Citrus Varieties Captivating the World's Consumers

Australian citrus – right variety, right market, right quality, right price!

A report for:

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Executive Summary

The citrus industry is Australia's largest fresh fruit exporter with a total crop of around 600,000 tonnes annually, of which, on average, 180,000 tonnes is exported (mainly navel oranges and Murcott mandarins). Export accounts for around 45% of farm gate returns, despite being only around 25% of total volume.

In 2014, oranges accounted for 80% of citrus exports, mandarins 19% and, lemons, limes and grapefruit 1%. The top five major export markets for 2014 were Japan; Hong Kong; Malaysia; Singapore; China and the Middle East.

Australia produces 210,000 tonnes fresh domestic fruit and 230,000 tonnes of fresh juice.

This report holds many recommendations to help drive the Australian citrus industry forward - none of which will occur without working together as an industry and focusing on the correct research and development.

There is no argument that times are changing and the citrus industry cannot afford to just focus on how to grow an orange. Markets, both domestic and export, are consumer driven and as such dictate the type of varieties that must be grown in the most suitable region.

China holds many opportunities and is not just one market. It has room for all citrus sectors if Australia is sensible and examines the second-tier cities - many of which individually have a greater population than that of the whole of Australia.

Mounting market competition, however, from other southern hemisphere countries, such as Chile, Peru and South Africa must remain uppermost in the minds of both citrus growers and exporters. It is fair to say the Australian citrus industry cannot beat its export competitors on price due to their lower costs of production. Therefore, the industry must "market" its point-of-difference, which is a reputation of being able to produce a premium, clean, green and safe product.

In maintaining such a clean, green and safe reputation, the industry has been seen to diligently come close to adopting ultra-low chemical residues. It has adopted this approach to protect markets at any cost, and understands the requirements of specific market's maximum residue

limits (MRLs) before shipping product. As MRLs vary from country to country just one mistake could close the trade.

Biosecurity threats are increasing daily - Huong Long Bing (HLB) has ravaged the United States (US) citrus industry, subsequently putting Australia on alert to be ready to act should it appear on these shores. To ensure superior biosecurity, the Australian citrus industry must take the lead role in regards to surveillance, and pest and disease trapping. In the event of an incursion, the industry must be able to manage the situation and work alongside government and agencies, but take the lead and ensure the right outcome.

In terms of what the industry must grow and market, varieties and rootstocks hold many keys.

Consumer preferences dictate the type of varieties the industry must grow, with trends fluctuating towards sweeter citrus, easy peelers and smoother rinds but do these preferences change from market to market?

The Japanese market prefers fruit with a higher brix level while China can't get enough of Australia's firm-skinned oranges and other markets want those easy peelers.

Meanwhile, rootstocks are not just focusing on compatibility but now more on crop yield, flavor and disease resistance. Trees are planted with a view of being in the ground for 25 years. It is therefore imperative researchers breed the right scion onto the right rootstock.

Orchard redevelopment is expensive with time lags in production but not having the right varieties to suit a market and rootstock to suit these varieties is a far bigger expense.

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Foreword

In 2004, I decided to take the plunge and purchase 350 acres of citrus, wine grapes, avocado and figs.

This was a huge decision given that my background was financial, accounting, computers and software, with no history of farming. My husband had agronomic skills, having worked as an agronomist and as a farm supervisor but none of this prepared us for the harsh reality of farming - with no control over costs or returns. The citrus industry has always been a price taker, never a price maker, and with a duopoly like we experience in the Australian retail sector, we have had to look to export markets to recoup our high costs of production.

In 2008 we, and our industry, were hit hard by drought. We had a water licence that was not worth the paper it is written on and hard decisions had to be made such as; for what plantings should the water be turned off, which plantings do we save and, can we grow a crop at all? Wine grape prices were sinking fast so that was the easiest choice in terms of which would be first to go. Avocados use more water than citrus and produce a highly unpredictable crop load so they were next to go. Also, having such a small number of fig trees in the overall scheme of things were more of a management hassle than an asset – so the water went off them.

That lack of control over costs and government policies inspired me to apply as a director of the national peak industry body, Citrus Australia Limited. This was a huge step out of my comfort zone and into a male-dominated arena. However, to then become Chair of this body, less than two years later put me on a steep learning curve. Being Chair meant representing the industry on advisory panels, making recommendations on key research and development projects, being industry spokesperson, being signatory to the emergency plant pest response deed with Plant Health Australia and media spokesperson on all things citrus (half of which I didn't even grow such as lemons and limes). Luckily for me my male-dominated board was supportive and my leadership style. They saw the need for the Citrus Industry to realise that we were not just growers but we were all in business and, that's where my skill set was.

In 2012, I was awarded the Victorian Rural Women of the Year. Whilst the award was in recognition for what I had done as a leader of the citrus industry it was also an opportunity to do more, an opportunity to show women that it is ok to stand up and speak out, that women

have many skills that they do not offer up as often as they should. The networks gained through this award gave me access to an alumni stretching across the whole country as well as across multiple industries with amazing skills and stories to share.

Being the representative on multiple fronts opened my eyes to so many things confronting our industry, such as growers farming in a country with the highest cost of production, changing consumer trends, biosecurity threats, competition in export markets, and reduced chemical availability threatening export market access. I also came to appreciate how difficult it is for the average grower in rural Australia to get across these issues, understand them and indeed find solutions to them. This was a key reason for me applying for a Nuffield Scholarship, not just to learn what was happening around the world but to also show others in the industry that we need to learn from our international colleagues and competitors.

My Nuffield study has found it critical to research and learn from our industry's export competitors and colleagues (such as Chile, Spain and the United States (US)), and investigate what they do in terms of citrus management - learning from their work but, then doing it better.

The Australian citrus industry, whilst being the largest fresh produce exported out of Australia, is less than 1% of the global citrus industry. Therefore, it is vital that we learn from, and build international relationships across the whole gambit, from growers to importers, retailers, researchers, nurserymen and more. Researching varieties and ensuring we plant the right one is a key to success for any citrus grower. This is because it takes five years before a grower can expect any return from the tree once in the ground, and as we look for that tree to crop for about 25 years we cannot afford to get it wrong.

Visiting key overseas markets, including China and Japan, ensures the industry is delivering what the consumer wants in terms of variety and quality. These markets, and that of Korea and Thailand, still have a penchant for Australian oranges, even as global demand increases for the easy peel mandarins. They are, therefore, important sectors for us to cultivate. Recent Free Trade Agreement (FTA) negotiations on tariff reductions also make these countries more attractive.

The study tours into these regions gave me insight and research ideas into targeted export markets, and how Australia's export competitors are changing to satisfy consumer trends.

Quite clearly, in Australia, we know how to grow quality fruit and how to ship it in prime condition but ensuring we send what our export markets want so we receive top returns is vital. Once varieties are identified there remains a magnitude of challenges and high costs of production ahead.

Today's family farms generally generate more cashflow than large corporates and are a safer investment in terms of survival. However, succession planning within a family business is paramount to its future. Today farming is a business, not a lifestyle, as in past generations.

My study had many aims, but they ultimately were to visit Australia's key export competing countries and determine what research and development they were adopting in order to remain competitive. As a consequence of these visits, I aimed to bring back research and development findings with the intention to link them back to the Australian citrus orchard; to see where there may be gaps in terms of increasing growers' productiveness and returns.

I also learnt about the cost structure involved in importing varieties our own Australian markets demand. For instance, in Chile, one of our main export competitors, the cost of buying a tree is about AUD$5, while the equivalent tree would cost AUD$20 to purchase in Australia.

Labour costs in the two countries also varied greatly, for Chile it was AUD$2.50 an hour compared to Australian labour being about AUD$25/hour. These costs add to Australia's high costs of production and emphasised why we must ultimately, produce a final product that is safe, clean, green and of the highest quality.

Another new alumni experience or network has now been afforded to me by having had the privilege of joining the Nuffield family. The opportunity to travel to countries such as Japan, Chile, USA, Spain, Hong Kong, China and more. I have learnt from the oldest citrus growing country in the world, seen where Australia's citrus originated from, witnessed the devastation of the worst citrus disease in the world, and visited Australia's fastest growing market learning firsthand what those consumers want. This has been nothing of mind blowing. Often, I wondered just how much knowledge I could absorb before my mind hit overload. Therefore, the only solution was to write down this new knowledge and share it with others so that the citrus industry had another resource showing them how to grow better quality fruit that is suited to consumer demands on both the domestic and export front, and also how to grow more future industry leaders.

Acknowledgements

A huge thanks and appreciation must go, first and foremost, to my family; they are the ones who had to cope with the long hours I was away as a Nuffield Scholar, and had to fill the gaps left behind, not just in the business but also, on the home front.

Thanks to Nuffield Australia for seeing in me the ability to represent the Nuffield brand, my business, the citrus industry and Australia on an international front.

Rabobank's ongoing support of Nuffield continues to reinforce its roots. Agriculture was the reason Rabobank came to be, and its continued support of this sector ensures that Australia is not only learning internationally but also teaching internationally. It is not all about learning – giving is part of the journey.

So many people have made this journey truly amazing; in every country, there were industry members who put themselves out to assist; organising orchard visits, shed tours, and meetings with industry and government participants. They provided very open, local industry information, and introduced the local culture. Above all, thank you to these people for providing a whole new range of networks and friendships that will not be forgotten. I will never forget the amazing team on our Global Focus Program, by the end of our six weeks it was like travelling with family.

