

Horticulture Water Initiative

Ensuring access to water for responsible and profitable horticulture



Citrus Industry

Industry snapshot

There are some 1,500 commercial citrus growers in Australia and estimates suggest the industry employs up to 7,000 people. The major production areas include Sunraysia, the Riverland in South Australia, Riverina NSW and Central Burnett region of Queensland.

Nationally, the citrus industry is one of the largest horticultural industries. Around 600,000 tonnes are produced annually (582,689 ABS 2002). However, production can vary significantly from one season to the next.

The gross value of citrus production was around \$425 million in farm gate value of production (ABS 2002). Total value has been estimated to be more than double this value when multipliers associated with processing, wholesaling, distribution, and retailing are included.

Water for production

Citrus is a relatively high water use crop, with similar usage patterns to other horticulture tree crops namely almonds, summerfruit and avocados.

Drip irrigation is generally more water efficient than full ground cover application systems, with mature citrus trees using approximately 7–8 megalitres of water per hectare. However, varietal differences need to be taken into account, as mandarins can have a greater water demand — a major factor is leaf area.

The citrus industry has made significant improvements in matching water use to tree and soil requirements, substantially reducing overall water use and off-farm impacts. However, this has increased the demand for continuous supply of quality water to manage risk to trees of drying out as a result of shorter frequencies of application.

Water use and return per unit of water

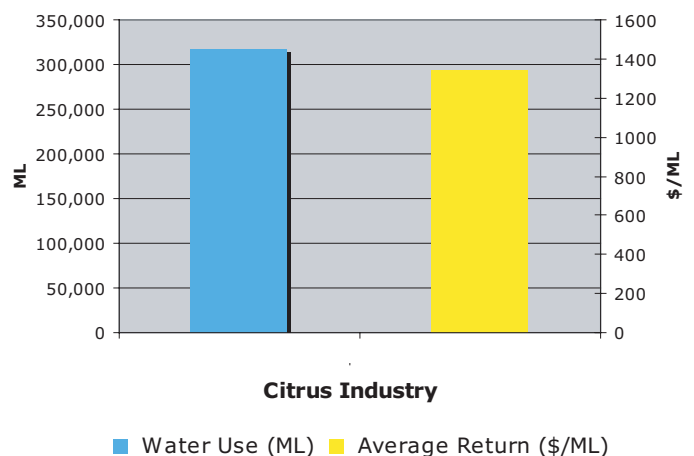


Table 1 – Water use comparison

Industry	Number of Businesses	Water Use (ML)	Average Return (\$/ML)	Estimated Number of Jobs	Production (t/ML)
Citrus	1,535	317,313	1,341	6,975	1.8
Horticulture	22,808	2,701,902	2,340	110,572	2.5
Total	43,774	10,403,759	816	188,300	-

