Crop Flowering Calculator – an online tool to optimise sowing date for wheat, barley and canola

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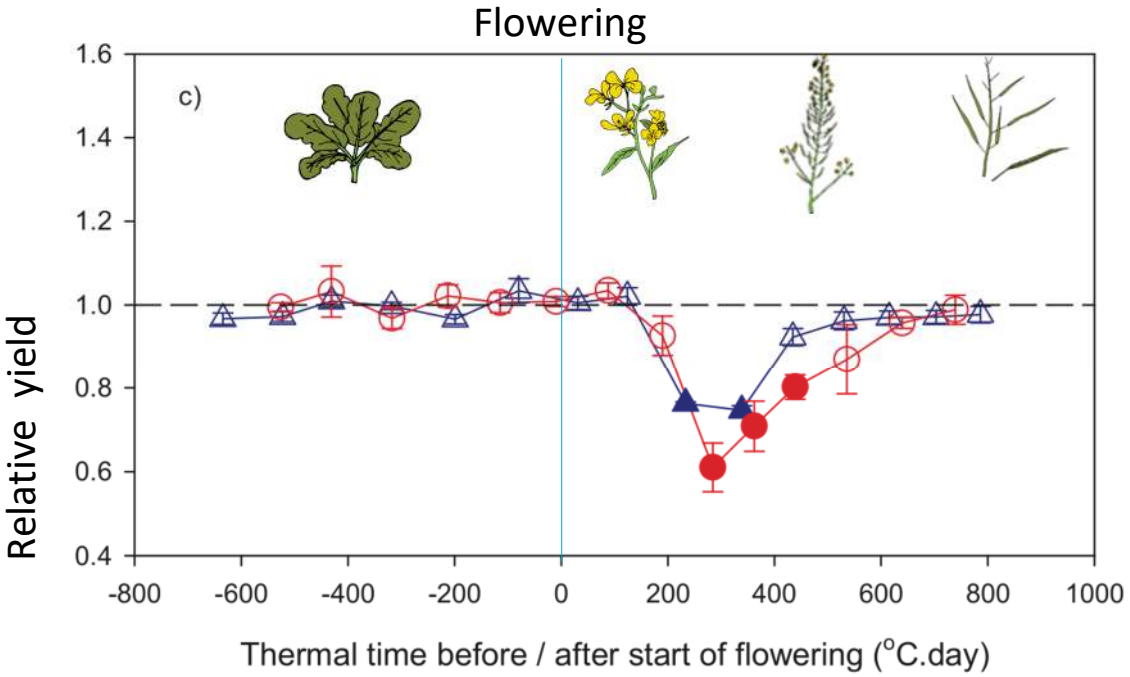
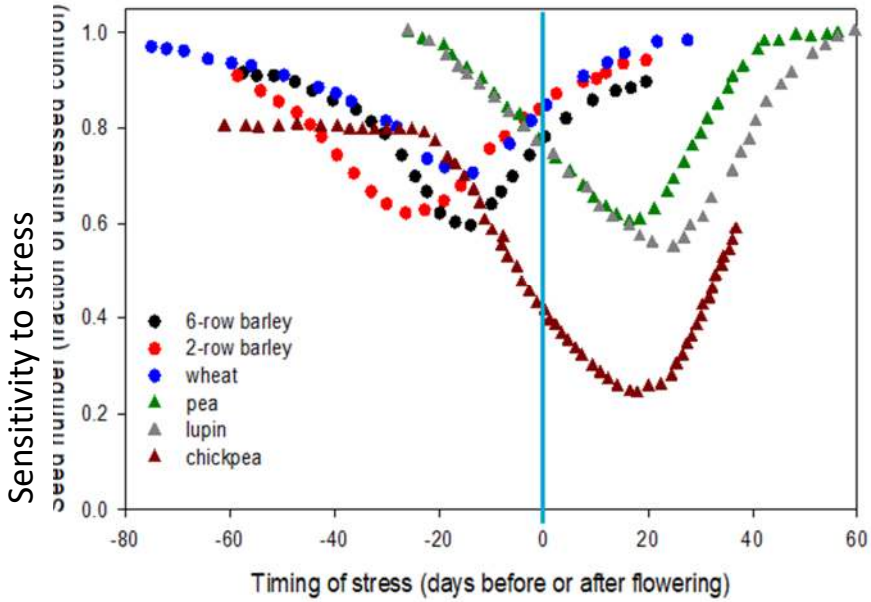
Australia's National Science Agency