Abbreviations

ACP	Asian Citrus Psyllid
AUD	Australian dollar
CHMA	Citrus Health Management Areas
COP	Cost of Production
EPPRD	Emergency Plant Pest Response Deed
FOB	Free on Board
FTA	Free Trade Agreement
GST	Goods and Services Tax
HLB	Huanglongbing
IPM	Integrated Pest Management
MRL	Maximum Residue Limits
OH&S	Occupational Health and Safety
OJC	Orange juice concentrate
PBRs	Plant Breeders Rights
PMA	Psyllid Management Areas
QLD	Queensland
R&D	Research and Development
RDC	Research and Development Corporations
RMB	Rand Merchant Bank
SARDI	South Australian Research and Development Institute
TPP	Trans Pacific Partnership
US	United States
USD	United States dollar
WA	Western Australia
YTD	Year to date

Objectives

The main objectives of this study were:

1. To identify ways and means that would allow Australia's citrus industry to remain sustainable, both financially and on the production front.
2. Ascertain where, how and why Australia's costs of production are different to its export competitors.
3. Identify the key point-of-difference in factors that allow Australia's export citrus market to remain ahead of its competitors.
4. Identify any management or market gaps that may exist within Australia's citrus industry compared to its overseas competitors, and recommend future research and development projects.

Chapter 1: A glance at Australia's citrus industry – the numbers

- Production area: Australia 28,000 hectares.
- 1,500 growers.
- Plantings: Australia 12.5 million trees.
- Crop volume: Australia 600,000 tonnes per year.
- Production split: oranges 70%; mandarins 20%; other 10%.
- Market sectors: export fresh 27%; domestic fresh 35%; juice 38%.
- Growing costs per hectare for a citrus orchard: AUD$12,000 - $15,000.
- Farm worker wages: AUD$180 per day.

Source: Citrus Australia website and authors' own data

1.1 Production

Australia's diverse climate is ideal for producing a range of sweet, safe and healthy citrus products. The country's wide range of climates also allow for a long citrus season; starting in autumn with early mandarins and Navel oranges, extending into winter with mid-season navel oranges and mandarins, and finishing in spring with late navel oranges, mandarins and Valencia oranges. Lemons and limes are produced in all climatic regions and are available for most of the year.

Commercial citrus production occurs in all states of Australia, except for Tasmania. Most production occurs in dry, inland river valleys with annual rainfall typically between 250 and 500 millimetres. The microclimate in these regions promotes many positive attributes in citrus: excellent flavor; very rich rind colour; good fruit storage life and very little rind blemish from pests and diseases. Key growing areas include:

- Riverland region in South Australia (6300 hectares).
- Sunraysia region in Victoria and New South Wales (6580 hectares).
- Riverina region in New South Wales (8000 hectares).
- Central Burnett region in Queensland (3590 hectares).

A major planting is also located at Emerald in Queensland (QLD), and two large plantings have recently been established at Moora, north of Perth, in Western Australia (WA). There also are

smaller plantings through WA, coastal New South Wales, other regions of QLD, and in the Northern Territory. In total, WA has about 1560 hectares of citrus in production and the Northern Territory has 135 hectares. The map below (Figure 1) provides an overview of the geographic dispersal of citrus areas in Australia.

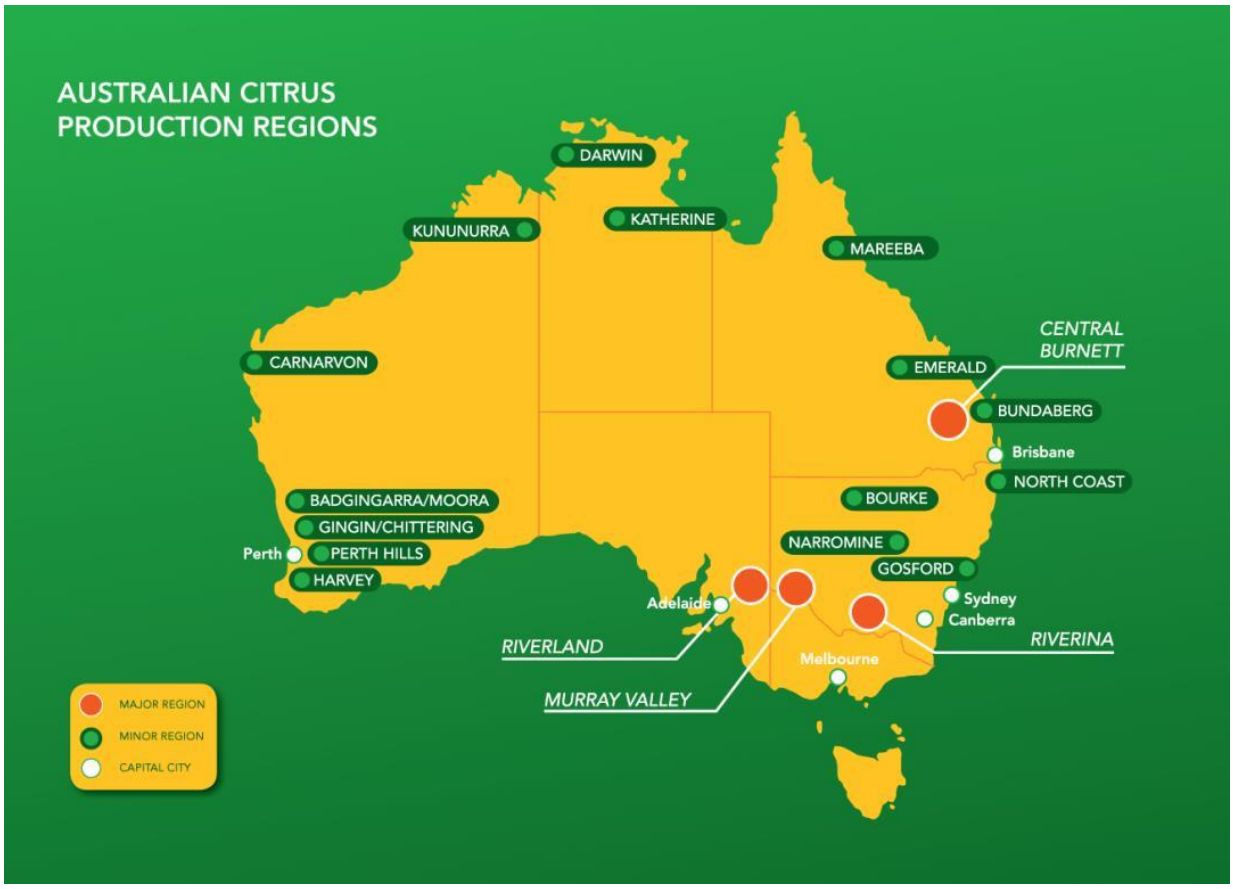

Figure 1: Major citrus producing regions of Australia (Source: Citrus Australia)

1.2 Citrus products

The most popular fresh citrus products are mandarins and Navel oranges but significant volumes of Valencia oranges, lemons, grapefruit (red and white) and limes are produced.

The main mandarins are Imperial, Honey Murcott, Afourer and Daisy, with many other varieties available such as Hickson, Sunburst and Nova. Clementine and Satsuma are minor mandarin varieties. The mandarin season begins in April with Imperial and extends to September, with late varieties such as Honey Murcott and Afourer.

Many different varieties of navel oranges are produced. The navel season is divided into early varieties (such as Navelina and M7); winter varieties (including Washington, Leng and Thompson); and Late varieties (including Late Lane, Chislett and Barnfield). This range of

varieties and the spread of climates across Australia's production regions allow for navel sales from late April through to December. The red-fleshed Cara Cara Navel and Blood oranges also are available in limited quantities.

Australian Valencia oranges are the most popular juicing variety. New varieties such as Hamlin and Salustiana are also used for processing. New plantings of these juicing oranges have been established with the intention of using mechanical harvesters to reduce labour costs. The Australian industry specialises in producing high quality fresh, single-strength orange juice (not-from-concentrate) and has an excellent food safety record. Export markets for this high quality, sweet and safe orange juice are being developed.

1.3 Production practices – high labour costs of production

The Australian citrus industry has the highest labour costs in the world; and many capital costs, such as land and trees, are also very high compared to those in other citrus producing countries.

Australian growers, packers and exporters, therefore, have to be very labour-efficient in all their practices, and, for this reason, in many activities have become world leaders. The industry has also focused on achieving high quality fruit rather than high volume, with the aim of presenting premium-priced fruit on all markets. Australia's export citrus fruit has an international reputation for:

- excellent flavour and rind colour;
- good storage life on arrival in overseas markets; and
- very reliable food safety assurance.

Integrated Pest Management (IPM) is used extensively throughout the industry for pest control. This farming practice means that agrichemical use is very low in Australian citrus orchards. The IPM sector is technically very strong, with several insect factories providing beneficial insects, which are released in citrus orchards to control pest species. Pest scouts are trained to carefully monitor orchards, and agrichemical sprays are only applied when outbreaks of critical pests occur. This widespread use of IPM is the basis of the Australian citrus industry's excellent food safety and environmental awareness reputation.

Efficient irrigation and fertigation practices have been researched and are now widely adopted by the industry. Pruning of trees, both mechanically and by hand, has become standard practice for encouraging regular cropping of large, premium quality fruit.

1.4 Australia's citrus supply chain

Australia's citrus industry has a modern and efficient supply chain. The citrus farms are well managed and have excellent modern and safe production practices. Packing houses use world-class equipment and technology to carefully and safely pack citrus for export markets. Traceability and quality assurance systems are compulsory in all export packing houses.

Refrigerated storage and trucking to port are used in all citrus production regions. Modern and efficient port facilities provide prompt delivery of citrus consignments to export destinations.

