

## ACE FACT SHEET

# SARDI at the Almond Centre of Excellence (ACE)



In October 2021, SARDI's Irrigated Crops team completed Hort Innovation project ST16003 to establish and assess several large-scale experimental orchards at the Almond Board of Australia's Almond Centre of Excellence (ACE). These orchards are now the focus of a series of experiments that are supported through various levy and non-levy funded projects. Research themes include:

## Density optimisation

Two density optimisation experiments examining the interaction between genotype and a continuum of planting densities ranging from low (Horizon 1 or H1) to medium-high (H2) to ultra-high density (H3).

**H1-H2 density optimisation** – testing the response of four varieties planted across a six-step density transition from 307 to 615 trees/ha. This 5 ha trial features 'Nonpareil' and three self-compatible almond cultivars ('Shasta', 'Vela' and 'Carina') all grafted to the full vigour rootstock, Garnem.

**H2-H3 density optimisation** – testing the response of two varieties planted across a three-step density transition from 512 to 1480 trees/ha. This 1.5 ha trial combines 'Shasta' and 'Vela' grafted to the size controlling rootstocks 'Controller-6', 'Controller-7' and Rootpac-40'.

## Genotype compatibility screens

Two screening trials assessing over 140 graft combinations for compatibility, phenology, disease susceptibility and suitability of growth habits for higher density production systems.

The first compatibility screen assesses 14 rootstocks of varying vigour planted at both H2 and H3 densities. Rootstocks are grafted to each of five varieties including 'Nonpareil' and four self-fertile lines.

The second compatibility screen assesses 21 scion varieties including traditional, newly released and unreleased material of varying growth and spurring habits. Scions are grafted to each of four rootstocks including 'Nemaguard' and three recently released genotypes of varying vigour.

## Soil amendments

A field experiment demonstrating 12 soil amendment treatments that test almond response to the rate, timing and method of applying organic matter. The experiment demonstrates drip versus sprinkler irrigation, repeat applications of compost and the 'Super-Soil' concept, where organic matter (ryegrass) was grown in-situ and incorporated into mounds prior to planting.



Image: Almond Board of Australia

## Root density and distribution

SARDI's Molecular Diagnostics Centre have developed a quantitative DNA assay for detection of 17 prunus rootstock genotypes with relevance to the Australian Almond Industry. When applied to almond research questions, the assay can characterise root architecture and anchorage traits plus characterise root response to genotype, density and water deficit treatments.

When applied in commercial orchards, the assay can be a useful indicator of root activity. SARDI's Molecular Diagnostics Centre can then use the same sample to quantify free-living nematodes and soil borne pathogens such as Verticillium, Rhizoctonia and Phytophthora.

## Water productivity and drought tolerance

Higher density production systems offer the potential to increase yield per hectare but will likely have higher water demand. Similarly, the novel genetics now available to industry (as both scion and rootstock material) may offer improved drought tolerance characteristics.

Water productivity assessments are being overlaid across density optimisation plantings, rootstock stress tolerance experiments and within two weighing lysimeters being installed in the ABA's self-fertile variety experiment.

## Automated canopy assessments

A range of mobile and stationary sensors are deployed across all of SARDI's ACE trials. These include:

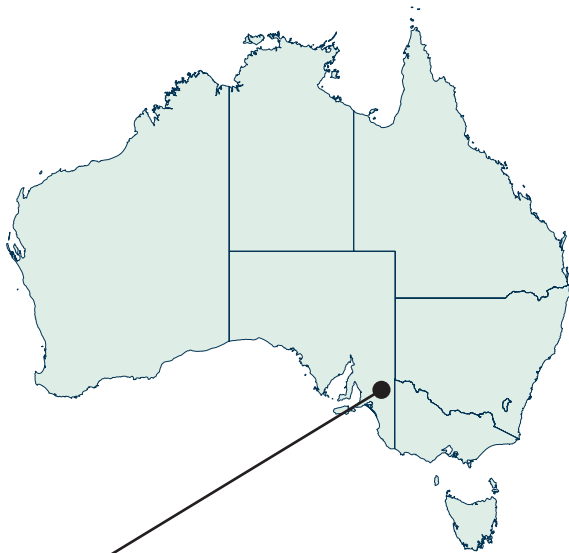
- a custom-built ground-based mobile sensing platform (LiDAR, NDVI and Ceptometer)
- aerial platforms (RGB, Multi-Spectral and Thermal)
- under-tree timelapse imagery
- rootzone moisture sensors and soil water extractors