Critical period of yield formation

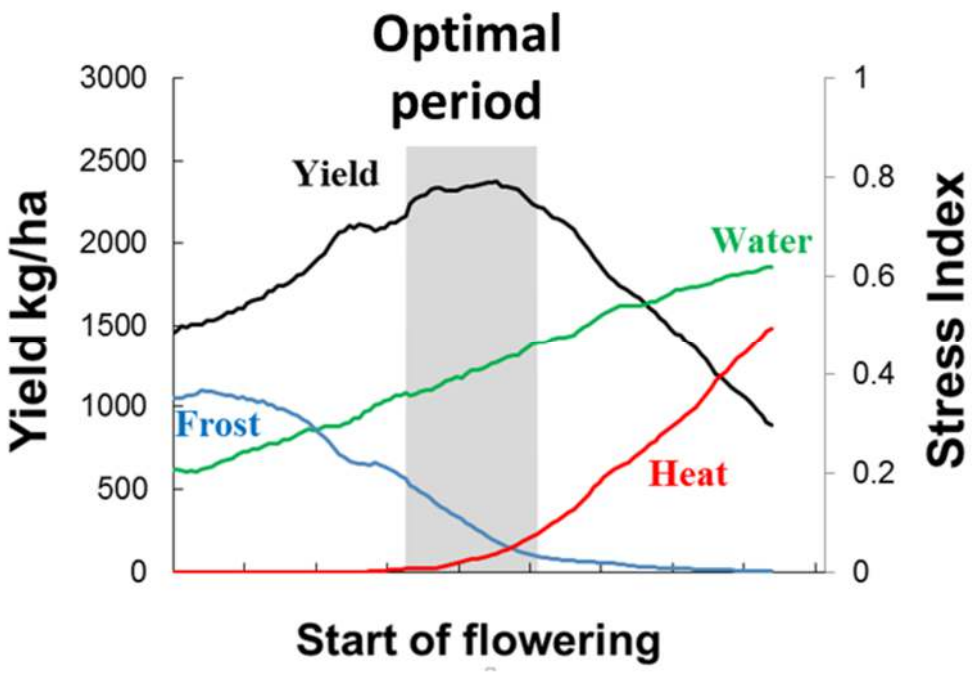


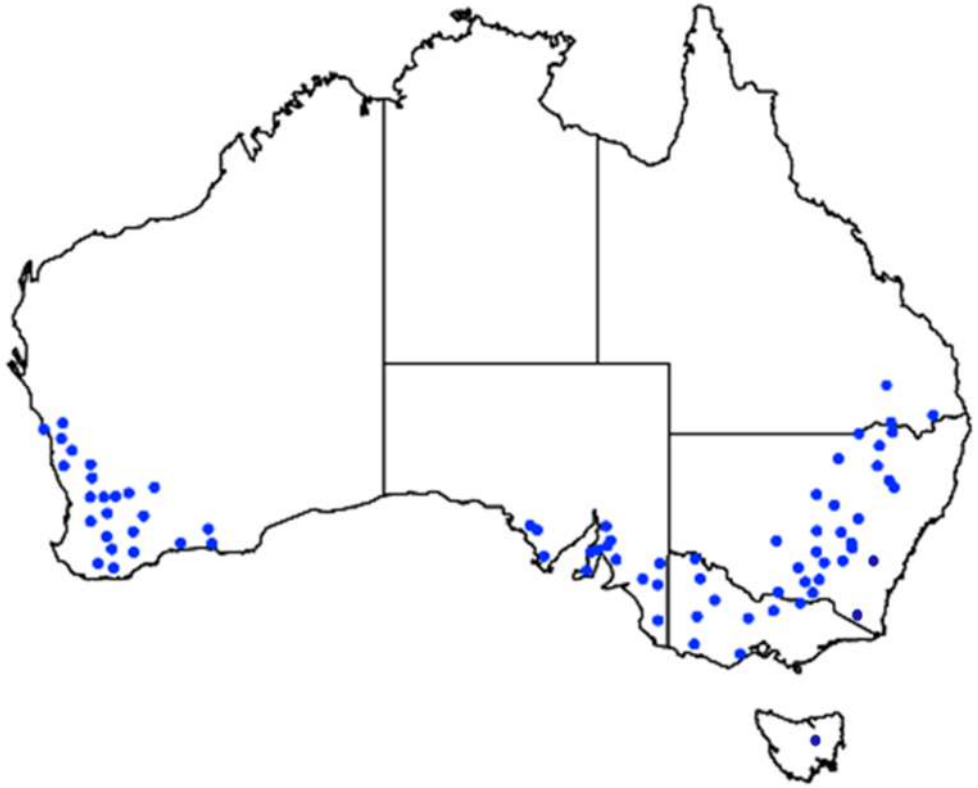


Kirkegaard et al. 2018 Field Crops Research 222: 180-188

Sadras and Dreccer (2015) Crop Past Sci 66:1137-1150

Optimal flowering period

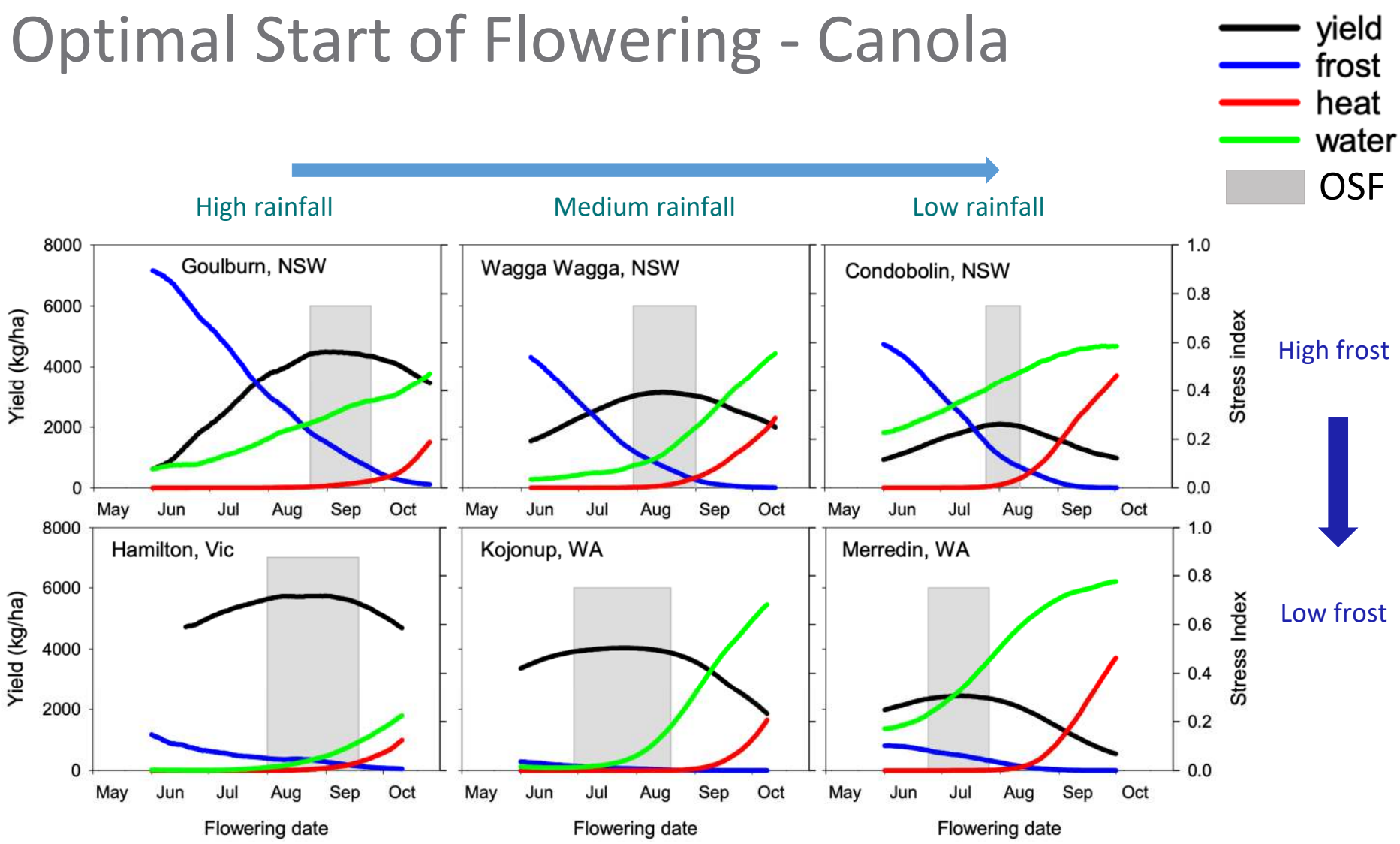




Flohr et al. (2017) Field Crops Research 209:108-119

Lilley et al. (2019) Field Crops Research 235:118-128

Optimal Start of Flowering - Canola



Lilley et al. (2019) Field Crops Research 235:118-128

Can’t we just use days from sowing

Gatton Qld

Ottawa Canada

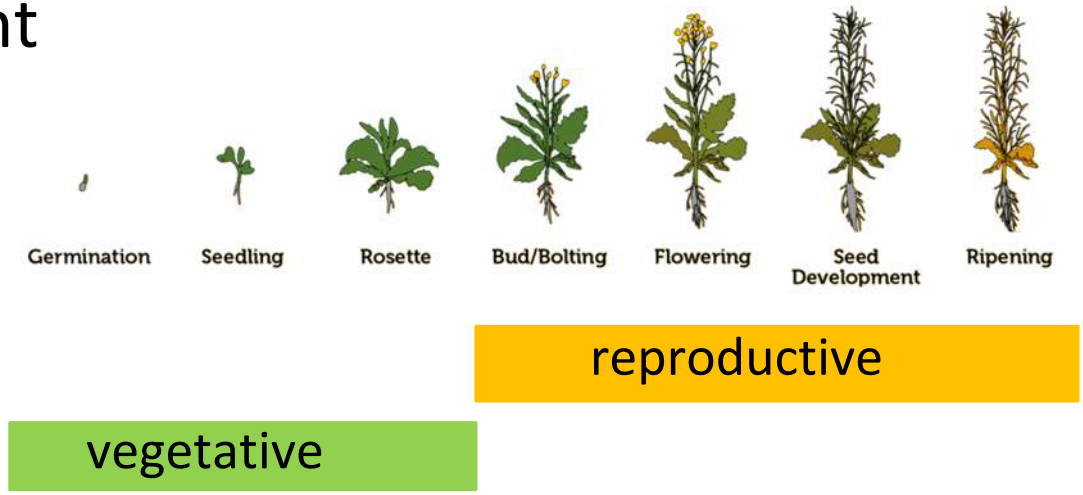
Canberra ACT

Sown on the same day, photos taken on the same day, same cultivars three different environments

