

## **Final Report**

# **Development of High Health Status Mother Planting of New Australian Almond Varieties**

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Almond Board of Australia

**Project code:**

AL16004

**Project:**

Development of the High Health Status Mother Planting of New Australian Almond Varieties – AL16004

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## Summary

Project AL16004, development of high health status mother planting for new Australian Varieties was funded to provide a propagation source for the new Australian Varieties bred through the Australian Almond Breeding program. This project provided the earliest possible access to the five newly PBR'd and released almond varieties owned by the University of Adelaide and Hort Innovation Australia Ltd. The establishment of the new mother plantings of virus tested and true to type trees enabled high health status budwood material to be provided to nurseries for grafting.

The provision of clonal material, as close as possible to the original generation the varieties, ensures trees of reliable performance are available for new orchard plantings. Without the establishment of the high health status motherplantings the commercialisation of the varieties would have been jeopardised as nursery trees produced from virus tested material outperform material taken from commercial orchards that are likely to contain viruses.

The new mother plantings at Monash and Loxton were developed with urgency as the industry had entered an expansion phase that led to 14,000 hectares being planted since 2016 and a further 6,000 hectares in 2019 and 2020. This expansion of orchard area involves the production and planting of 6.3 million trees.

The new varieties have been thoroughly evaluated in the project AL12015 and have highly beneficial production characteristics such as improved yields, self-fertility, closed shells and have desirable visual and eating qualities. These varieties will help address major industry risks such as pollination surety and the need for Australian almond orchards to outperform those in California given their industry dominates global production and enjoy lower production costs.

The mother plantings have been a crucial step in facilitating the uptake of the varieties thereby maximising the return on investment for grower levy payers and Government from the HIA funded project AL12015 and the previous almond breeding and evaluation projects. As the owners of the new varieties both the University of Adelaide and Hort Innovation Australia are receiving royalty revenue from the sale of the new varieties.

## Keywords

Almonds; Australian Varieties; High Health Budwood; Carina; Capella; Maxima; Mira; Rhea; Vela; True to type.

## Introduction

The ABA maintains motherplantings of high health status varietal trees as the source of budwood for nurseries supplying the Australian almond industry. Until this project, the industry relied on two motherplantings, located at Monash South Australia and Colbinabbin Victoria, to supply budwood. Multiple sites are part of the strategy to manage risk should a site be impacted by virus contamination or seasonal bud damage by frost, hail or severe winds.

This project involved the planting up of the remnant area at Monash and the establishment of a new 0.8 site at Loxton. Having the two sites for the new varieties provides risk mitigation in supplying high quality budwood to the nursery industry.

At the beginning of the project, the ABA plantings survey conducted at the end of 2015 showed the industry orchard area to be 31,115 hectares. The industry's expansion boom has seen the orchard area increased by 14,000 hectares to 45,000 hectares planted by the end of 2018. These plantings alone will raise production from 80,000 tonnes in 2016 to 140,000 tonnes by 2025. Planned future plantings will add further significant expansion, estimated to be at least 6,000 hectares, in 2019 and 2020 further increasing the productive capacity of the industry. At current grower returns the almond industry will exceed a value of \$1 billion at the farm gate before 2025.

In addition to new green field orchard sites being established, there exists a demand for trees to replant older orchards that have reached the end of their commercial life. Both these factors mean that within the Australian almond industry there is a large demand for high health status, true to type budwood.

It is into this environment, that the five new almond varieties PBR'd by the University of Adelaide and jointly owned with Horticulture Innovation Australia Ltd were released. To optimise the uptake of these new varieties, that have superior production and quality characteristics, it is essential that a motherplanting source to supply buds to nurseries for grafting was established. Without such a motherplanting, growers, knowing the advantages of trees grafted with high health budwood, would be more inclined to plant traditional varieties.

This project enabled the establishment of a budwood planting of all five new varieties. As the demand for each variety was yet to be established, large numbers of each were planted. This differs from the established varieties where the orchard planting mix varies little and enables the motherplanting mix of trees to reflect this.

The new motherplanting also enabled the budwood supply to meet the requirement from nurseries for access to more buds in late November / December to facilitate earlier grafting, thereby enabling a longer growing period in the nursery before dormancy with the aim of producing a tree of adequate size to sell in winter rather than it taking 18 months to produce trees for sale. Importantly, this reduced delays in investor plans to establish orchards.

As the owners of the new varieties both the University and Hort Innovation are receiving royalty revenue from the sale of the new varieties that is being reinvested in almond research.

## Methodology

### Site Establishment

The Loxton Budwood Site is located at the Loxton Research Centre and the original site can be seen in appendix 1. The gum trees bordering the southern and south western corners had to be removed to optimise the 0.8ha.

A 1.7m high cyclone fence with a post every four metres was installed. The fence has a single strand of barb wire to deter budwood theft and kangaroo intrusion as well as 40mm rabbit netting that sits 900mm high from the ground and 600mm underground to stop the rabbits and kangaroos from digging under. It is essential for high health budwood production that the trees are protected from rabbits and kangaroos to not only ensure survival throughout the trees immature stage but also ensure virus transition does not occur by pest animal vectors (Figure 1).



*Figure 1: Fence at the Loxton Research Centre*

The below-ground works were delayed in 2017 due to the presence of asbestos irrigation pipes. This required a PIRSA approved contractor to be engaged to supervise the trenching activities. The irrigation and fertigation systems were designed and installed. Due to the one-hectare size of the Loxton budwood site, it was necessary to engage contractors to undertake activities in conjunction with the Almond Centre of Excellence experimental orchard (ST16000) or risk lengthy delays due to other larger jobs being prioritised by the contractors. Ground preparation works were completed in September 2017. The irrigation component has two dripper line valves to provide the ability to have different water applications for young and mature trees and a sprinkler valve for cover crop purposes.