The logistics of exporting are often better managed by many competitor countries. It is necessary to focus on more efficient ways of inspecting and certifying Australia's agricultural products, and develop more streamlined quality assurance and food safety frameworks for agriculture. Having travelled through many citrus growing countries learning about supply chains and meeting with both growers, and industry organisations such as California Citrus Mutual, Citrus Growers Association of South Africa and the Chilean Citrus Committee, it is very evident that the high costs of Australia's supply chain are a constant inhibitor to competitiveness. These costs need to be analysed, and benchmarked with competitors in a bid to do things smarter. The table below clearly shows the effect on the Australian US export market when Chile, a country with a cheaper cost of production entered that market.

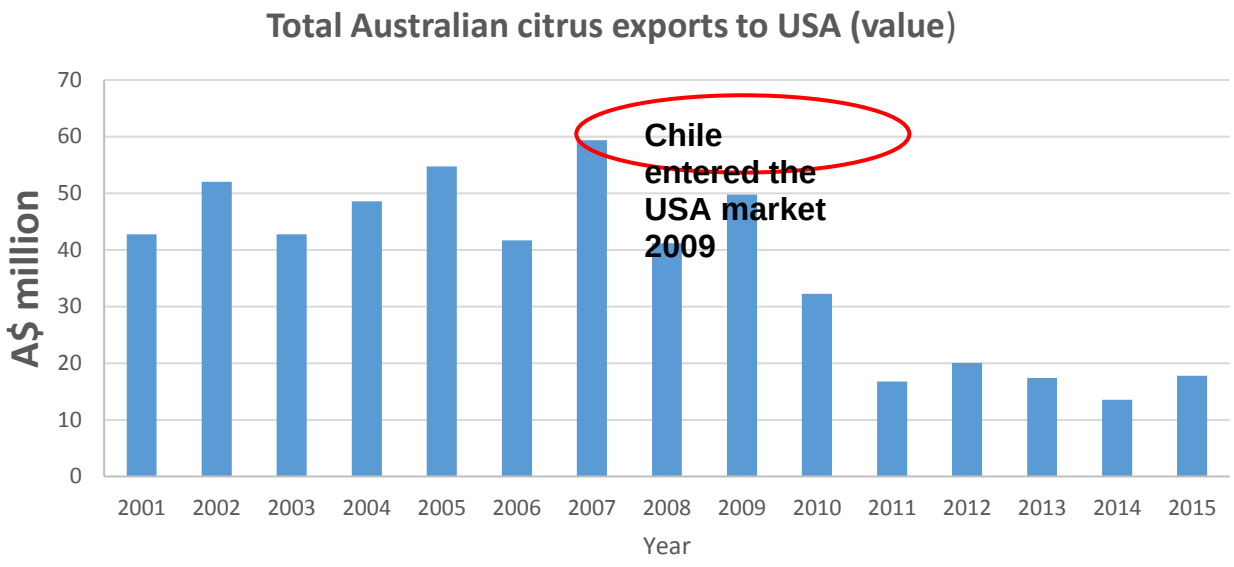

Table 1. Australian citrus trade in the US pre- and post- Chile access (Source: David Daniels, Citrus Australia)

1.5 Australia's export markets

The citrus industry is Australia's largest fresh fruit exporter, with 180,000 tonnes of citrus (mainly navel oranges and Murcott mandarins) delivered annually to more than 30 export destinations. The top five markets are Japan, Hong Kong, Indonesia, Malaysia and China. Annual export earnings, on average, of AUD$190 million Free on Board (FOB) are achieved in most seasons.

January 2014 to December 2014			
Market	*2014	**Chg Ly	Share
	Tonnes	%	%
Hong Kong	30,244	-4%	19.2%
Japan	28,524	-19%	18.1%
China	18,341	33%	11.6%
Malaysia	12,230	1%	7.8%
Indonesia	11,012	16%	7.0%
Singapore	10,755	26%	6.8%
United States	7,582	-38%	4.8%
New Zealand	7,353	-22%	4.7%
United Arab Emirates	6,376	-20%	4.0%

Thailand	4,487	30%	2.8%
Philippines	3,602	317%	2.3%
Canada	2,894	-28%	1.8%
India	2,508	92%	1.6%
Taiwan	2,172	22%	1.4%
Saudi Arabia	1,628	93%	1.0%
All other	8.076		5.1%
Total Tonnes	157,801	-4%	100.0%

*Ranked by 2014 YTD volume **

Table 2: Australian citrus exports by market (Source: World trade Atlas, Fresh Intelligence Analysis)

1.6 Australia's Domestic Market Threats – issues at a glance

Local Market Conditions

A large focus of this report, and subsequently the underlying reason for the study, was to determine and explore the factors affecting Australia's citrus export industry. Local market conditions have also been seen to affect the way Australia's citrus export market runs, such as spiraling electricity, transport, storage and high labour costs. As a result, citrus growers are concerned that Australia is at a competitive disadvantage in comparison to other citrus producing countries such as Chile, Spain, Brazil and the US. See Table 2.

Labour, and other variable costs, contributes to about 60% of an Australian citrus grower's business. This is higher than many other Australian crops and puts the grower at a competitive disadvantage to international businesses that have lower costs of labour.

Supermarket Duopoly

Added to the high labour costs are the homegrown challenges facing citrus growers, not only in terms of input costs but also access into the domestic market. Woolworths and Coles supermarkets account for close to 50 per cent of the domestic Australian citrus market. The bargaining power and market imbalance between growers and these two major retailers cannot be underestimated, and can place growers in serious financial hardship. In 2014, the industry experienced a 2.5% drop in purchase volumes across most retailers (especially Coles) with Aldi being an exception. The orange sector was the key driver of this volume decline. These factors are a big reason for the increased push into export markets.

Of note in the domestic market is that, on average, consumption of citrus fluctuates across the year. There is usually a promising rate of increase in the buying trend of citrus in the last quarter of the season (June through to August).

In the juicing sector, a similar imbalance and concern occurs. For instance, growers enter into contracts with juice processors for supply for up to three years. These contracts are not negotiated as a group of suppliers but are given to growers individually to sign. Growers can feel intimidated by this process and are concerned that if they voice an opinion their contract could be broken or not accepted.

Importation of Orange Juice Concentrate

A long-running source of anxiety within the Australian citrus industry is the importation of cheap Orange Juice Concentrate (OJC) being passed-off as "Made in Australia". It is vital that consumers can easily identify where the juice is from – is it local or imported? Australian growers are strongly focused on a clean, green, safe product, and a sweet healthy taste when producing juice, so it is important that consumers know whether the juice is imported or local. When OJC comes in imported concentrate form there are no guarantees of its quality.

Furthermore, it has been seen that OJC is entering Australia at lower than cost price, and is a threat to the industry. The author believes the onus needs to be on the country exporting OJC to Australia to prove that they are not selling it at less than their cost of production. As highlighted earlier in this report Australia has very high production costs and stringent food safety rules; to ensure these are not compromised in any way by cheap imports government needs to provide this level of protection at a minimum.

Imported fruit into the domestic market

Imported fruit entering the domestic market is an issue for growers when there is a hang-over of imported fruit at the beginning of the Australian season. For instance, when Californian citrus remains in the market at the same time that Australian fruit enters, in April, it impinges on the local fruit market and can depress early season sales.

One solution to this is the introduction of a two-week break in sales of imported fruit before the Australian fruit comes to market. Data from Nielsen Homescan on citrus domestic sales has found this can produce a ten-fold benefit to the local industry.

1.7 Costs of establishing an Australian citrus orchard

The costs of establishing an Australian citrus orchard start with securing the preferred variety of fruit. This may depend on the breeding program the variety belongs to. The success of a variety is seen as vital in order to cover the high overheads, costs of annual and follow-up visits plus, in some cases, capital injections into breeding programs, in order to be a participant.

It is quite clear that Australia's high labour costs and overheads far outweigh those of our export competitors. And as has been previously emphasised, this is what makes competing on the export front a challenge.

Planting	Costs
600 trees/ha (AUD$15.50/tree)	AUD $46500
Work up on 5ha (minimum spend of 250 hours to prepare land)	AUD $6250
Drip Irrigation (AUD$3000/ha)	AUD $15000
Fertiliser (AUD$750/ha)	AUD $3750
Mounding or ripping (A$750/ha)	AUD $3750
Sudaks (bamboo-wind protection) etc. (AUD$1500/5ha site)	AUD $1500
Planting (AUD$2.50/tree)	AUD $7500
Care and Training for 1st year (AUD$1000)	AUD $1000
Water (3 mega litres/ha AUD$450 each year for 2 years)	AUD $2250
Incidentals (for 1st year, there will be ongoing costs from 1st year to at least 5th year)	AUD $1000

Table 3: Example of cost structure involved to establish a viable Australian citrus orchard (Source: Colignan Producers Company (Vic) Pty Ltd + Ellerslie North Citrus Pty Ltd)

Figure 2: New plantings at an orchard in Mildura Victoria (Source: Chapman Farms Pty Ltd)

Investing in new varieties

An estimate of the investment in a new variety within Australia would be in the vicinity of AUD $30,000 to AUD $40,000 per variety (it takes about eight years for trees to come into production). These costs generally relate to government-owned and bred varieties.

Privately owned varieties are usually less costly to secure, with an estimated cost of AUD $20,000 per variety (eight years growing time until commercially viable).

Costs associated with domestic varietal development are significant; also, associated with the costs for imported varieties, are Australian quarantine costs. These are for a period of two years in quarantine and are estimated to be AUD $6000 per variety; experience indicates it can be as high as AUD $12,000 per variety and can, in fact take up to three-and-a-half years. As an industry, it is necessary to continually evaluate varieties and meet consumer trends but as Table 4 (multiplication costs for budwood) and Table 5 (maintenance charge) detailed below demonstrate, everything is at a cost and the variety owners need to also recoup their costs or they stop looking at new varieties and Australia will fall behind the rest of the global citrus industry.