Genetics and environment drive phenology

Environment

- temperature drives development
- vernalisation
- photoperiod



Genome

- genetic effects

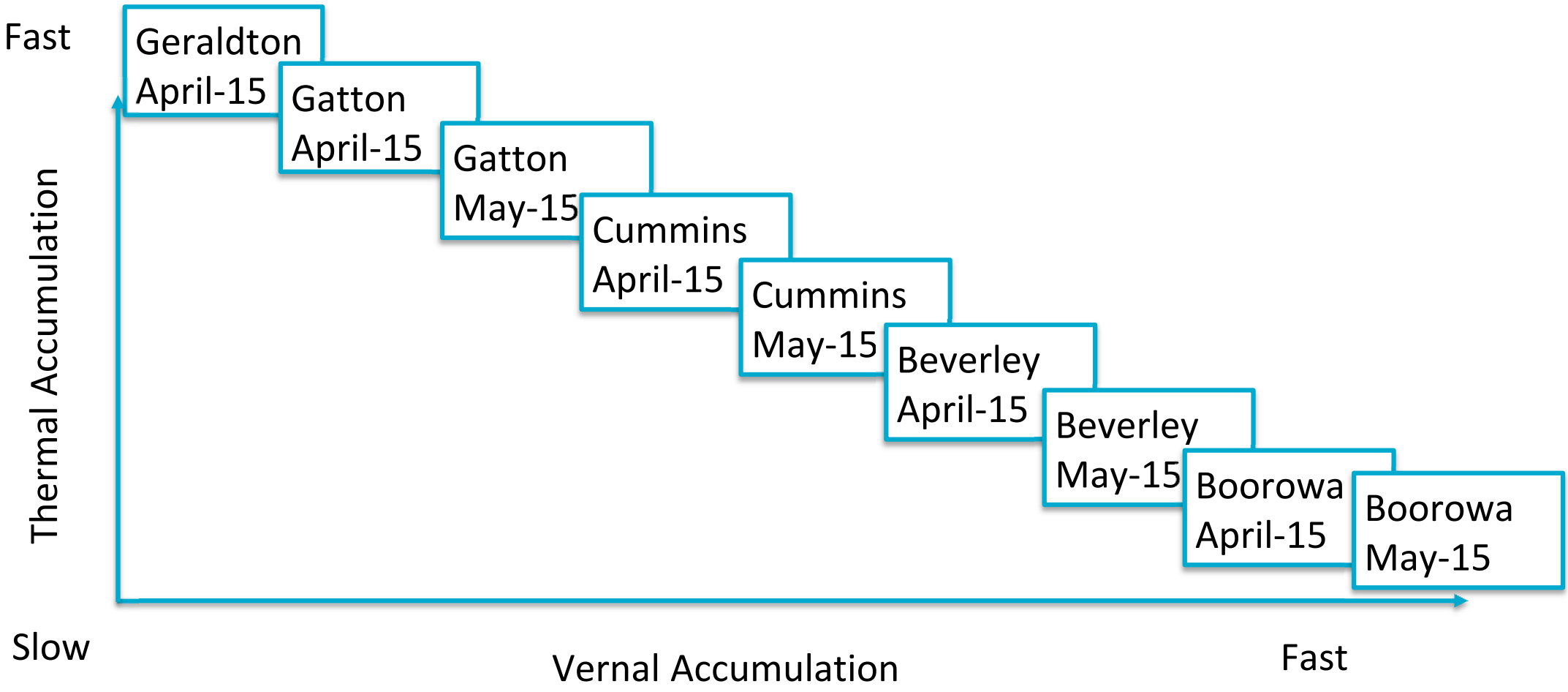
Interactions

- GxE

Understanding control of flowering time

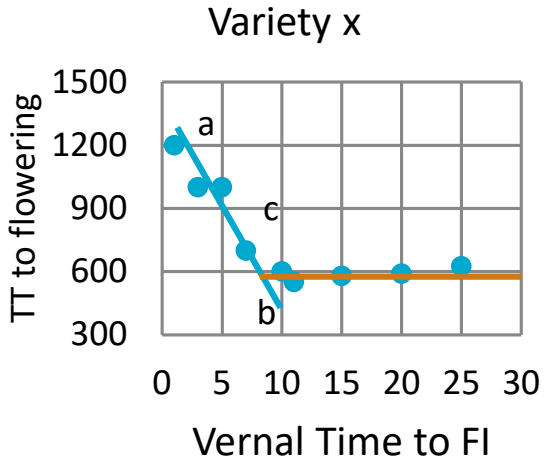
- Thermal time
- Vernalisation
- Photoperiod

Climate analysis



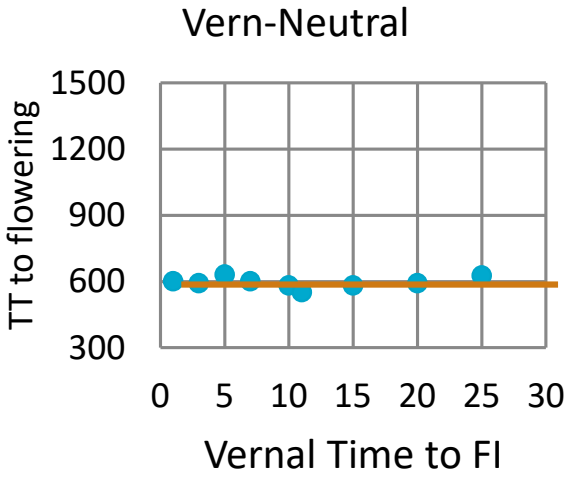
Capturing response to temperature

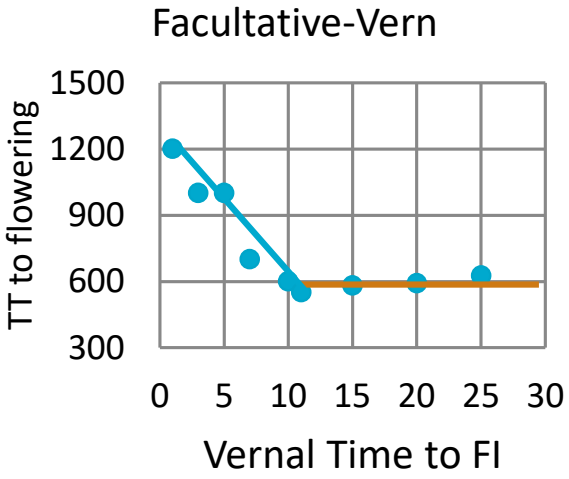
Example - phenology response multi-site data

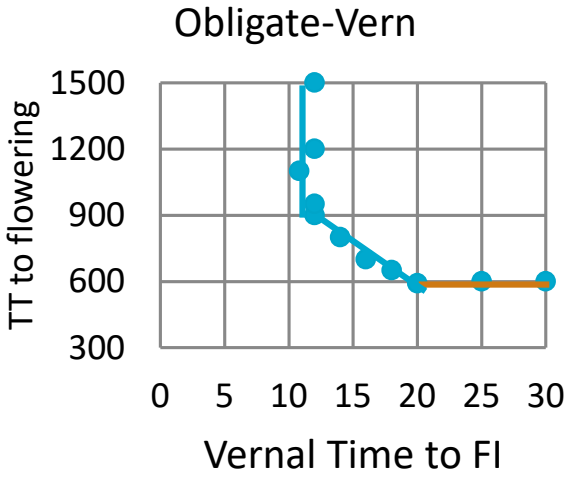


Parameters

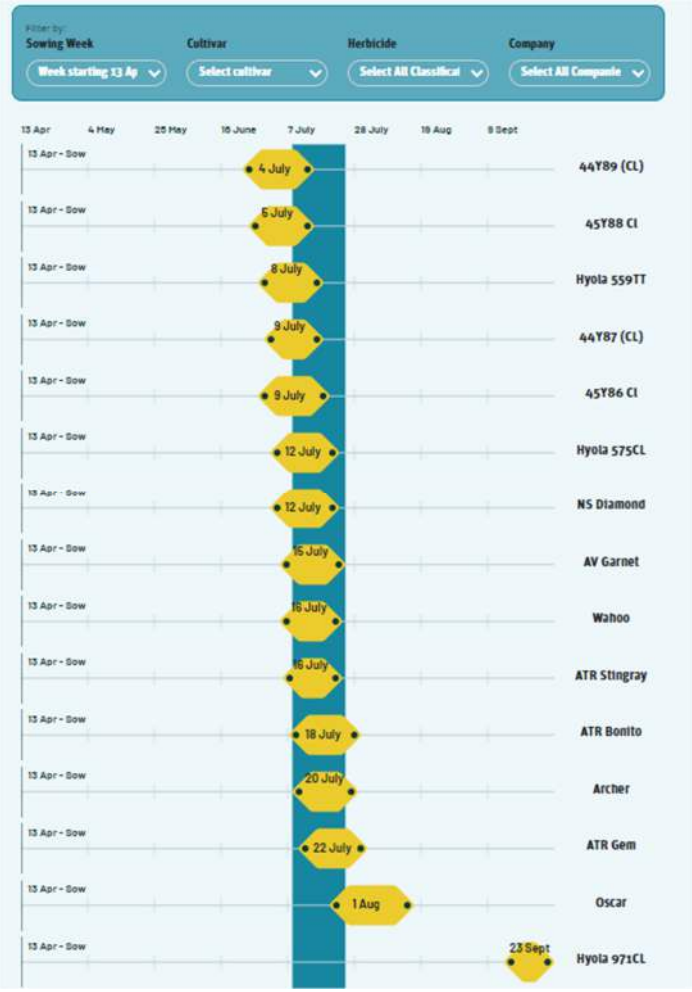
a. TT to flower – no vern
b. Vern response saturated
c. Rate of response to vern