Tree planting began directly after the irrigation was installed in September of 2017, with the purchased trees being stored at Loxton Cold Stores from mid-July. Although the planting of the trees was delayed they developed a strong root system and only two of the 640 trees died.

### High Health Tree Monitoring and Maintenance

As seen in figure 2, a harsh pruning approach is taken with the mother trees, both to minimise flower development and promote the maximum amount of budwood production through a strong tree shape. Keeping the trees at a manageable height is also critical for efficient harvesting of the budwood.



*Figure 2: Monash Budwood Trees - Young trees are the Australian Varieties*

Also seen in figure 2 is an application of Gypsum to help with tree health on the Monash soils.

Virus testing of all trees was conducted through Agriculture Victoria's AgriBio division with four testing positive for an Ilarvirus and Prunus necrotic ringspot virus. The PCR tested viruses are:

- Apple Chlorotic Leaf Spot Virus,
- Apple mosaic virus,
- Apple stem grooving virus,
- Apple stem pitting virus,
- Ilarvirus,
- Plum bark necrosis stem pitting associated virus,
- Prune dwarf virus,
- Prunus necrotic ringspot virus.

These trees were all planted with stakes, fitted with guards and maintained and monitored according to general budwood tree practice that includes acute equipment sanitation between pruning trees to avoid possible spread of viruses. Tree growth has been strong in preparing the trees for budwood production. Figure 3. shows the development of the 2017 and 2018 planted trees. The 2017 planted trees will harvested after another round of successful virus testing has occurred in 2019. The second round of testing is required to meet high health status definition





*Figure 3: Tree development from the 2017 and 2018 planted trees respectively*

## Outputs

740 Australian bred varietal trees have been planted to produce high health status, true to type budwood at the two Riverland budwood sites, with the development of the Loxton Research Centre Budwood Site being established through this project to mitigate virus contamination and seasonal production risks.

Guided by the ABA's Plant Improvement Committee the most promising of the new selections from the breeding program were also planted. A total of 16 Australian varieties have been planted at Loxton and Monash with the ability to provide enough budwood to serve their purpose (Table 1). As of February 2019, the Almond Board has 2094 budwood trees in the ground.



Released Varieties	Total
<b>Carina</b>	122
<b>Capella</b>	43
<b>Maxima</b>	240
<b>Mira</b>	44
<b>Rhea</b>	44
<b>Vela</b>	118
Promising Varieties	Total
<b>Almond 18</b>	7
<b>Almond 24</b>	7
<b>Almond 21</b>	7
<b>Almond 34</b>	2
<b>Almond 29</b>	6
<b>Almond 23</b>	2
<b>Almond 13</b>	69
<b>Almond 12</b>	23
<b>Almond 36</b>	3
<b>Almond 16</b>	3

Table 1: Australian Varieties Budwood Trees

## Outcomes

The varieties bred by the University of Adelaide have significant yield, production and quality advantages compared with existing varieties currently used by the industry. In short, these advantages include superior yield, self-fertility, closed shell to assist with pest damage and bacterial contamination, and attractive flavoursome kernels. Full details on the benefits of each variety are included in AL12015 reports.

The above variety characteristics in combination with production of the propagation material carried out in a high health manner strongly aligns to the Almond strategic investment plan 2017-2021 through outcomes 1, 2 and 3.

The additional motherplanting at Loxton has mitigated the risk of virus contamination or seasonal conditions reducing supply of high health status, true to type budwood to nurseries.

The competitiveness of the Australian almond industry has been enhanced as a result of this project in terms of cropping performance, cost efficiency, food safety and product quality.

## Monitoring and evaluation

The budwood sales for the new varieties totalled 72,790 (2017/18), 121,100 (2016/17) and 44,600 (2015/16) with Maxima and Carina dominating demand.

In 2018, two factors have caused a reduction in the demand for Australian varieties being planted. The incidence of severe Bacterial Spot found on Maxima and Rhea, has caused a loss of confidence in these varieties and led to cancelled nursery orders and young patches of trees being removed. As a result, growers are questioning the disease susceptibility testing and awaiting to see how well the disease can be managed in commercial orchards. The second factor being that the early demand was from innovative growers prepared to be an early adopter whilst other growers are waiting to see how the kernel product will perform in the market. These factors have contributed to sales slowing for the current cutting season and sitting at 26,165 buds or about 5% of total sales.

With this evaluation of the current situation, the Plant Improvement Committee believes that the current number

of mother trees is more than sufficient to meet budwood demand for the new varieties and will allow space at the Loxton Research Centre budwood site for the new selections that will be released in the near future to be planted.

## Recommendations

- High input orchards should be included in the evaluation of new selections as they appear to be more susceptible to Bacterial Spot infection.
- When growers are considering planting new varieties they should take into account the tree architecture to understand how best to set up the orchard and how it will influence orchard management practices.
- Promising new selections should be planted in modest numbers to provide access to early adopters of the best available plant material immediately upon being released and numbers increased as the varieties prove themselves.

## Refereed scientific publications

None to report.

## References

None to report.

## Intellectual property, commercialisation and confidentiality

No project IP, project outputs, commercialisation or confidentiality issues to report.

## Acknowledgements

The Almond Board recognises the support from PIRSA for allowing access to land for the development of the Loxton Research Centre budwood site.

## Appendices

1. Government of South Australia – Land Services Group Satellite Image of site before site works.



# Land Services Group

The Property Location Browser is available on the Land Services Group Website: [www.sa.gov.au/landservices](http://www.sa.gov.au/landservices)

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Government of South Australia  
Department of Planning,  
Transport and Infrastructure



Government  
of South Australia

Land Services Group

Boundary Example - Not to scale

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