Instalment Per Charge	Charge (Incl. GST) Payable
One tree	AUD$10.00 (on completion of budding)
Two trees	AUD$7.50 (12 months from budding date)
Charge per bud	AUD$0.50 (immediately after bud cutting)

Table 4: Citrus multiplication costs in Australia (Source: W.Parr)

Note: Trees can only be kept for two years to ensure freedom from disease. Trees are the property of the Variety Manager once all charges are paid.

Year from Planting	Charge per year per tree (Incl. GST)
1st	AUD $30.00
2nd	AUD $30.00
3rd	AUD $50.00
4th	AUD $50.00
5th	AUD $75.00
6th	AUD $100.00
7th	AUD $110.00
8th	AUD $125.00
9th	AUD $135.00
10th	AUD $150.00

Table 5: Maintenance charges for trees in budwood field mulitplication blocks (Source: W.Parr)

Other related costs for establishing an Australian citrus orchard include:

Evaluation: The Australian citrus industry independently evaluates all new varieties.

Legal: An expensive area where there must be agreements for every movement of material. As these laws easily change there can be ongoing monthly fees. Also, policing and acting on infringements is very costly.

Plant Breeders Rights (PBRs): Require a site where comparator trials can occur, a qualified person to perform the PBR trials, as well as applications and administration. (Estimated cost is approximately $6000 per variety plus an annual fee (estimated to be about AUD $300 a year)).

Administration: Includes data entry, reporting, technical evaluation and the costs to update data onto a variety manager's website.

Timeframe to produce a commercially viable orchard.

Industry sources within Australia believe it can take up to eight years to establish a commercially viable orchard, from the importation of a variety to the completion of evaluation trials and then the commencement of commercialisation. Some varieties, however, may be established quicker if it is a known variety to growers.

Country	Land ($/ha)	Cultural ($/ha) $USD	Labour ($/day)	Tree Cost ($)	Exchange Rate
Australia	$20 - $25,000	$11000	**$180**	$14 - $15	$.77/AUD$
Spain	$30 - $45,000	$5 - $7000	**$150**	$5 - $10	USD$1.3/Euro
California	$50,000	$6 - $9000	**$100 - $120**	$9 - $11	-------
Chile	$25 - $25,000	$8 - $9000	**$40 - $45**	$5	480CH Pesos/$
Argentina	$7 - $15,000	$3.5 - $4000	**$38**	$8	5
Turkey	$25,000	$5 - $5.500	**$25**	$4 - $7	USD$1.3/Euro
Uruguay	$5 - $15,000	$3.5 - $4000	**$20 - $30**	$4	20
South Africa	$15,000	$8 - $10,000	**$13 - $15**	$3 - $4	R10/USD
Peru	$10 - $15,000	$8 - $10,000	**$11 - $14**	$2 - $3	2.60Sol
Morocco	$10,000	$4 - $5000	**$10 - $30**	$3 - $5	8.7Dirhams
China	$0.3 - $2000 (lease p.a.)	$1 - $2.700	**$5 - $15**	$1 - $2	6.3RMB

Table 6: Cost structure of labour costs for Australia and competing export countries (in descending order) (Source: E Rabe. Paramount Citrus)

Chapter 2: Lessons from Japan – Agrichemical residues and variety recommendations

2.1 Agrichemical residues

One of Australia's citrus industry's key points-of-difference from competing export countries is its ability to produce fruit with ultra-low chemical residues. This is a key factor that sets Australian citrus fruit apart from other countries and also allows growers to demand a premium for their fruit.

Food safety in Japan is an extremely sensitive issue among consumers and government, and the Australian citrus industry must ensure total compliance with Japanese Maximum Residue Limits (MRLs) and safety regulations.

The study tour to Japan highlighted the need for the Australian industry to embrace the principle of ultra-low residue programs as non-compliance could seriously disrupt trade into this export market. It is vital that every grower, packer, and exporter understands that as little as two MRL breaches in any one season could potentially halt trade to Japan.

As Australia's domestic market is growing slowly, a large proportion of fruit must be exported, in particular to the lucrative Japanese market. Following discussions with both Australian and Japanese government officials the following recommendation have been made to industry:

- **Growers** who intend exporting to Japan need to be thoroughly aware as to which agrichemicals can be safely used and their withholding periods. Accurate recording of all agrichemical applications in spray diaries to allow trace-back is essential for the Japanese market.
- **Packers** need to be aware of requirements for pre- and post-harvest agrichemicals and must check spray diary compliance for every grower that supplies fruit to be packed for this market.
- **Exporters** have the ultimate responsibility to confirm that packers and growers have complied with Japanese MRL requirements, and must verify MRL status of consignments by participating in the National Citrus Residue Monitoring Program.

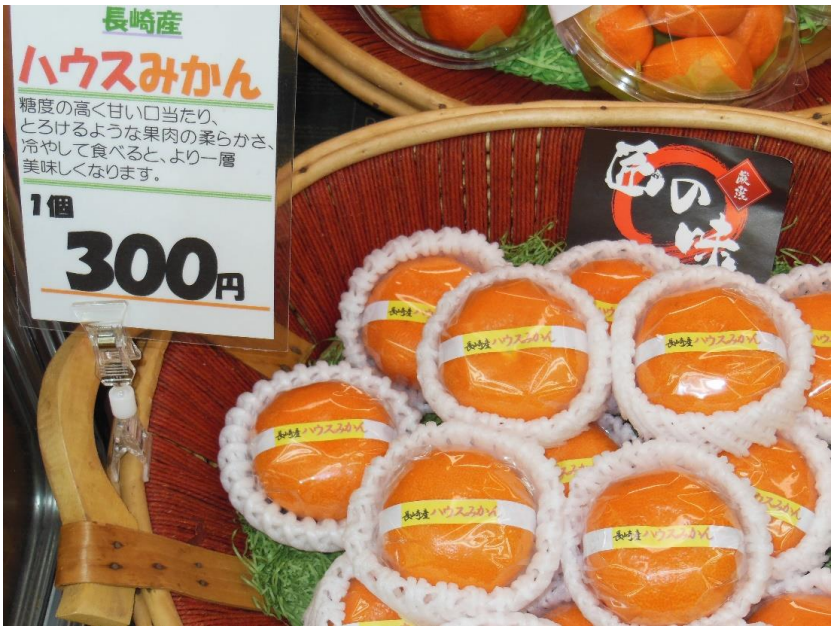

Figure 3: The easy peeler category is proving popular with Japanese consumers (Source: Tania Chapman)

As certain countries, such as Japan, take MRL breaches very seriously they subsequently have a very stringent tolerance to agrichemical residues, which has therefore seen the Australian citrus industry introduce strict testing programs. The visit to Japan highlighted how vital it is for Australia's citrus industry to adhere to these programs as it can ill afford to be left behind by competing exporting countries.

In Australia, the Citrus Residue Monitoring Program has proven itself effective, and according to the South Australian Research and Development Institute (SARDI), in 2012 when the program tested 238 samples, there was 100 per cent compliance to MRLs nationally for the domestic market. This was a figure the citrus industry was then able to quote to viable markets, especially export, as hard evidence that Australian fruit was "clean, green and safe". This is another industry point-of-difference to Australia's competing export countries.

2.2 Variety recommendations

Time spent in Japan highlighted the industry's vibrant culture of variety improvement. Australia holds the Japanese citrus industry in high regard because of its size, its careful attention to growing practices and especially its impressive emphasis on fruit quality. In fact, Japanese citrus varieties, such as Unshu and Mikan have gained world status for their superb flavour and excellent quality. Within Australia, an important part of the industry's research and development program is the improvement of varieties and rootstocks.

Figure 4: Australia watches closely as Japan develops new citrus varieties (Source: Tania Chapman)

Over the years, the Australian citrus industry has supported several projects, which aim to improve the citrus plantings in Australia. This study tour was able to bring home valuable information for an existing breeding project, a variety evaluation project and a rootstock evaluation project.

Within Australia, the industry also supports an organization called Auscitrus, which is vital in providing high-health citrus seed and budwood to citrus nurserymen. This independent organisation also helps to keep the Australian citrus industry productive and free from harmful virus diseases.

The study tour visited various Japanese citrus growing regions to establish networks and contacts with citrus growers, researchers, breeders and other members of the Japanese citrus industry. The aim was to deliver and exchange information on Australia's respective variety and rootstock programs, and to bring all findings/learnings home to the industry.

Of importance was the sharing of ideas, as Australia's industry has been evaluating many interesting new citrus varieties and rootstocks, which are also of great interest to Japan's citrus industry. These included new mandarin hybrids, early and late navel oranges, red oranges and seedless lemons.

Australia's rootstock project has also developed several interesting selections, which provide more productive trees with excellent fruit quality. During the tour, the author was able to share this knowledge with respective Japanese colleagues, and similarly the author learnt about their new varieties and rootstocks.

To date, access to Japanese citrus varieties has been highly protected, parochial and political. New varieties fall into two categories: those that have completed or are close to completing the period of registration; and those which are newly registered and highly protected.

The study tour found that it was unlikely the Australian citrus industry would gain access to recently registered varieties, as these cannot be distributed beyond the prefecture in which they were developed.

However, of note for Australia's industry, were several candidate varieties that have registrations, which have lapsed or are close to lapsing. These (Goko Wase Mikan) varieties should eventually be able to be imported thanks to the Japanese industry contacts made on the tour.