Putting it all together



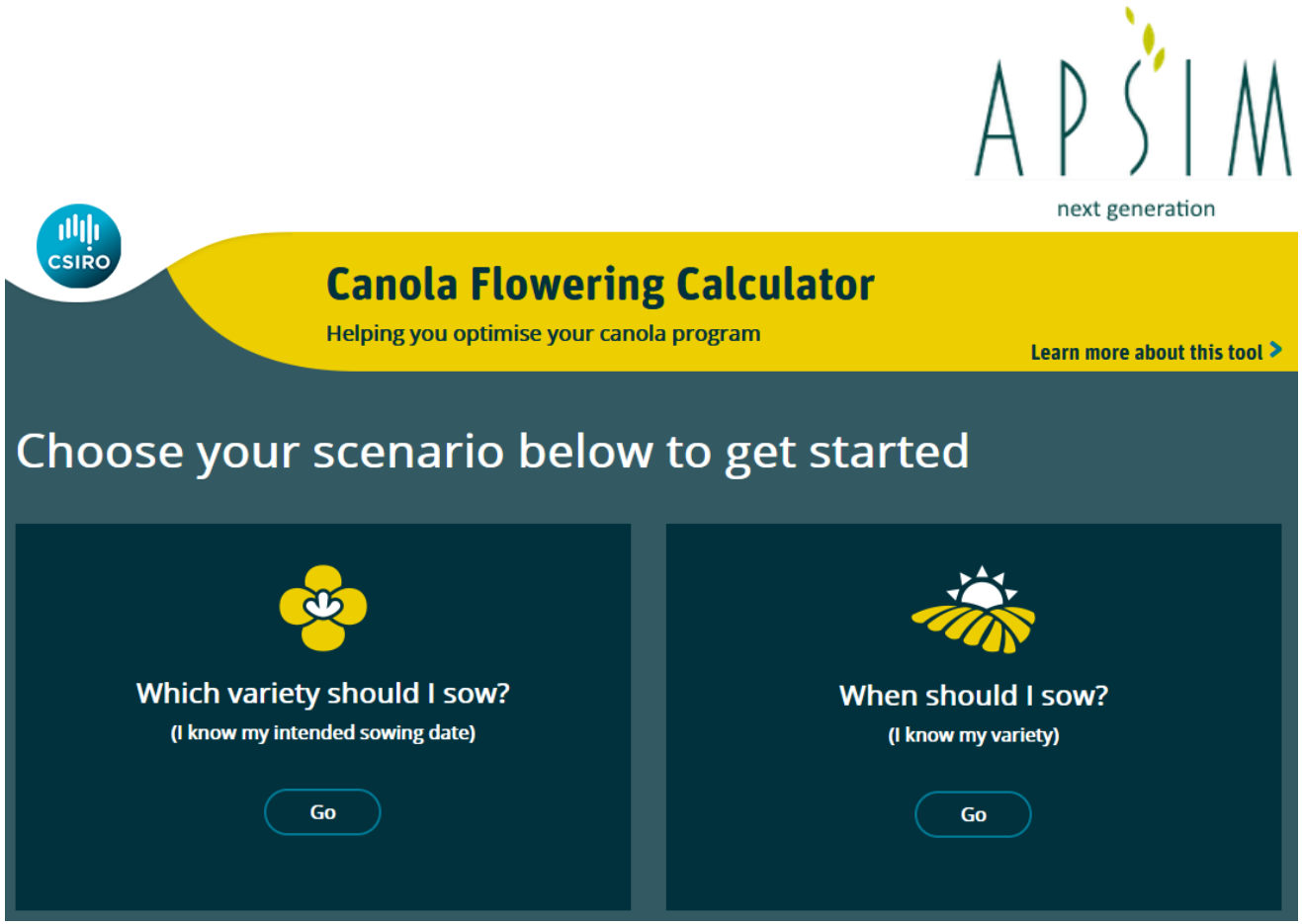
Developing dynamic tools

APSIM models simulate phenology

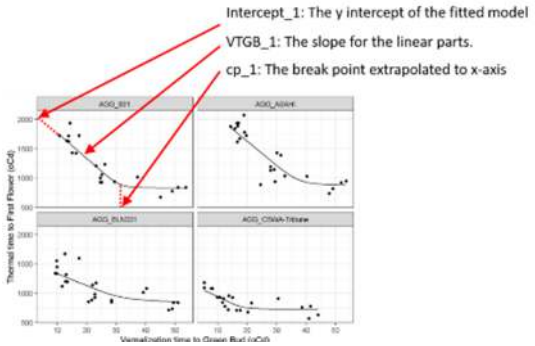
Does this accurately

But..
Phenology parameters must be estimated first

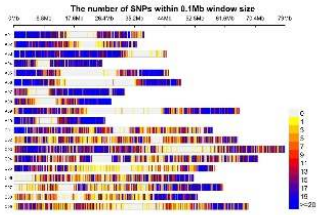
Compounded by new varieties - rapid turn-over for canola