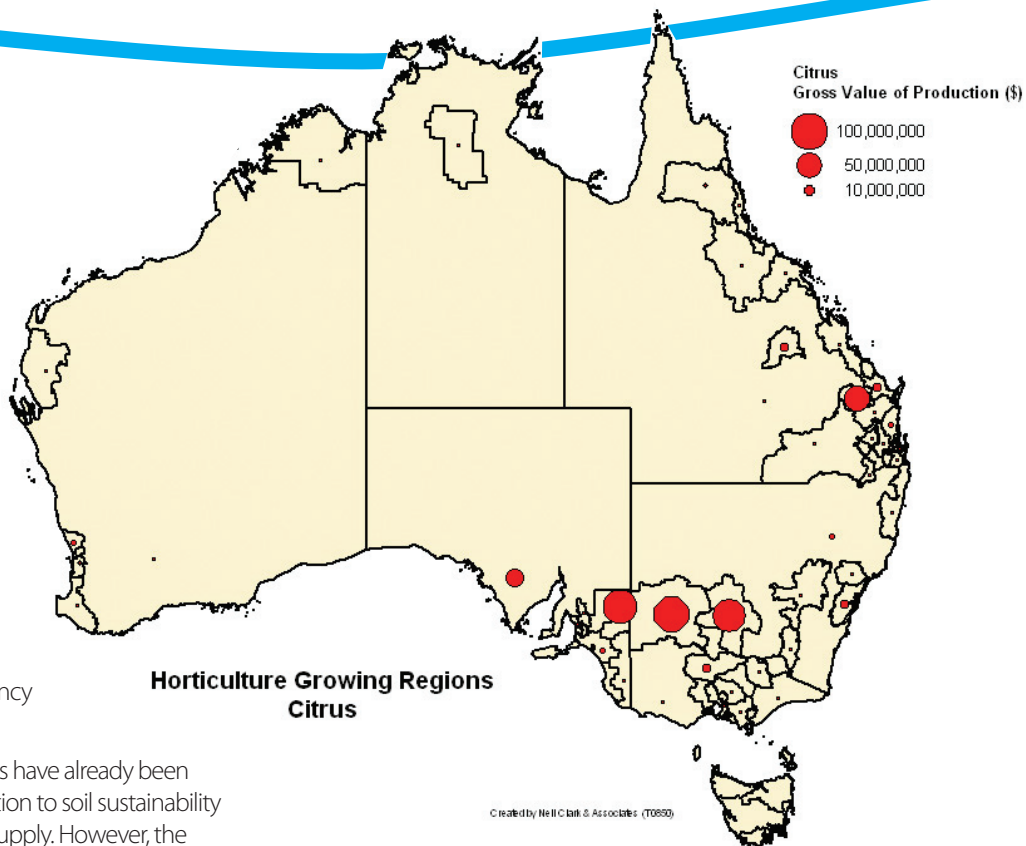
Source: HAL Stats Handbook 2004, HAL Water Initiative 2005, ABS 2001, Agricultural Commodities 2002-03, CIE 2004

Industry commitment

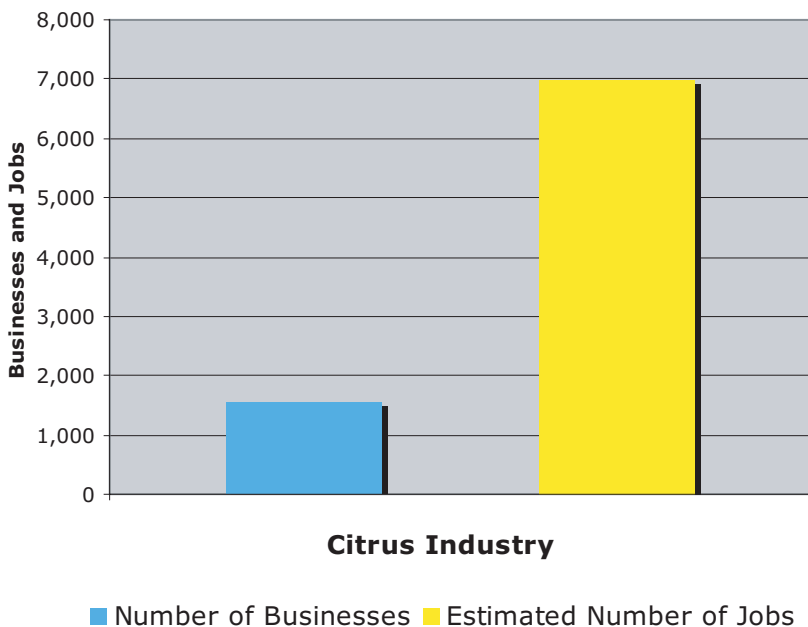
The industry is committed to a continued improvement in irrigation efficiency and management, and supports a coordinated approach, designed to ensure ongoing access to water.

Coordinated investment in research and development is being achieved, demonstrated by horticulture's contribution to the National Program for Sustainable Irrigation (NPSI), which has leveraged funding worth \$12.6 million. Most of these projects are directly applicable to the long-term sustainability of horticulture. For example, the program is continuing to fund research into new technologies, such as high frequency 'hydroponic' irrigation techniques for citrus.