The Goko Wase Mikan (super early Satsuma) varieties, in order of priority, are: Yura, Iwasak, Hiroshima 7, Imada, Nichinan and N1 (Table 7). Due to these varieties' early fruit maturity and higher Brix levels, it is recommended to the Australian industry that they be imported through research and development grower levy funded programs and the support of Auscitrus.

Variety	Harvest	Comments
Yura	Late October	Has good flavour but difficult to grow. Quality can vary between years. Alternate bearing and small in fruit size. Commands high market prices AUD$8 - $9/kg. °Brix average between 11.3 and 12.3.
Iwasaki	Early October	Low acid, earlier than the Yura, originates from Nagasaki region. Sampled at Tokyo wholesale fruit markets. °Brix average 11.2.
Hiroshima 7	Late September	A super-early Satsuma (registration expired in 2013). Low acid. °Brix average 10.8. Mild flavour and small fruit size.
Imada	Mid October	Larger fruit, at sampling had a noticeable acid taste. °Brix average 8.9.
Nichinan	Late October	Sets fruit readily, consistent and heavy cropping with small fruit size. Appearance of the fruit was favoured by the local consumer market. °Brix average between 8.3 – 8.9.
N1	September	From the Miyazaki prefecture with September harvest. °Brix average 9.6.

Table 7: Varieties observed and sampled at the Japanese research centres and citrus properties (Oct 2013)

Source: Collated from visits at Ehime Mikan Research Centre with researchers Haruhito Nakata and Yasuyuki Masamoto. Mikan (Satsuma) selections

It also was made clear that the opportunity for private citrus commercialisers to secure rights to any Japanese citrus varieties is very limited. There may be opportunities for commercialisers to promote Australian varieties such as seedless lemons within Japan, although the small scale of the Japanese citrus farms and the large number of farmers would make commercial licensing of PBR varieties very challenging.

As previously mentioned, it is very difficult to export a citrus variety from Japan. However, from the tour it was found that this landscape appears to be changing, and variety exchange between the two countries could become a lot easier to negotiate.

Anyone in Japan can register a variety, and the Trans Pacific Partnership (TPP) agreement includes uniform plant protection arrangements. In fact, Australia supporting the TPP may improve the opportunity for variety exchange between Australia and Japan.

So, looking ahead, the Australian citrus industry will need to maintain a close watch on the development of the Japanese varietal program and foster ongoing relationships at the appropriate levels.

The study tour emphasised to the Japanese industry that production within Australia would not compete with Japanese production. The point was also made, letting the Japanese industry know, international retailers were looking at year-round supply of superior varieties, so counter- season supply between Japan and Australia would be a strong market advantage for both countries.

The author met with four researchers from the Fruit Research Division, at the Aki Research Station near Hiroshima: Mr. Y. Kawasaki; Mr. Nakamoto (manager of the centre); Dr Junko Kaneyoshi; and Mr. S. Akasaka. This team is working on citrus development projects, including breeding of new varieties; management techniques for improving mikan fruit quality; labour saving pruning and training practices; and developing lemon production in Hiroshima prefecture.

The author also met with researchers Haruhito Nakata and Yasuyuki Masamoto. The research centre was started in 1933, with a new building erected 2007. The centre has three main research goals: new varieties; improved growing techniques; and better storage technology.

Chapter 3: Learnings from key exporting countries – Chile and Spain

3.1 Chile

Australia's citrus trade figures clearly show that after South Africa, Chile is one of the main export countries that has fueled the decline of Australia's lucrative citrus trade into the United States (US). This has been mostly due to the influx of cheap Chilean navels, which started in 2009, and dramatically upset demand for Australian navels in the US summer market (June to August).

Figure 5: A young Chilean citrus orchard (Source: Tania Chapman)

When looking at the Chilean industry for answers as to how Australia can be more competitive, it is quite clear that the Australian citrus industry will not be able to compete on Cost of Production (COP). It is evident the Chilean industry has lower labour costs and overheads. For instance, Chilean wages on average are AUD $3/hour compared to AUD $25/hour in Australia.

During the study tour, time spent with Chilean citrus committee members Juan Ortuzar and Monserrat Valenzuela it became obvious Chile's orchard practices enabled the COP to remain low, and costs of citrus products such as trees varied immensely. For instance, in Chile the cost to purchase a citrus tree is about AUD $5, whereas in Australia it is about AUD $25.

On a positive note, it was apparent Australia is far more technologically advanced in orchard practices than Chile. Taking this into account it was evident, however, that Chile was very switched on to consumer demand, and had over recent years changed production focus from navels to easy peeler mandarin varieties, such as Afourers to meet that demand.

This move has been spurred on by the US consumer markets' demand for seedless, easy peelers. In fact, out of Chile's total 170,000 tonnes of total production, 106,000 tonnes is exported and of that, 80 per cent is sent to the US. Again, these figures show Chile's strong reliance on the US market. This is why Australia must be making inroads into other lucrative markets such as Japan, China and South-East Asia.

While it was evident the Australian citrus market cannot compete with Chile in the export sector on price – it is perfectly positioned to win-over market share through the branding of its fruit as "clean, green, safe and of a high quality".

This point emphasises the need for research and development in Australian programs that focus on these areas, to be either maintained, or introduced.

Figure 6: Chile's labour costs are significantly lower than Australia's (Source: Tania Chapman)

3.2 Spain

Spain's citrus industry – the numbers (Chavarria, 2015):

- Production area: 330,000 hectares (Australia 28,000 hectares).
- Plantings: 140 million high-health nursery trees planted since 1982 (Australia 12.5 million trees).
- Crop volume: 6.5 million tonnes harvested annually (Australia 650,000 tonnes/year).
- Production split: oranges 48%; mandarins 36%; lemons 16%.
- Market sectors: export fresh 50%; domestic fresh 30%; juice 20%.
- Growing costs per hectare:
  > Oranges and lemons - AUD$6500 - AUD$7800.
  > Mandarins - AUD$10,400 - AUD$11,700.
- Farm worker wages: AUD$11.70 per hour.
- Picking costs: AUD$65.00 per tonne.

Healthy plantings

The Spanish industry is rightfully considered one of the most successful and technically advanced in the world. A cornerstone of this success is the high-health status of the plantings – the industry rests on the productivity of healthy trees.

The study tour identified the two components to this achievement: a world-leading budwood program delivering disease-free propagation material; and a regulated nursery industry, which produces healthy planting stock of excellent quality and uniformity.

Since the start of the Spanish high-health program in 1982, about 140 million certified trees have been planted, accounting today for 97 per cent of the plantings. While drip irrigation, fertigation and other practices have all contributed to the productivity of the Spanish industry, the single biggest contributor has been healthy trees.

While Australia's citrus industry has a world-class budwood scheme with Auscitrus delivering high-health buds to nurserymen, unlike the Spanish system, Australia's citrus nursery industry is not regulated (and it is unlikely it ever will be). This does not, however, prevent a grower from insisting that their nursery tree supplier only uses Auscitrus buds when propagating his/her trees. The cost benefits of an orchard grown from healthy bud lines at a cost of 40cents extra per bud are well proven and must be promoted.

Rootstocks

Rootstocks are playing an increasingly important role in influencing disease susceptibility, tree size control, and pre- and post-harvest fruit quality. Spanish breeding programs are focusing a lot more on this area of research including somatic, diploid and triploid hybrid programs. Internationally, two opposed schools-of-thought have emerged in the development of new citrus rootstocks, both of which are driven by differing economic goals.

The first approach is to develop and plant new orchards on rootstocks, which give rapid and vigorous tree growth (despite poor soil and growing conditions) and which result in huge yields per hectare of large fruit.

This approach is very attractive from a production angle, with very impressive pack-outs being achieved. Unfortunately, some of these vigorous trees produce fruit of poor eating quality: the rind is typically thicker, rougher and pale; juice percentage is lower; and most significantly, Brix and acid levels are much lower, resulting in bland, tasteless fruit.

The alternative approach is to focus on dwarfing or semi-dwarfing rootstocks, producing smaller, more manageable trees which are easier to thin, prune and pick. Trees of this size need less height and width management, and are thus more suitable for mechanical harvesting.

The reduced tree vigor typically gives much better fruit quality: smoother, thinner and deeper coloured rinds; higher juice content; and high Brix with medium acid levels, resulting in a rich tasting experience. The lower yields per tree are compensated by planting at closer spacings, so that tonnage per hectare is still high.

During the Spanish leg of travel, it was evident that growers have been attracted by the high yields of large fruit produced on rootstocks such as macrophylla, volkameriana and rough lemon, particularly on more marginal soils.

The economic drivers of quick returns from early, high yields have overridden the need for excellent fruit quality. In some markets, this strategy is working well, such as when consumers are less fussy about eating quality and are driven more by price. But where fruit quality is the main driver of sales (such as Australia’s lucrative export markets), this poorer tasting fruit will not command a premium.

As Australia's export markets in Asia and elsewhere are very taste-sensitive, and eating quality is one of the industry's main advantages over competitors, selecting the correct rootstock is vital. Any reduction in fruit quality will move the fruit from the premium end of the market to the low-priced end.