Hybrid genomics-APSIM-NG model



APSIM parameter optimisation



SNP

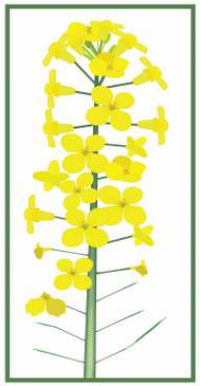
Genomic prediction
Random Forest

Genomic estimated APSIM parameters

Crop growth model
APSIM NG

X-validation

Observed phenology

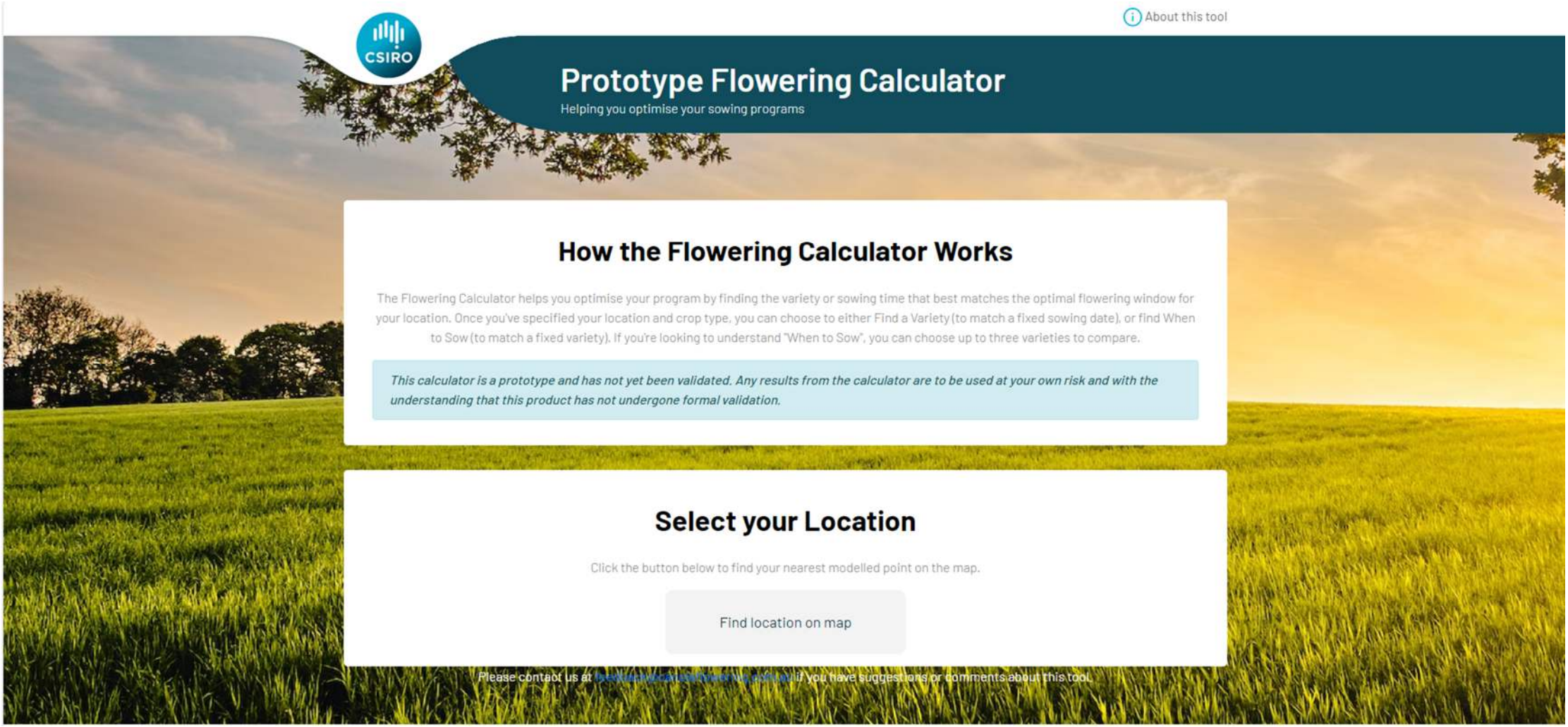


Flowering time prediction

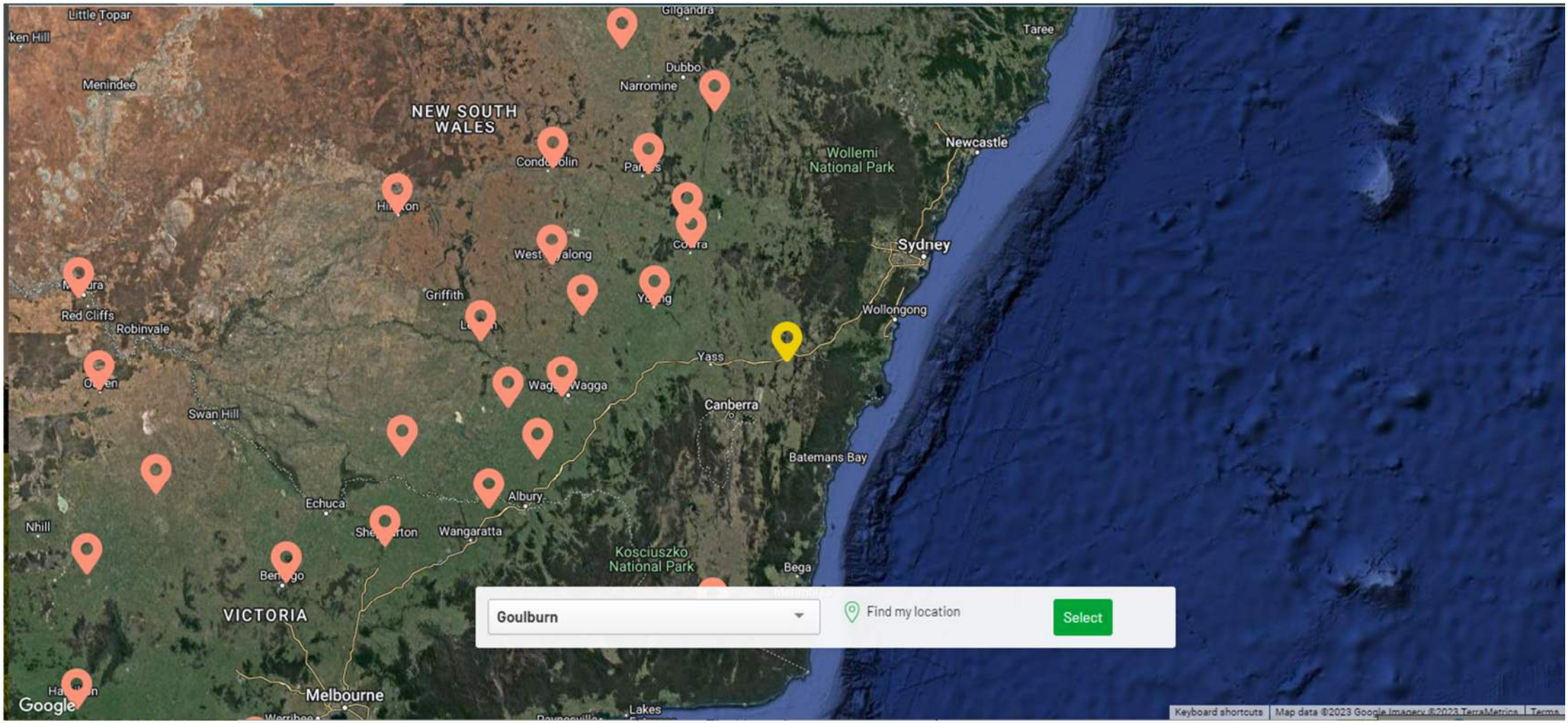
National Phenology Initiative (Phase 2)

- Use genomics to predict phenology parameters
- Tool for selection of cultivar and sowing date combinations which flower in the optimal period for each location.
- Wheat, barley canola
- Validate against National Variety Trial data
- 77 locations (2023)
- 850 locations by 2025