Around 2,400 hectares of open hydroponics have already been adopted, with potential implications in relation to soil sustainability for heavier soils and the reliability of water supply. However, the technology has the potential to improve fruit quality and produce higher yields.



Number of businesses and jobs



For further information

Please refer to the following websites:

Water Initiative

Horticulture Australia Limited

www.horticulture.com.au/water

Horticulture for Tomorrow

Horticulture Australia Limited

www.horticulture.com.au/environment

Citrus Industry

<http://www.australiancitrusgrowers.com>



Spanish technology proves itself on the Darling

CASE STUDY - Alan Whyte, Mildura

A citrus farmer, north of Mildura in southern NSW, testifies to the advantages of using Spanish irrigation and production technology.

Alan Whyte manages 55 ha of citrus orchard on his 2,000 ha "Jamesville" property between Wentworth and Pooncarie. The challenges posed by the Darling River, bordering his farm, have seen Alan develop his system to cope with the risks of low water availability and poor water quality.



Alan Whyte with his highly productive tangelo trees

At the end of 2003, flow in the Darling ceased, leaving local irrigators with little water and severe water quality issues. "The water from the Darling ranged from 2,000 to 5,000 EC (2-5 dS/m) and had a pH of 9.4-9.5". Despite the implications of this for production, Alan and other local farmers banded together to work through the problem.

"We had a really good group of people to get through the problem. There was no whingeing or blood in the streets. We put down four bores in this area, three of which had usable water. This had never been done before in the area". Water taken from a depth of 24 m on "Jamesville" had a salinity of 800 EC (0.8 dS/m) and a pH of 7. This allowed Alan and others to shandy the poor quality river water with groundwater supplies.

New technology - the breakthrough

The real break for Alan came with the use of irrigation technology from Spain. With help from a Spanish colleague, John Chavarria, Alan has established a system that he believes makes the citrus trees stop taking up salt. Citrus trees are fed a specific fertilizer mixture that is expected to manipulate the movement of ions across the plant root membrane. Not only does this help trees to stop taking up particular ions such as salt, but it also encourages trees to take up particular elements, which are critical for fruit development.

The pH of irrigation water can also be controlled with this technology by adding sulphuric acid to the fertiliser mixture. This allows pH to remain relatively constant at 6-6.5 and has eliminated the threat from highly alkaline river water.

The technology works best with drip irrigation as the nutrient mix can be precisely concentrated on the root zone. The fertilizer mixture changes depending on the growth stage of the plant, which has allowed Alan's production to be more consistent. "Our fruit quality is much better than industry averages and now we produce heavy crops of large fruit every year".

The technology is much cheaper than some alternatives. The technology on "Jamesville" was installed

and running for \$20,000 including Alan's time. It took about six weeks to set up the system and Alan has since spent about \$8,000 making it more user friendly. This contrasts to some alternatives that can cost up to ten times this amount.

Alan has also used Spanish knowledge to improve the development of fruit on his trees. "The aim is to get fruit over the three-dimensional volume of the tree". Consequently, Alan has manipulated his trees

"Our fruit quality is much better than industry averages and now we produce heavy crops of large fruit every year."

so that only terminal fruit develops. When combined with pruning to let light into the inner areas of the tree canopies, the result is



The Darling River downstream of "Jamesville"

Summary

Poor water availability and quality

Use of relatively inexpensive Spanish technology

Increased quality and size of fruit

Risk Management

Regional planning to drive NRM

healthy fruit over the entire area of the tree and increased production.

Spanish technology has also been used by Alan to reduce the time taken for younger trees to reach production. Usually trees take 7 to 9 years to reach a significant level of production. A combination of nutrients/supplements such as amino acids and brotomax has been used on the property to reduce this period to 4 to 5 years. This means trees can be productive sooner than normal.

