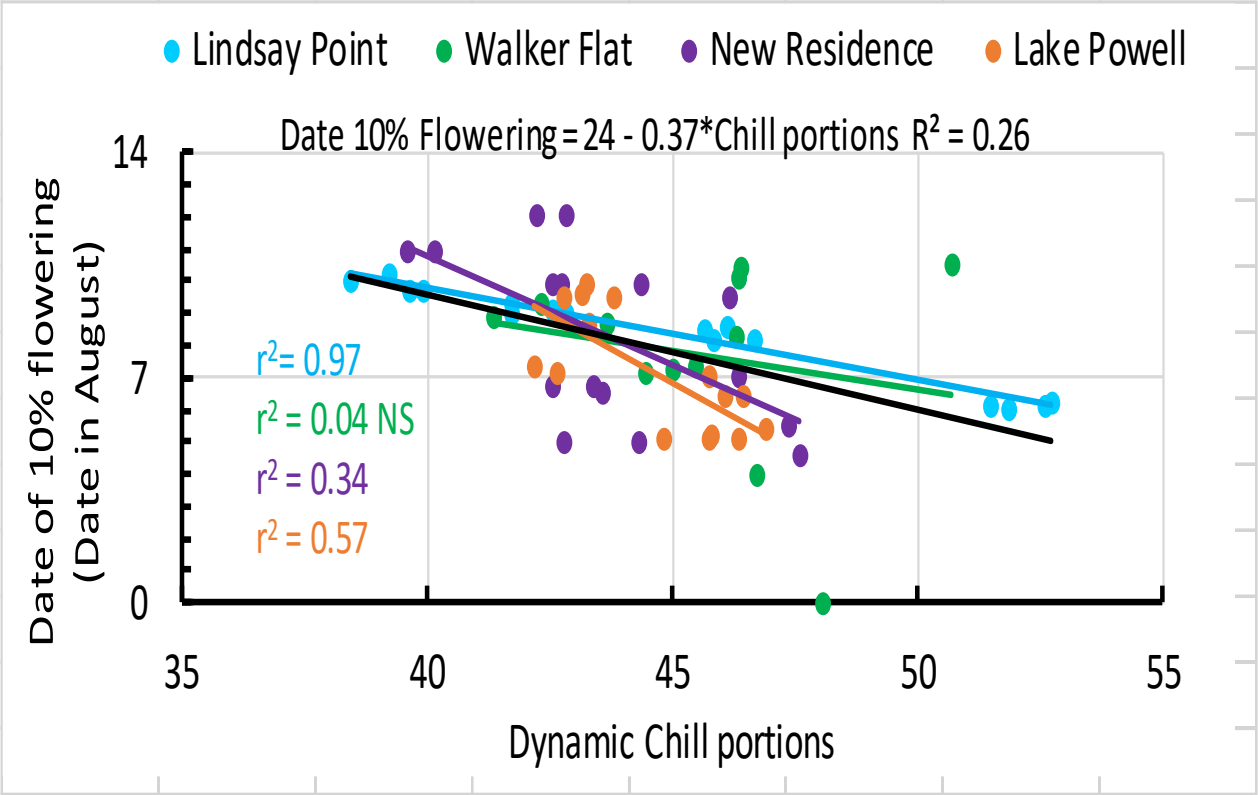
Climate
Crop development (phenology)
Yield
Quality (kernel size, deformities)



Phenology

Lower elevation meso-sites were cooler

Later flowering in warmer winters (less chill)