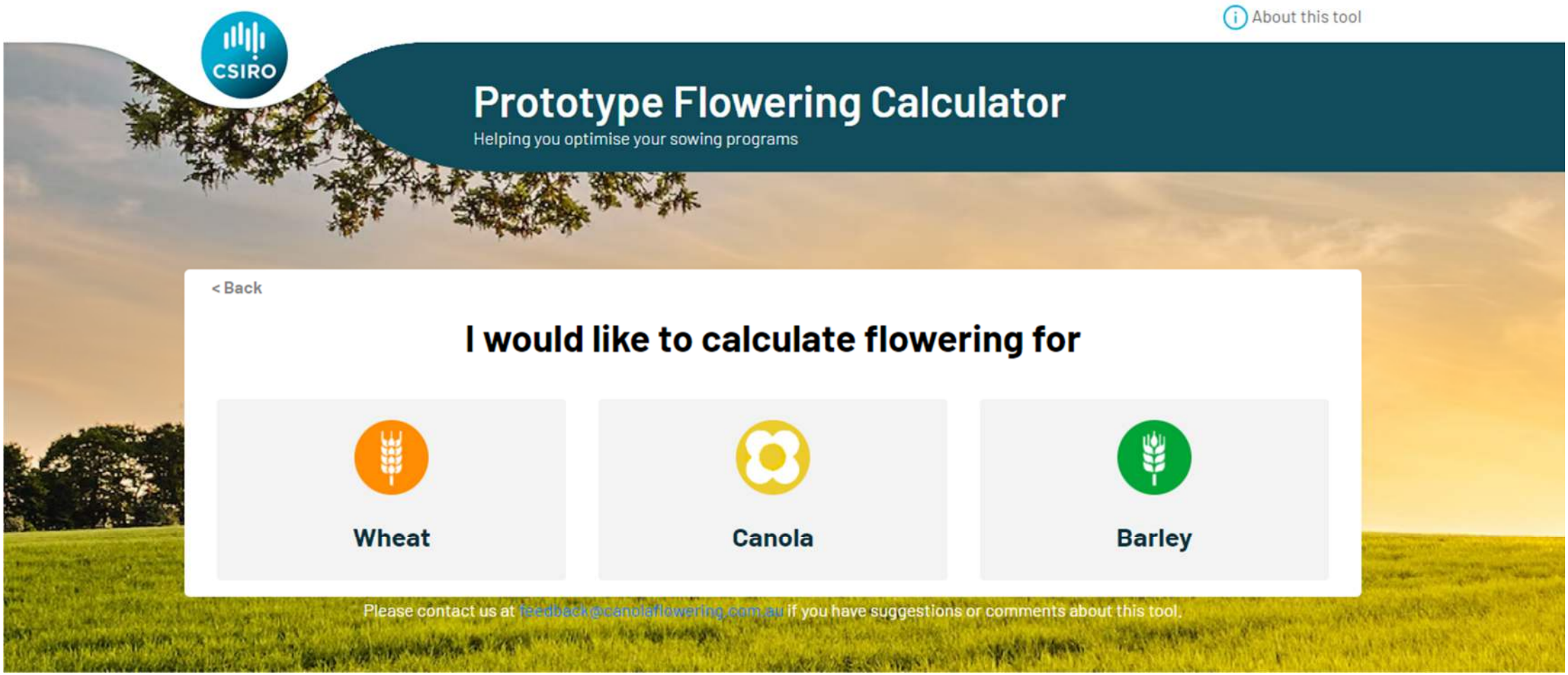
Welcome to the flowering calculator



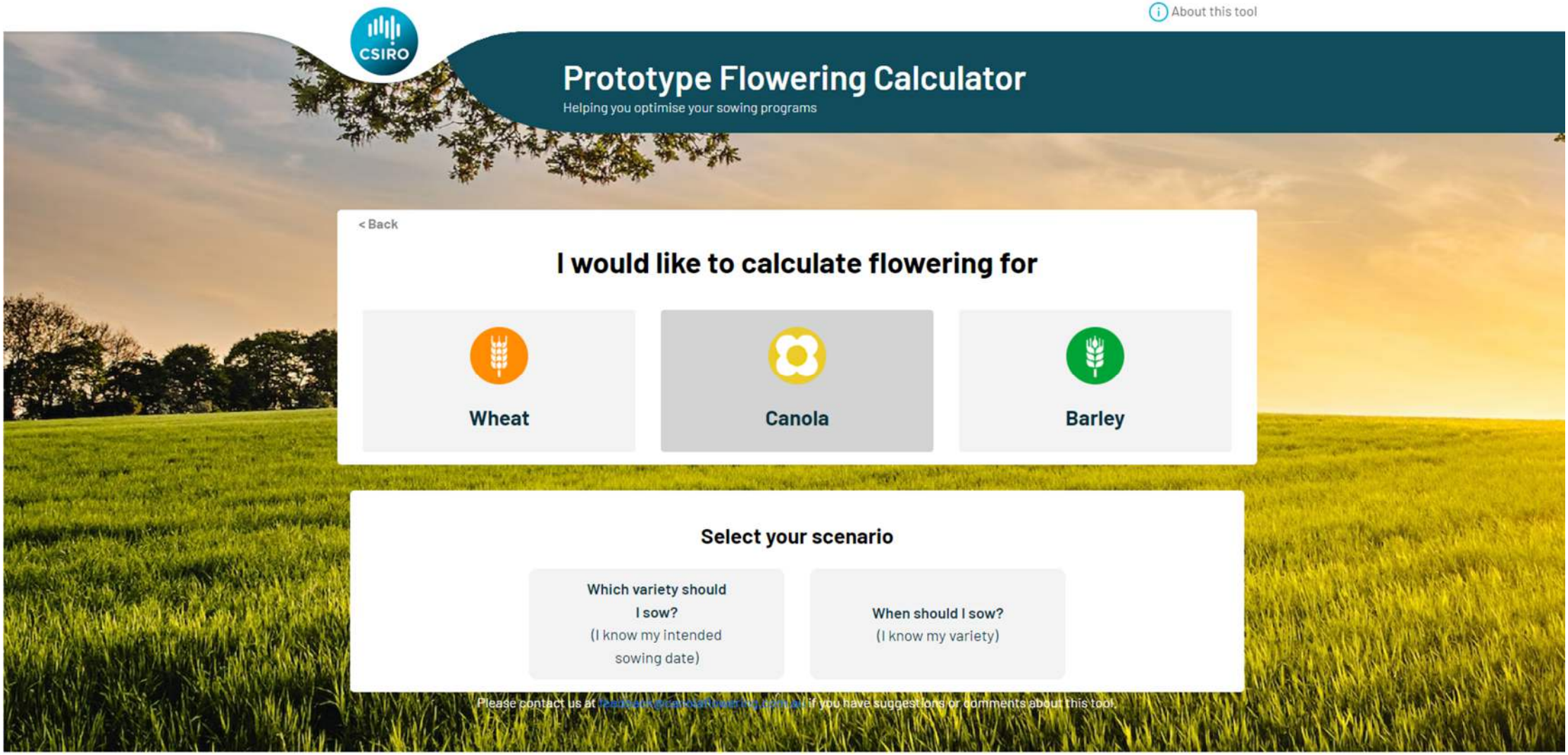
Select a site



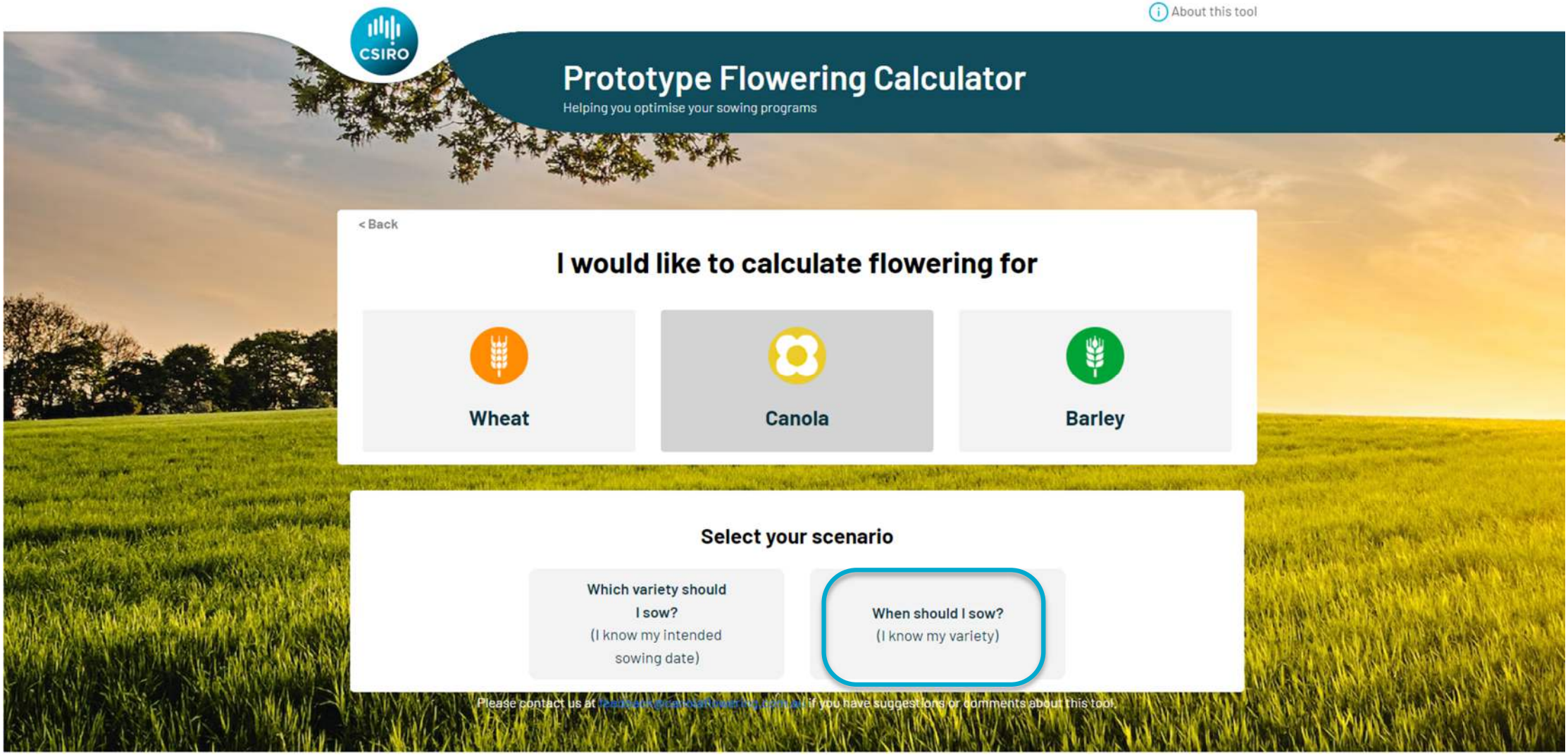
Select a crop



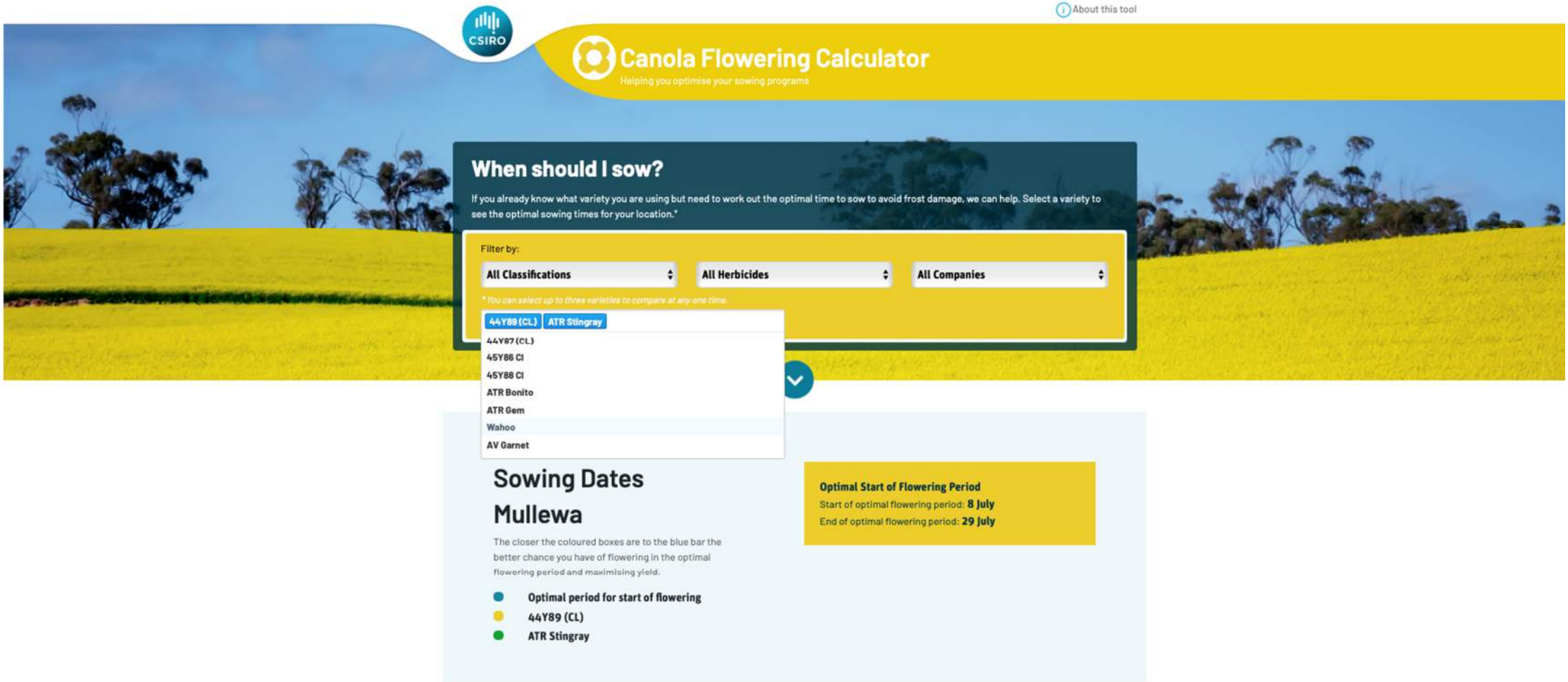
Choose a scenario



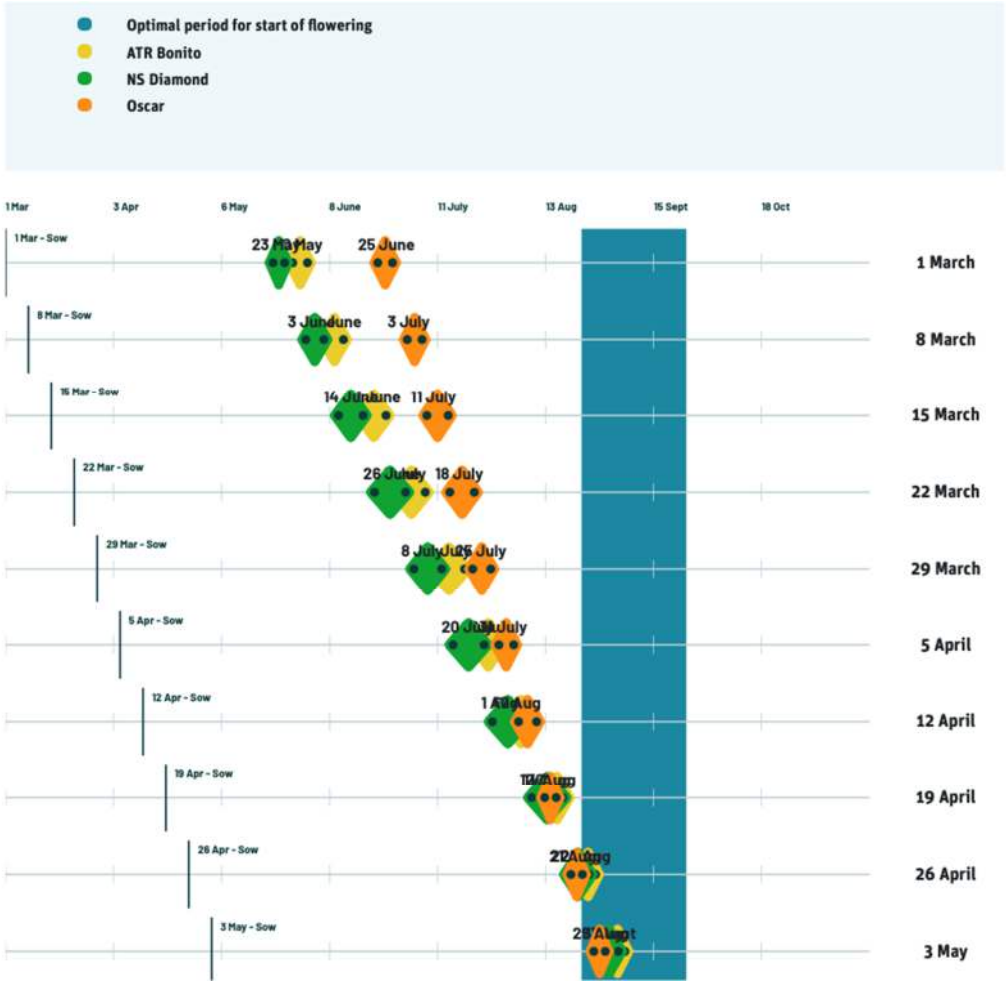
Choose a scenario



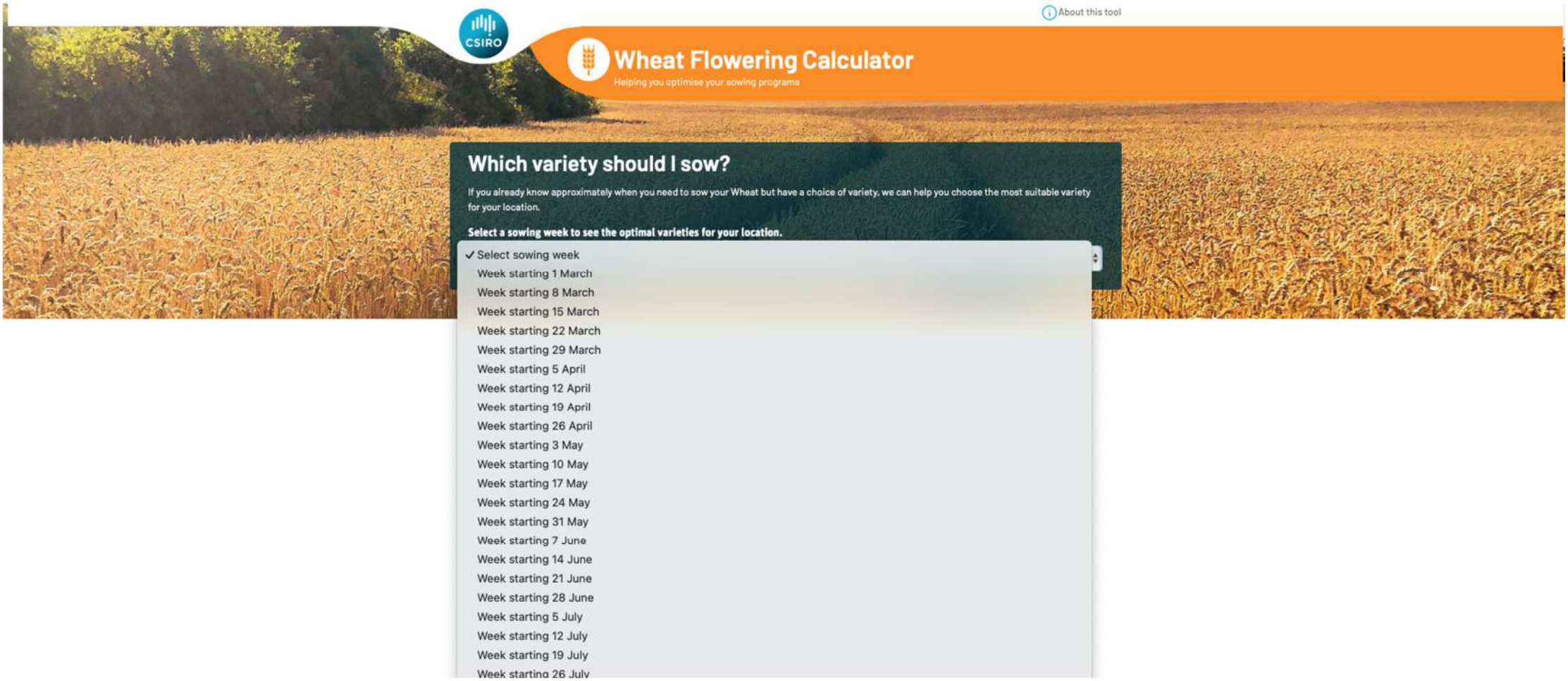
Filter cultivar options



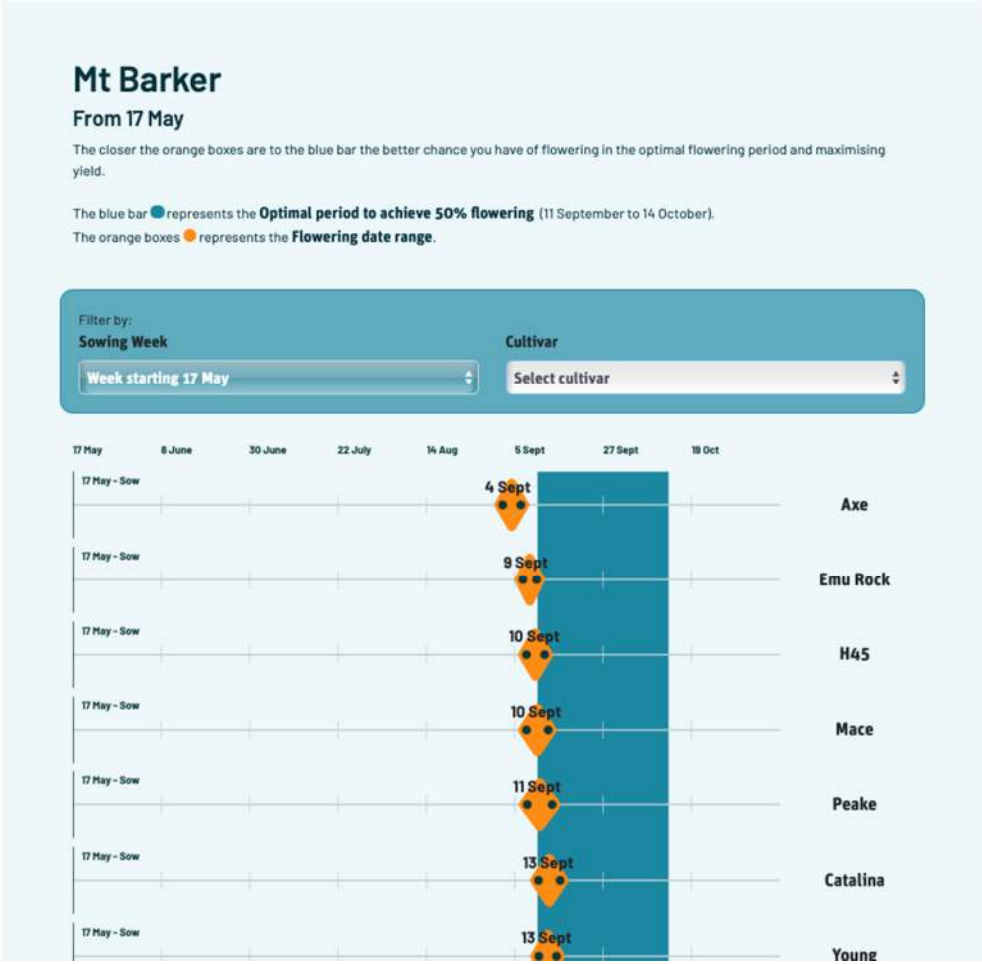