Alan uses approximately 300 ML of his 670 ML license every year, from which he gains a gross farm gate return of more than \$1,000 per ML in a "normal" year. His drip system uses about 5.5 ML/ha

over the farm area, however this varies depending on the type and age of the trees. In 2003/04 Alan managed to maintain production using 4 ML/ha of poor quality water. Fruit size (diameter) reduced by approximately 5 mm during this time.

About 14 different citrus varieties are grown on the farm including oranges, tangelos and mandarins. The spacing between tree rows and the density of trees varies depending on the variety. For example, Alan uses double planted rows for his Afourer mandarins and surrounding buffer zones, where a pair of rows are 2 m apart followed by a 5 m gap to give a plant density of about 900 trees per hectare. Recent navel plantings have been 6 m by 3 m. Older plantings are 7 m by 5 m.

Alan uses a combination of spotted gum (*Eucalyptus maculata*), casuarina, white cyperus and forage sorghum as wind breaks within the orchards to help protect the fruit. The spotted gum wind breaks are a favourite with Alan due to their height, lack of understorey to impede machinery and their vertical growing root system, which interferes less with the citrus trees than other high wind breaks and helps keep the water table down.

Because of the variation in citrus tree spacings, production per hectare can differ for separate parts of the farm. It can also differ within particular plots depending on local factors such as soil. However, on mature mandarin and tangelo trees an average production of 50–60 t/ha can occur and up to 80 t/ha can occur on localised patches.

Average crop returns across all production in 2003 (a very poor one) was \$360/t, with premium mandarin varieties fetching \$700/t. Up to \$1,000/t can be obtained in a good year, especially if good quality produce is exported to the United States when their local produce is out of season.

Alan likes to be “a bit ahead of the pace” and is beginning to establish seedless mandarins on his property because of their potentially higher value on the market.

He has been involved in the CSIRO plant breeding program and is taking great care to ensure his potentially seedless varieties are not cross pollinated with other varieties. However, the CSIRO varieties are often seedless even if they are cross pollinated.

The Afourer variety of mandarin he is currently growing could be cross-pollinated, so Alan has planted them a substantial distance from other varieties. He has also planted at least 100 m of navel oranges (which are pollen sterile) around the seedless trees to help reduce seed development. If successful, Alan will cover the trees with mesh to reduce blemishes on the fruit and maximise their value on the market.

Having so many varieties on “Jamesville” allows production to occur consistently from March/April through to the end of October/early November. “We are consistently picking through that period and can run from patch to patch. That means fruit is always good quality when it is picked and is not over mature”.



Spotted gum, casuarina and forage sorghum used as a wind break to protect citrus trees

However, having numerous varieties and an intensive irrigation and fertigation system poses management challenges for Alan. He is currently updating the communication technology on his farm and is installing wireless network coverage across all planted areas, including Ethernet data systems and internet based cameras. This will allow key systems to be easily monitored from anywhere on the property by computer or pda or from any internet connection anywhere in the world. “This will help make running the property easier and it is remarkably cheap because it is very common technology”.

Despite the technological advances used on “Jamesville”, Alan has ensured he has ‘back ups’ as a risk management tool. “The irrigation system has to run every day, so there are numerous backup systems including a generator and the ability to manually operate any system on the property”. The good agricultural practices undertaken by Alan have seen the farm become EurepGAP accredited.

After being the Chair of the NSW Panel for the National Heritage Trust and being involved with the Catchment

Management Committees and numerous regional NRM planning initiatives, Alan is aiming to improve the condition of his farm. His fundamental philosophy regarding natural resource management is that “decisions on what happens should be based on regional scale planning, based on good quality information”.

Alan believes this is the best way for intelligent decisions to be made. He also believes management can be made easier through the use of Geographic Information Systems (GIS), which are easy to use and can be updated with new information. “GIS makes it easy to say why things should or should not happen”.

With the current advances on “Jamesville” one may think that the opportunities for improvement are declining on the farm. However, Alan is striving to continue his excellence in the citrus industry. “If you had asked me ten years ago if I could do what I am doing today, I would have said no. We can always get better”.