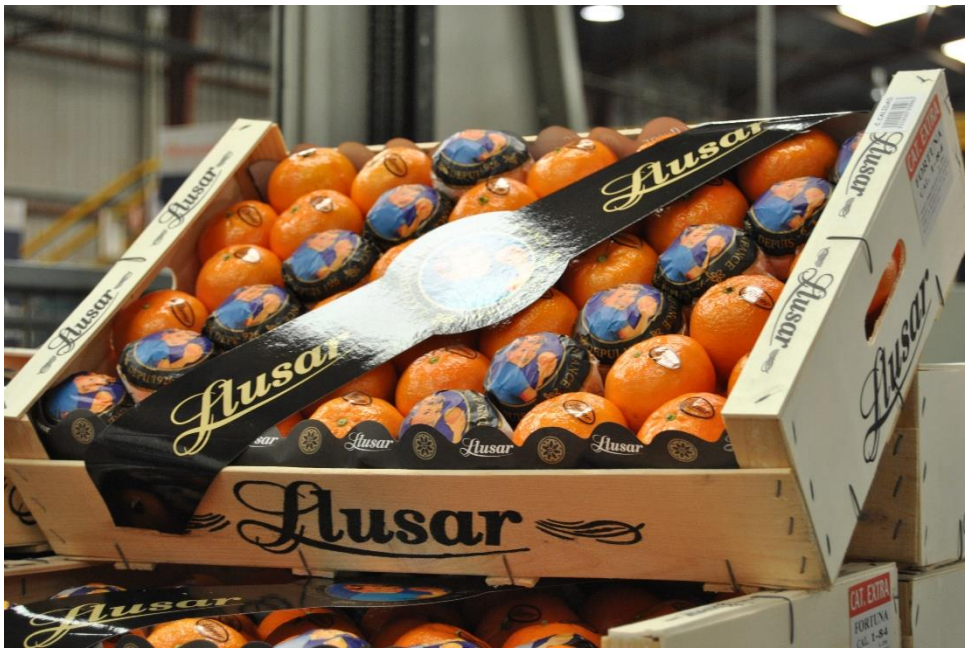

Figure 7: Spanish citrus fruit is some of the best in the world. Presentation is so important (Source: Tania Chapman)

In addition, given Australia's high labour costs, it does not make sense for Australia to be growing large, vigorous trees, which are more expensive to thin, prune and pick. Also, Australia's strict Occupational, Health & Safety (OH&S) regulations mean that tall citrus trees need more ladder work, which presents a significant workplace safety risk.

Following the Spanish study tour, the advice to Australian nurserymen and growers is to avoid the high-vigour rootstocks, and focus on semi-dwarfing rootstocks which give high fruit quality. Again, this is where research and development must focus.

Changing varieties

Like many other citrus-producing countries, Spain is moving towards the production of easy peeler varieties, and a decreasing focus on oranges.

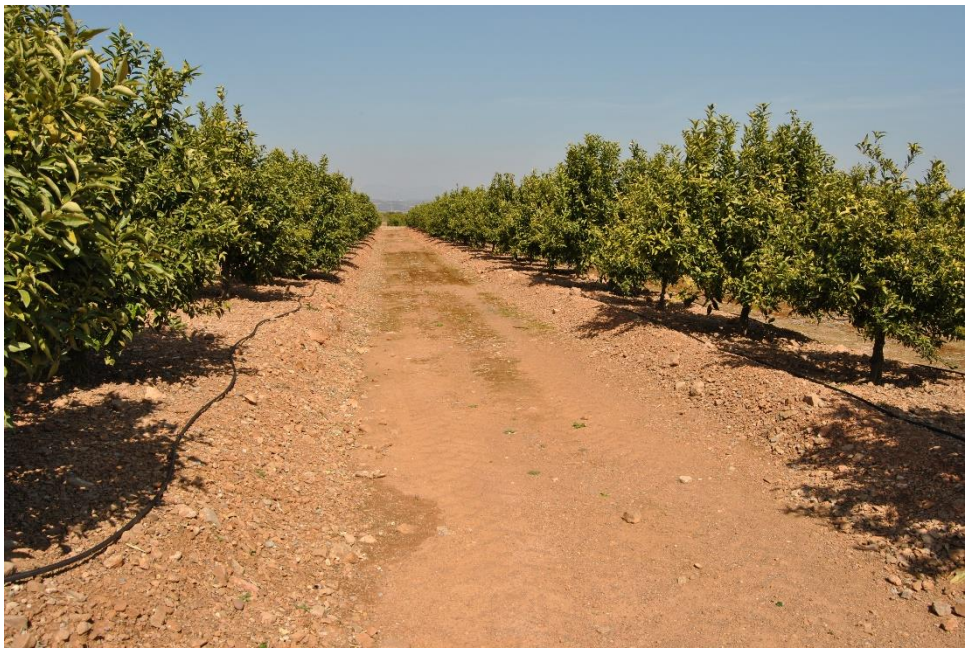

Figure 8: Like many other citrus industries, Spain is moving towards the production of easy peeler varieties (Source: Tania Chapman)

Another feature of the study tour was seeing the industry's rapid change-over of varieties within orchards, always with an eye on which is more profitable. Several examples of how orchard change-over can be done rapidly and efficiently was witnessed, with planning right from the initial tree planting.

It was not uncommon to see new orchards double planted, with every second tree being a different variety – the less profitable variety is eventually removed. An advance of that method is where every second tree is patch-budded with an alternative variety shortly after planting. Should the alternative variety become more lucrative then the patch bud is forced to grow out by part-girdling the trunk just above it.

Keeping up with the changes in the orchard, are changes in the packhouse. New technology is constantly being developed in the packhouses of Spain. Infrared technology that measures the Brix has been developed and is now slowly being adopted in Australia, new technology will also soon allow the fruit's acid levels to be measured. This will be advantageous in ensuring the right quality product is put on the market each and every time.

Figure 9: Spanish packhouses are continually upgrading technology to improve pack-out numbers (Source: Tania Chapman)

Chapter 4: China and Korea – great doors of opportunity for Australian citrus exports

The Chinese market is a relatively new export destination for Australian oranges; the trade is growing rapidly due to a strong demand from Chinese consumers who are becoming increasingly health conscious.

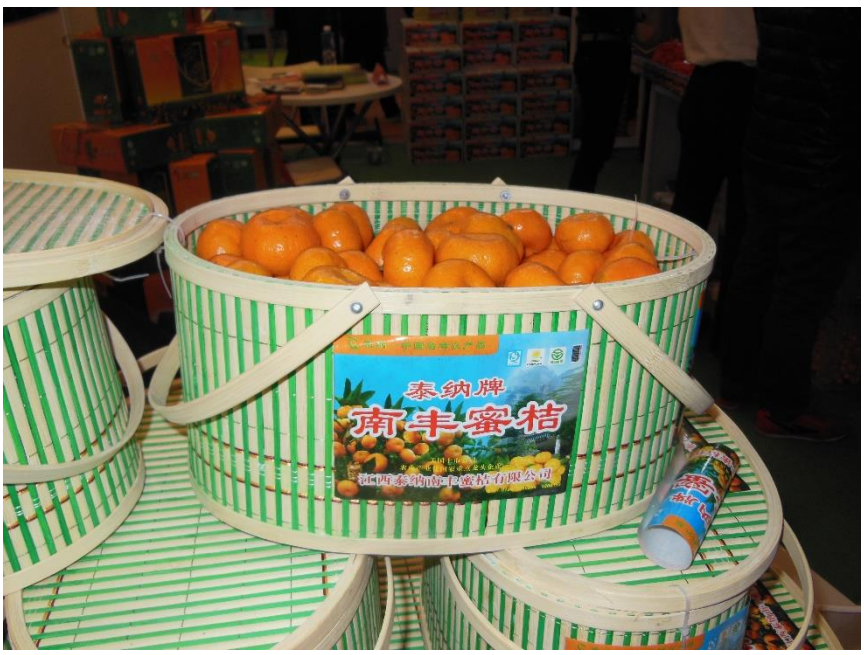

Figure 10: Chinese consumers love citrus that is guaranteed to be "Sweet, safe and healthy" (Source: Tania Chapman)

Through intense orchard management practices and marketing research, today Australian oranges can truly be labelled as 'Sweet, Safe & Healthy'. New campaigns, within the China market, now promote the fact that Australian farming is well-known for its clean, pollution-free and green environment, as well as safe, well-managed production and processing along the whole supply chain. It was apparent marketing campaigns must focus strongly on the 'Sweet, Safe & Healthy' message which has recently been successfully rolled-out in China as well as the Philippines and Japan.

The study tour also highlighted China's awareness of Australia's strong focus on the widespread practice of Integrated Pest Management. IPM relies on farmers carefully monitoring pest levels on their farms, and mostly using beneficial insects for the pest control work. The end result of IPM is that very few insecticide sprays are used, which means that Australian oranges are seen by China, in particular, as the safest in the world.

Also, seen on the tour was the recognition that Australia's packinghouses have stringent traceability practices. Current and past research and development programs have allowed Australia's packhouses to be able to prove that every batch of oranges is tracked from the farm to the packinghouse, and then on the ship during its voyage to China.

Below is a comprehensive outline of recommendations and conclusions that the study tour brought home for Australia's industry to consider.

4.1 Market potential

China holds huge potential for the Australian citrus export sector - this is probably the biggest market opportunity ever presented to the industry, and hard work must be done to capitalise on it.

4.2 Export growth

Australian citrus export growth in the past three years to China has been exponential and shows every sign of continuing to rapidly expand - Citrus Australia's target of 20,000 tonnes by 2020 seems likely to be reached well before that date given that 18500 tonnes were exported in 2014.

4.3 Many markets

China should not be viewed as a single market - the eastern seaboard cities are only one segment of a massive number of markets available inland. Many of the second and third tier cities are far larger than markets in Australia's largest capital cities. In fact, during Australia Week in China visits to second tier cities, such as Chengdu, proved that there exist large pockets of wealth and middle-class income in these regions that want Australian product.