Compare cultivars



Select a sowing week



See what cultivar suits



How to access the tool

Crop Flowering Calculator

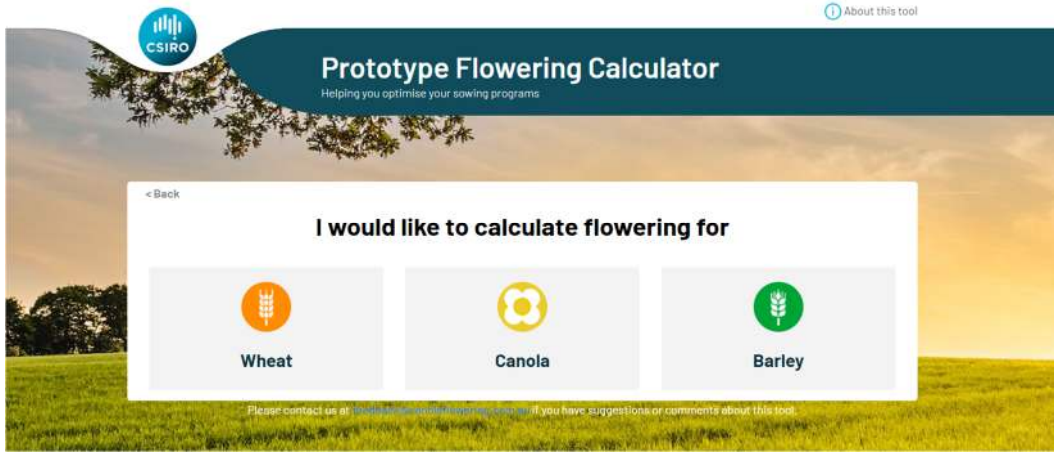
- GRDC investment (started 2022)
- incorporating genomic model
- update model and app annually via NVT

Help Growers

- choose variety or sowing time best suited to their site
- Interpret NVT data

Help breeders

- characterise phenology for new and existing varieties in wider range of locations
- incorporate into hybrid and OP breeding programs



testfloweringtool.squarevdesign.com

Testing and Feedback

https://testfloweringtool.squarevdesign.com

Feedback welcome

- Email address link on webpage
- Questions
  - Do you like the look and feel?
  - Do you think the results are accurate in your region - comments?
  - Would you use it? Why?

Thank you

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