## Salt tolerance of rootstocks

A glasshouse-based salt tolerance investigation was conducted in parallel with the establishment of ACE genotype compatibility screens. The study tested almond response to four saline irrigation treatments ranging from <math><0.5\text{ dS/m}</math> to <math>>5\text{ dS/m}</math>. Six Prunus rootstocks were assessed as either ungrafted trees or as trees grafted to Nonpareil or Shasta.

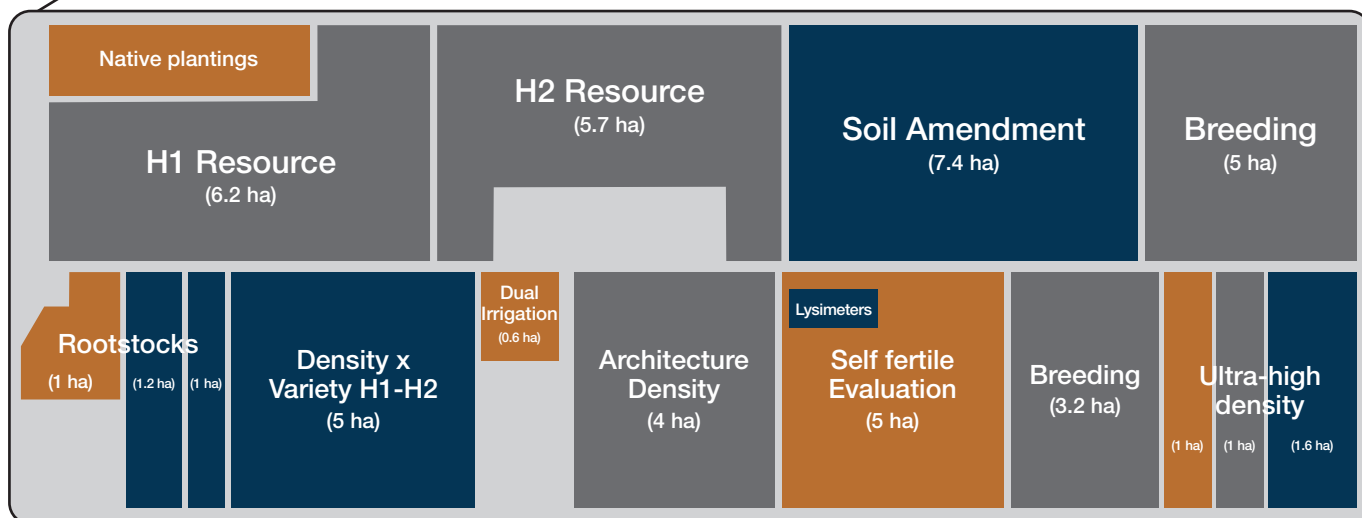
## Annual climate trends

SARDI climate scientists produce an annual review of seasonal weather at the ACE experimental orchard, including comparison to average climate trends in relation to almond production.



## Almond Centre of Excellence

Map of 60 ha experimental orchard north of Loxton, SA



- SARDI
- Almond board of Australia
- Other users

### Further information

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SARDI projects conducted at the ACE experimental orchard have been funded by Hort Innovation using the almond research and development levy, the Hort Frontiers Advanced Production Systems Fund and AgriFutures Australia, with co-investment from the South Australian Government and contributions from the Australian Government. For more information on these funds and strategic levy investments visit [horticulture.com.au](http://horticulture.com.au) and [agifutures.com.au](http://agifutures.com.au).