Figure 11: Tania Chapman and Federal Minister for Trade & Investment, Andrew Robb, in China during the 2014 Australia Week event (Source: Tania Chapman)

4.4 Quarantine Protocols

Last year, Chinese government regulators caused concern by shutting down trade from several countries due to minor quarantine breaches. Australia must meticulously follow quarantine protocols and have strong traceability systems, which will withstand audits by Chinese and Department of Agriculture inspectors. As Australia gains the trust of the Chinese authorities with each successful season, it should also press for protocol improvements.

Whilst Free Trade Agreements (FTA) do not have any impact on protocols, it has been pleasing to hear comments to come out of China that state they hope to see improvements on the protocols to ensure our product continues to flow to them, and it is also affordable for more of their consumers.

4.5 Relationship Building

Strong relationships are the key to successful long-term trade between Australia and China. This applies not only to commercial relationships, but also to those with government regulators and market associations. Citrus Australia has forged a strong relationship with the Chinese Agriculture Wholesale Association to the point where a Memorandum of Understanding has been signed to further develop relationships and trade. By being able to visit the Association in Beijing three times in one year, it was demonstrated how important this relationship was to Australia, not only as an industry but also as a country.

4.6 Trade development

It is important the Australian citrus industry continues to develop the citrus export trade in China. This includes participating in trade fairs and missions, and hosting inward bound trade missions and individual importer visits. Targeted, generic promotion programs should also be seriously considered.

4.7 Fruit quality

More than any other single factor, the excellent taste of Australia's citrus must be safeguarded. Consumers in China openly acknowledged that Australian citrus tastes sweeter than that of the lower-priced southern hemisphere competitors. However, Australian growers, packers and exporters must protect this reputation and resist sending shipments that are not of top quality. There is no room for complacency. The China market is only profitable for Class 1 product; therefore Composite and Class 2 product should be sent elsewhere, or sold domestically.

4.8 Food safety

Chinese consumers are prepared to pay high prices for fresh produce free of agrichemical residues and other contaminants. Australia's reputation as a supplier of "clean, green and safe" citrus must be maintained through constant testing and compliance with MRLs.

Forging trade with Korea:

The FTA Australia has with Korea will give the citrus industry a greater incentive to ship to this prosperous market. Previously the tariff on oranges into Korea was 50%, it has now dropped to 32% and will further decline over the coming year. Both the US and Chile have quite a lucrative market in Korea, and therefore, as Australia becomes more competitive this market opens up a whole lot of new possibilities. In Korea, it was very obvious that citrus is treated with great respect - they realise the value citrus adds to their economy, and to their farmers (who mostly have small orchards). Mandarins are predominantly grown in Korea which is why the mandarin tariff is much higher, and will take longer to reduce, than for oranges. Korea is a high protocol market for Australian citrus growers- in fact it incurs the same costs as China, but in recent times the returns haven't been enough to reward growers for that extra effort and thus has deterred exporters. Korea has become a solid market for US and Chilean citrus, and Citrus Australia believes it could be a market that absorbs around 10,000 tonnes of Australian citrus so it is definitely worth pursuing.

Figure 12: Tania Chapman at the Korean pre-World Citrus Expo, Jeju Island (Source: Tania Chapman)

Asian Potential

Australia needs to be aware that the massive marketing opportunity thrown up by the Asian Century has not gone unnoticed by the rest of the world, including key citrus competitors:

South Africa, Chile and Peru. Every one of these competitors has listed in their export targets that they will significantly increase trade into Asia, particularly China. They are vigorously engaged in trade missions, FTA negotiations and market access applications.

To keep up with, and surpass, this avalanche of trade development from the rest of the world, Australia needs to lift its game in every sector, government, industry body, Research and Development Corporations (RDC) and producers. Strong leadership, clear goals and targets, and appropriate allocation of resources are urgently required.

There needs to be recognition that as FTAs begin to remove tariff barriers, the countries of Asia are turning to other mechanisms to restrict trade of agricultural goods from abroad so as to protect their domestic farming sectors- quotas and stringent food safety requirements are just two examples of this. Australia is exposed in the area of food safety and MRL compliance with inadequate government resourcing in this area. The next decade will require Australia to have the skills and systems in place to tackle these non-tariff barriers.

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Chapter 5: Protecting Australia's Biosecurity – learnings from the US

Australia clearly has been able to sell the message of having "clean, green and safe" citrus fruit. The question must be asked, however, is the industry prepared for biological threats such as the most destructive citrus disease in the world – Huanglongbing (HLB), otherwise known as citrus greening, that have destroyed other viable citrus growing industries?

Figure 13: A citrus orchard in the US destroyed by the destructive citrus disease Huanglongbing (Source: Tania Chapman)

There is no doubt that it is only a matter of time before Australia's citrus industry suffers from one of the industry's most destructive biological diseases, HLB, and that industry, not government, needs to take control of managing any incursions. Therefore, industry must be on the front foot and ready.

Since 2005, Australia has been on the alert and has watched with great concern the ongoing affect HLB has had on Florida's citrus industry, which has spent at least US $500 million so far on research and development, for orchards that now have 100 per cent infestation of the disease, with up to 70 per cent of these trees infected (G.Nelson, Fort Pierce).

Whilst travelling to the US, visits to Florida and California's citrus regions offered some key recommendations to take home to the Australian citrus industry in relation of biosecurity.

These recommendations mirror that of an industry-led tour earlier in 2014. The recommendations include: a mandatory budwood scheme; stringent border and pre-border surveillance defences; urban community education; a knowledge of key surveillance and monitoring strategies that assist in HLB control and finally improved risk modelling that plays out an outbreak scenario.

It is imperative these recommendations are enacted forthwith, with a focussed use of our limited resources.

A key outcome is that Australia's citrus industry needs to increase its awareness and preparedness for this high priority pest, HLB, and its insect vector, the Asian citrus psyllid (ACP). As a result, in 2015, the Australian citrus industry started a trapping process to look for the presence of the psyllid in citrus growing regions. Following on from that, an emergency response plan was prepared and an incursion simulation exercise occurred, which included key members of the industry, government departments and researchers to test Australia's preparedness for HLB and, to identify gaps in the plan.

5.1 HLB - inside the US

As much as $US 1 billion has been spent across California and Florida as a result of the pest incursions, including surveillance, control, outreach and research. The economic losses in Florida have brought the industry close to the point of collapse, with losses in excess of $US 9 billion and 10,000 jobs. Production is now less than half of what it was prior to HLB.

In contrast to Florida, where control of ACP was not instigated after detection in 1998, a greater focus on controlling the vector in California has resulted in no confirmed incidence of HLB beyond one tree found in suburban Los Angeles. This presents a clear case for proactive management in the Australian citrus industry.

5.2 Recommendations

5.2a Strengthen industry/government partnerships in biosecurity

Based on observations and insights from J Nelson, R Dunn and N Hill the following recommendations to the Australian citrus industry and government partners need to be considered. While some of the recommendations are already being pursued under various programs, the industry must take responsibility for coordinating these activities.

What was clearly evident is that the Californian industry has developed a very close working relationship with government agencies and researchers. However, it aims to lead the response to HLB and ACP rather than expecting government to drive the process. The Australian citrus industry will need to be ready to take the lead, working jointly with other industries such as nursery, transport, councils and many government agencies.

In both California and Florida, the industry introduced a specific levy for responding to the threat posed by ACP and HLB. The levies raised about $US 3 million and $US 5 million per annum in California and Florida respectively. Therefore, adequate industry funding within Australia to respond to and manage incursions is critical. The Australian citrus industry has a biosecurity levy ready to be activiated, but will need to work closely with the government and associated industries to act quickly and decisively.

5.2b Consistent categorisation of HLB and ACP

It has been proposed that both HLB and ACP be categorised at the same risk level (currently HLB is Category 2 and ACP is Category 3), and that Citrus Australia lodges a substantiated request with Plant Health Australia for its re-categorisation in the Emergency Plant Pest Response Deed (EPPRD).

Based on the information and evidence seen in both California and Florida, HLB is only a major issue in the presence of ACP. Without the vector, it is a self-limiting disease (killing the host outright). The recommendation, therefore, is to have equal rating applied to both the vector and the bacteria.

5.2c Maintain Australia's border and pre-border defences

Evidence suggests, in both the California and Florida incursions of HLB that citrus material came in across borders via illegal entry. This, therefore, stresses to the Australian industry the importance of maintaining strong defenses at all ports of entry, as well as maintaining close relationships with neighboring countries in which high priority pests are endemic.

5.2d Review current pathway assessments and risk analyses

Closely linked to the risk modelling and border protection work is an assessment of the likely entry pathways for the disease. In light of the work being done in California regarding the cultural links to regions of high risk, a review of the pathways in Australia is warranted.

5.2e Review legislation and regulations across all potential risk areas

Australia has strong regulations in place to allow for the management of exotic pest incursions but it is important to test these. The experience from Florida as it relates to Citrus Canker, and the flow-on impacts this had on controlling HLB, is a warning to ensure legislation is robust.

Legislation needs to be reviewed in relation to powers enabling eradication in production systems (for example, removal of infected trees and psyllid host plants), and how eradication or management programs can be enforced in urban and commercial areas. This includes regulation of nursery stock movements and the handling of other risk materials (such as green waste).

5.2f Planting database/property registration

A key component of managing both the risk and the incursion response relates to the ability to identify all properties at risk. While the Australian citrus industry has invested in a national planting database, it may not capture adequate data for an incursion response. Therefore, it is strongly recommended that the database should also capture nursery information, as there are many non-commercial plants that are hosts.

5.2g Surveillance and monitoring strategies for HLB and ACP

It was clearly seen that monitoring for HLB and ACP is very difficult. No species-specific trap is available for ACP, and instead a general-purpose yellow sticky trap is used. In California, the trap is referred to as a 'blunder trap', meaning that ACP, although attracted to yellow are often only caught when they happened to bump into the trap.