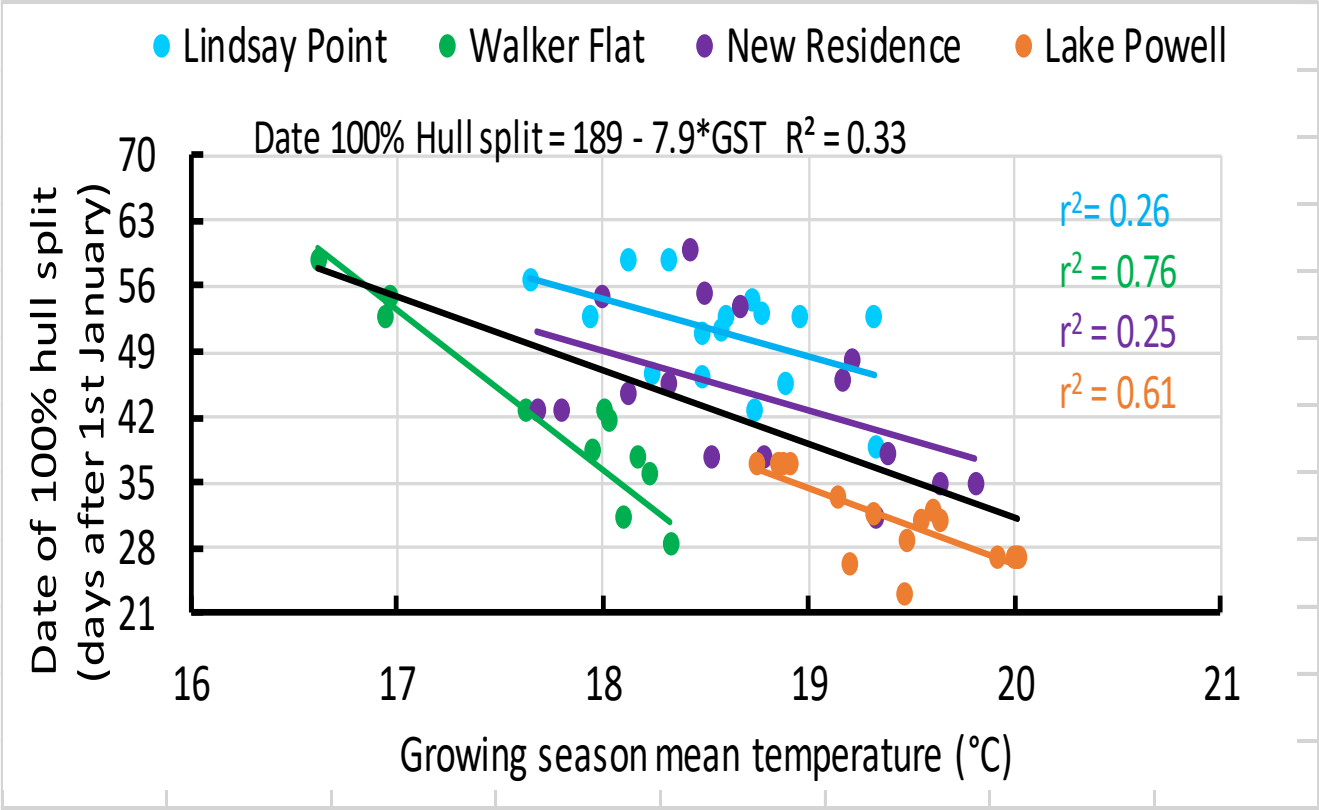


Flowering was 1 day later for each reduction of 3 chill portions.

Very rough approximation of decline by 8 chill portions per 1°C mean temperature warming

Phenology

Hotter spring and summer led to earlier hull split



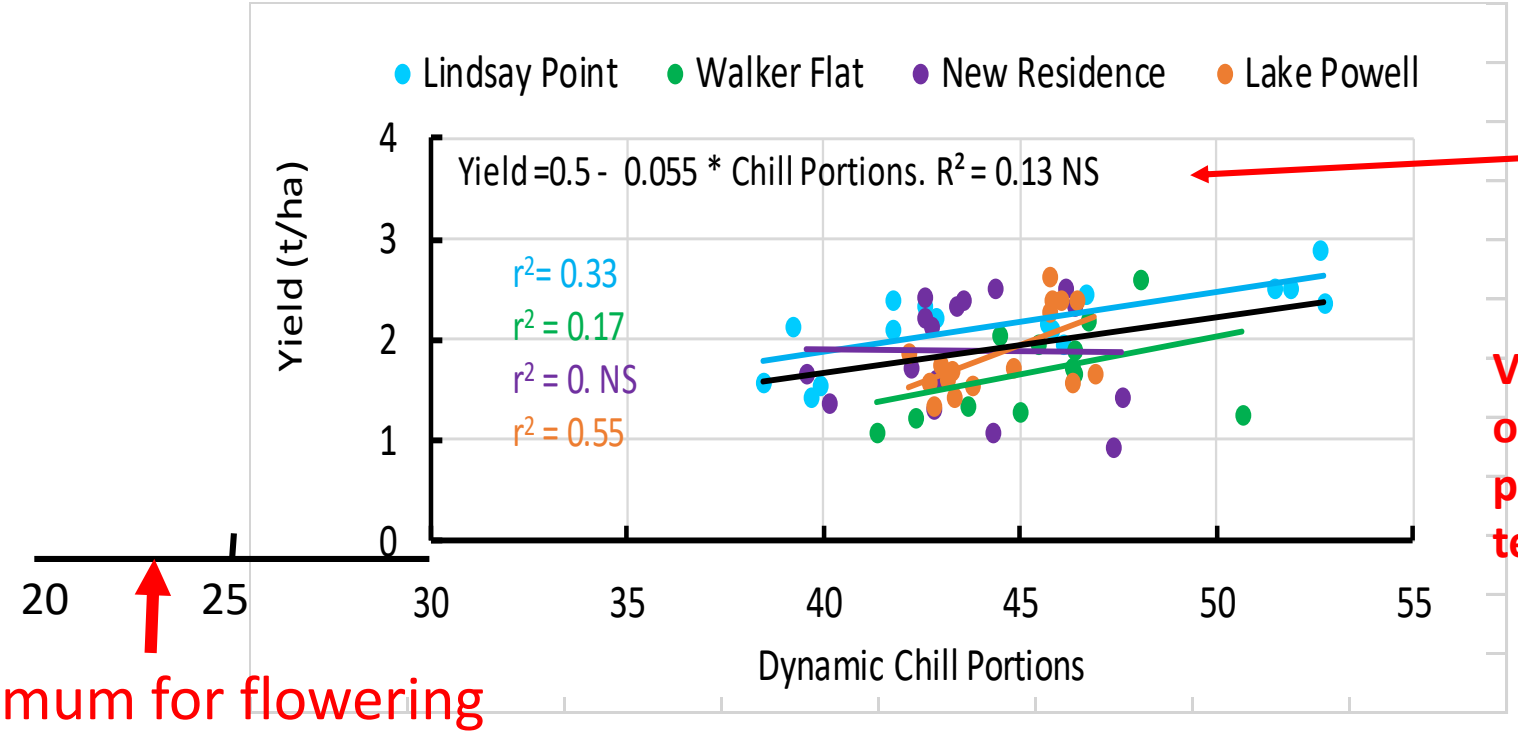
Hull split was 8 days earlier per 1°C warmer