In the absence of anything better, the recommendation is that this 'blunder trap' may be the only option for finding the psyllid. As the disease may not show up on any test in a tree for up to four years, finding the psyllid is paramount to stopping its spread.

5.2h Engaging with urban stakeholders

In both the California and Florida incursions of HLB and ACP, the first points of entry were into urban areas. Engaging with the urban stakeholders, however, is challenging. California has good examples of working with communities post-incursion but pre-incursion advertising and awareness raising is a major challenge. Australia has much to learn from California's actions and interaction with its urban community.

5.2i Being prepared

Both California and Florida have introduced grower-led groups for responding to HLB. These are called Citrus Health Management Areas (CHMA) in Florida, and Psyllid Management Areas (PMA) in California. The aim of these is to undertake area-wide control programs for ACP and to provide important social support in dealing with quarantine issues.

Having such a system in place prior to any incursion should be considered for Australia.

Chapter 6: Advice to Industry – Driving Research and Development investment in the citrus sector

Throughout travels of the various citrus producing countries, what was seen was that one of the backbones supporting a profitable citrus industry is research and development (R&D).

Quite clearly, innovative and effective solutions produced from R&D would continue to improve the Australian citrus grower's all-important bottom dollar.

Over the past ten years, R&D within Australia's citrus industry has proven invaluable in gaining access to million-dollar export markets, identifying biosecurity solutions or producing new varieties that suit consumers' taste preferences. Today, it is quite clear that the industry is seeing the lucrative outcomes of this research. But it cannot stop here - with an increased global focus on food safety, taste, and MRLs we have to stay on top of the game- Australia needs science-based research to maintain competitive advantages in the global marketplace.

Today's Australian citrus grower recognises the urgent need to increase R&D investment. The current national R&D levy for citrus growers, which consists of two components, is $2.00 per tonne which includes:

- $1.97/tonne the R&D levy.
- $0.03/tonne the Plant Health Australia levy (the body that oversees national plant biosecurity issues).
- orange growers also pay a national marketing levy of $0.75/tonne, but this cannot be used for R&D purposes.

In 2012/13, the total national levy income received was $1,409,492. The Australian Government matched the R&D levy, dollar-for-dollar, which saw a total investment of $2,709,616 for R&D projects.

Keeping this in mind, for nearly 16 years, the national citrus levy has not changed but at the same time market competition both within the fresh produce and other global markets has gained stronger momentum. An overall reduction in citrus production in the last two decades (due to less juice production) has meant a lower levy base. It is worth noting that citrus

growers across Australia voted in November 2014 to increase both the R&D levy and the biosecurity levy. The submission for this increase has been forwarded to the Federal Minister of Agriculture, Barnaby Joyce and the industry looks forward to his positive response.

The new levy would mean:

- Biosecurity would collect $0.30/tonne.
- R&D would collect $3.20/tonne (of which would then be matched dollar for dollar by the Federal Government).

Some of the big-ticket items that have made real returns for growers and are achieving profitable outcomes are in areas such as better market access and variety improvement. Also, work on R&D biosecurity projects is offering an insurance policy to safeguard growers' assets.

There is no doubt that competition from other growing nations is reaching unprecedented levels in both the domestic and export markets. With Australia's total citrus production figures tallying 620,000 tonnes at the end of 2013, R&D outcomes are vital in helping to find a profitable home for this fruit.

Government can work together with industry in the R&D arena by providing a robust framework that is driven by industry aspirations. This includes flexible and effective levy mechanisms and RDC structures, along with development of highly focused R&D strategic plans.

Knowledge is power and having robust market intelligence systems is an area that horticulture in Australia in general needs to improve on. Most competitors have better information gathering and reporting systems in place, to their advantage. Australia can, and must, do better.

The final recommendation is that industry and government do not become complacent in terms of investing in future R&D projects as this is the one area that gives Australian growers positive cash flow and profits as well as safeguards the industry's future investment.

Conclusion

The Australian citrus industry has the highest cost of production which far outweighs international competitors. Australia can, however, win market share through branding of clean, green, safe and high-quality product and reputation.

There is a need to be able to quickly and clearly identify the country of origin of Australia's produce, both fresh and juice.

Australia's key point of difference from competitors is ultra-low chemical residues – all growers, packers and exporters need to be aware of agrichemicals use and withholding periods, including pre- and post-harvest.

The Australian citrus industry is very small relative to global production so it is imperative that global relationships are built. Strong relationships are key to long-term trade between Australia and China.

For the Australian citrus industry to advance and be recognised globally, it needs high health status plantings.

Quality citrus starts with quality rootstocks. Differing economic goals have driven rootstock choice between rapid tree growth and high yields per acre, but lesser quality fruit and dwarfing or semi-dwarfing, which produces a more manageable tree and better quality produce.

China recognises Australia's push for reduced chemical use and safe citrus. Traceability through the supply chain is important to the Chinese consumer. China's middle class is on a rapid rise and they are looking to feed their families premium food and are willing to pay a premium for it.

Australia must safeguard the taste of Australian citrus, as reputation rests on the quality sent into the market.

Korea offers opportunity and as a Free Trade Agreement tariff reduction come into effect, new possibilities for trade will continue to arise.

The Australian citrus industry must always be aware that it is not the only country focused on Asia. Key competitors of South Africa, Chile and Peru are very focused on China and Australia needs to endure to protect markets by focusing on the quality of the fruit exported.

Unfortunately, it is only a matter of time before a destructive biological disease such as Huong Long Bing (HLB) hits the Australian citrus industry so increased awareness and preparedness for these priority pests and diseases is imperative.

All countries that have a profitable and viable citrus industry have strong research and development programs.

Knowledge is power and having robust market intelligence is vital going forward for the Australian citrus industry.

Recommendations

- Consumers get confused about the country of origin of fruit in the market place. As imported fruit into Australia is counter cyclical, one suggestion is to have a minimum two-week break on supermarket shelves between imported citrus and local citrus.
- Due to the high cost of production relative to competitors, the Australian citrus industry should benchmark and analyse supply chain costs against those of competitors in a bid to do things smarter.
- As global consumers become more focused on food safety and growing practices, the industry needs to embrace ultra-low chemical residue programs.
- All exporters should participate in the national citrus residue monitoring program- it should be compulsory in order to protect markets.
- All citrus nurseries should be registered. It should be compulsory that they buy high health citrus seed and budwood from Auscitrus to ensure freedom from harmful viruses' and diseases and thus increase production of quality citrus.
- It is so important to continue the two-way sharing of knowledge with respective colleagues across areas including varieties, rootstocks, diseases and vectors including HLB, research and development. In Australia, the industry needs access to global information across these sectors, whilst continuing to invest in research.
- The must be greater focus on dwarfing or semi-dwarfing rootstocks as they tend to give better fruit quality as well as smaller trees that are easier to manage, prune, pick and thus reduce costs which is vital for market competitiveness.
- China cannot be viewed as a single market. Many second and third-tier cities are larger on their own than the Australian market, and the continued increase in middle-class wealth presents an amazing opportunity. To capitalise on this, the industry needs to stop treating the product as a commodity and position the brand as 'premium food'. This can be assisted by attending trade fairs and outbound missions and hosting inbound missions. Targeted generic promotions around brand 'Australia" could assist.
- Australia needs to allocate sufficient resources from government, industry, research development corporations and producers to keep up with the avalanche of trade development that the rest of the world is investing in.

- Industry must be ready to take the front foot on biosecurity incursion, surveillance and monitoring strategies, urban community education and improved risk modelling. Strengthening industry, government and international relationships is vital, but with industry taking responsibility to coordinate these activities.
- One of the biggest threats is Huong Long Bing (HLB) and Asian Citrus Psyllid (ACP) and it needs to have equal categorisation, so that the vector and disease have the same risk rating.
- Industry should review pathways, legislation and regulation across all risk areas. The national plantings database should also capture nursery information as there are many non-commercial plants as hosts. Grower led groups should be set-up to respond to HLB, to undertake area wide control programs for ACP and provide important social support.
- Above all, industry and government need to partner to ensure high levels of investment in research and development to safeguard the future of the industry.

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Plain English Compendium Summary

Project Title:	Citrus varieties captivating the world's consumers
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Objectives	1. To identify ways and means to allow Australia's citrus industry to remain sustainable, both financially and on the production front. 2. Ascertain where, how and why Australia's costs of production are different to its export competitors. 3. Identify the key point-of-difference in factors that allow Australia's export citrus market to remain ahead of its competitors. 4. Identify any management or market gaps that may exist within Australia's citrus industry compared to its overseas competitors, and recommend future research and development projects.
Background	The citrus industry is Australia's largest fresh produce exporter but has the highest cost of production, internationally. In order to maintain its competitive advantage and its export market-share, the main points-of-difference need to be identified, so Australia can capitalise on the opportunities available to it
Research	Research involved travelling through Australia's new, and existing markets of Japan, Korea, China, Canada, Spain the Philippines and the United States, as well as that of Australia's main competitor, Chile. Inquiry focused on the supply chain, growing environment, and the market, and Government policies underpinning the import protocols in those countries.
Outcomes	As the battle for the dinner plate of middle class Asian consumers will increasingly focus on quality, food safety and value for money- we need to continually keep ahead of our competitors with the clean, safe, sweet citrus varieties that are being demanded in our global markets.
Implications	Government working alongside of industry in the R&D arena by providing a robust framework, driven by industry's aspirations- flexible and effective levy mechanisms and RDC structures, and the development of highly focused strategic plans. Knowledge is power- most of our competitors have better information gathering and reporting systems in place giving them the advantage - we need to do better. When our costs are so high we have to leverage other avenues.