Climate

The relationship between yield and temperature was not conclusive.

In some orchards a larger number of hot days reduced yield.

Higher yield when winter chill was higher.

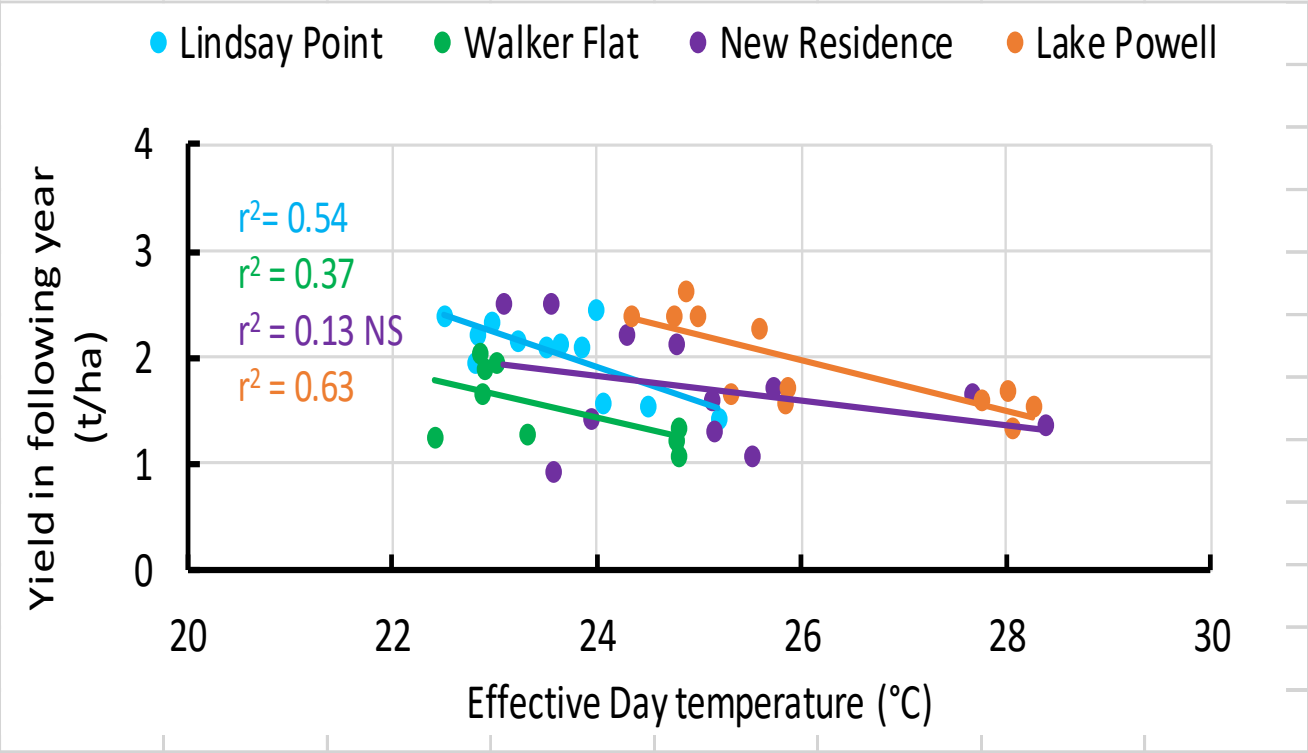


55 kg /ha for each 1 chill portion

Very rough approximation of decline by 8 chill portions per 1°C mean temperature warming

Climate

Warmer conditions during December reduced yield from buds developing at this time. That is, yield was lower in the following year.



3. Crop development (phenology)

Outputs

Phenology standard

How to assess phenology

Excel based phenology model. User input of temperature with calculated output of dates of flowering, hull split and harvest

https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/almond-phenology-model-spreadsheet/

Assessing Phenology of Almonds

Dane Thomas, SARDI, Adelaide, Australia

Joseph Connell, University of California Cooperative Extension Emeritus Advisor, Butte County, California

28 May 2018

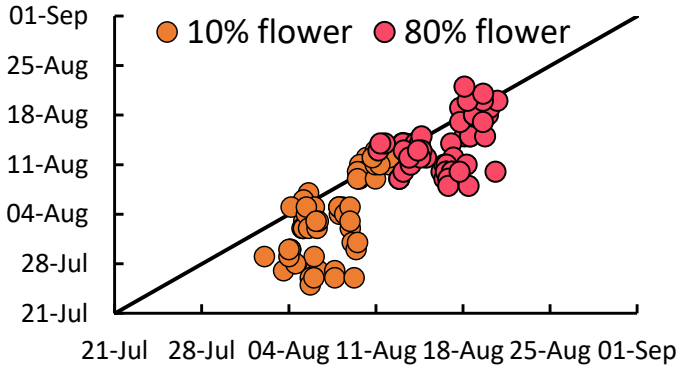
https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/al14006-assessing-phenology-in-almonds.pdf

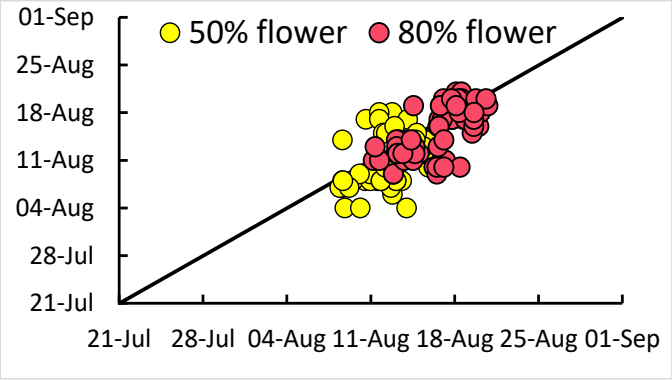
https://www.horticulture.com.au/globalassets/hort-innovation/resource-assets/al14006-phenology-standard-for-almonds.pdf

3. Crop development (phenology)

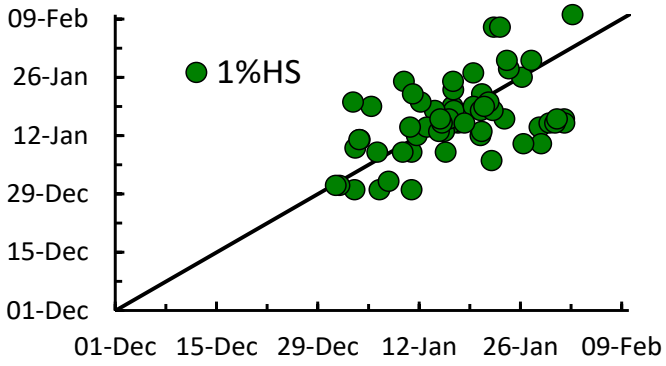
Observed date vs predicted dates. Black line is 1:1 line (i.e. perfectly predicted)

Flowering

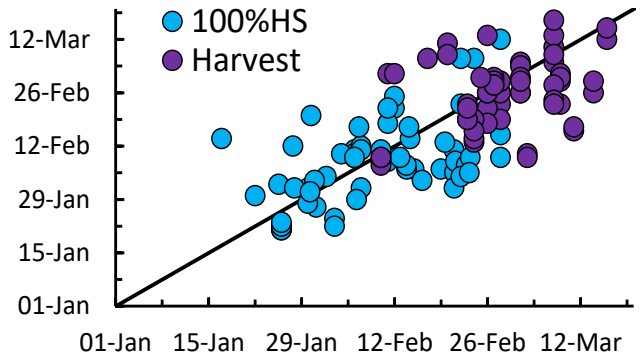




1% Hull split



100% Hull split and Harvest



Phenology in future climates

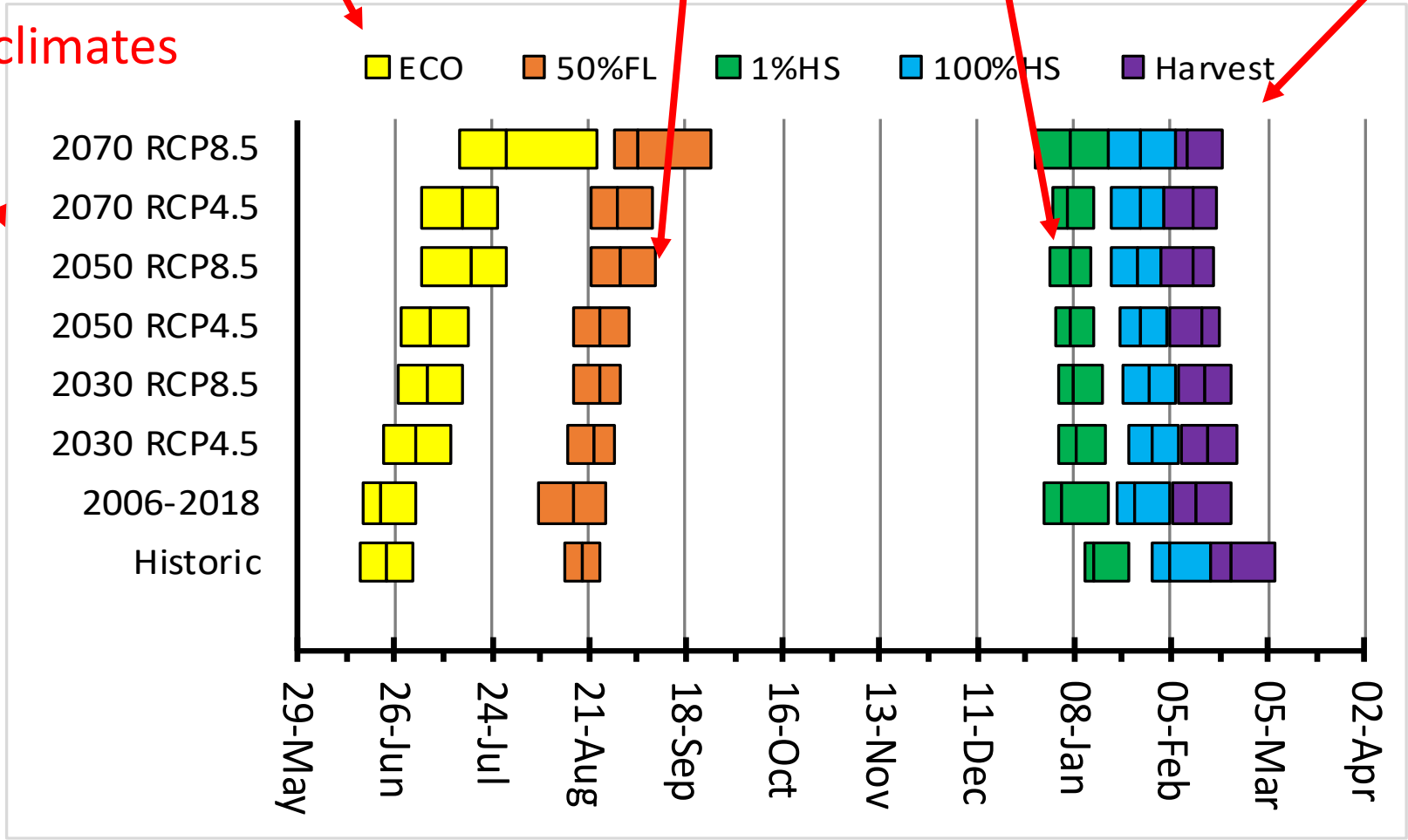
Later minimum chill requirement

Later flowering

Earlier Fruit maturity

Earlier harvest

Future climates



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Select Harvest
Walker Flat Almonds