Horticulture Innovation Australia

Final Report

Almond International Networking

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Almond Board of Australia (ABA)

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Summary

The Australian almond industry has grown rapidly in the past decade. The speed of the growth has meant that the Australian industry has now become a significant part of the global almond industry as the world's second largest producer. The Australian industry is dwarfed by the Californian almond industry that produces between 75-80% of world production.

The Almond Board of Australia has established a beneficial relationship with the Almond Board of California. It is recognized that most of the technology used in Australia was developed by the Californian industry and so the Australian industry recognizes a debt to the US producers and processors and their industry's market development programs. In acknowledging this the Australian industry has an open policy in relation to sharing the outputs of our research programs and the knowledge of industry participants which in the areas of drought management, irrigation, nutrition, varietal breeding and orchard and processing equipment is valued by the Californian industry.

During the period of this project the Almond Board of Australia has received assistance from the Almond Board of California in relation to food safety research, product pasteurization and consumer concerns, pre-shipment sampling and testing, trade issue management in Europe and India, industry statistics, market analysis, researcher visits, Conference presenters, insights into their research programs, access to research reports and attendance at their conference. One example of this is the ABA receiving access to the nutritional research undertaken by American researchers during the past decade at a cost of $15million.

Access to ABC staff to draw on their past experience on matters now faced by the Australian industry has been very valuable.

The broader international almond and other nut industries were also engaged through attendance at the International Nut Congress.

The Spanish industry, which has rootstock and hard shell variety breeding projects and a significant agronomic research programs were visited in 2013 and 2015 and good contacts were established to enable their breeding and high density orchard systems to be monitored. The relationships established were also useful in the task of having a tissue culturing company of the international standing of Agromillora establish in Australia to rapidly multiply rootstocks for the benefit of the almond and other horticultural industries.

Research providers involved in high density orchard development in Summerfruit and pome fruit industries in New Zealand, Spain and the US were also a key focus of developing a network of research providers as the Australian almond industry moves to develop advanced production systems based on dwarfing rootstocks.

The networking project also facilitated meetings to discuss technology extension with industry organizations that have a proven record of success.

The ABA has strong processes in place to distribute the contact details of those people that are part of the developing network throughout the grower, processor and marketer segments of the Australian industry and to disseminate the information gathered.

As a result of the network of international contacts developed as a result of this project many industry participants and researchers have been welcomed overseas and are now part of a much broader network than those funded by this project.

Keywords

Networks, collaboration, almonds.

Introduction

The Australian almond industry has a gross value of production close to $1 billion. The growth of the industry has been rapid. Many of the challenges faced by the industry are shared with the Californian industry or they have previously dealt with them. The Australian industry is indebted to the Californian industry for the development of the production system that forms the basis of the modern Australian almond industry established in the past decade. There is much still to be learned from the US industry and the Australian industry has knowledge that is of value as part of a two way exchange. The Almond Board of Australia has adopted an open policy in regard to information. This attitude has enabled an open and trusting relationship to be developed with participants of the Californian industry and their researchers.

The areas of interest covered with the US industry include: food safety; consumer research; nutritional studies; varieties and rootstocks; new chemicals for pest, disease and weed control; equipment development; closer plantings; tree nutrition; crop modelling; cogeneration using almond hulls.

The Spanish industry also offers valuable knowledge in terms of varieties and rootstocks suited to Australia's low fertility soils and soils containing limestone. The Spanish have also established world class tissue culturing facilities that have not been available in Australia. Their nursery techniques and products are of the highest quality. The Spanish researchers and Agromillora are also investigating high density plantings and in-field hulling which are both of great interest as components of an advanced production system. The use of controlled environment storages is also being led by Spanish hullers.

Pollination is a key requirement of the almond industry and remains a major crop risk with biosecurity threats to bees from Varroa Mite, other hive health issues, and a hive supply issue in meeting the requirements of a rapidly increasing orchard acreage. The New Zealand Kiwi fruit industry and researchers are very experienced in managing Varroa Mite and are researching efficient pollination technologies including pollen collection and mechanical application.

New Zealand research has also led the way with regard to high density plantings for apples and Summerfruit crops.

The visit to New Zealand developed contacts in Crop and Food NZ, PollenPlus and Agfirst, a company with industry benchmarking programs utilised in the apple industry and since our visit now developed for the almond industry.

The project funding has facilitated travel to a range of Conferences, face to face meetings, field trial inspections and discussions that has enabled a broad international network of contacts to be developed that have provided valuable knowledge and guidance to the Australian industry during the period of this project and will continue to in future.

The network of contacts developed have been with the following organisations:

- Almond Board of California
- University of California
- Burchell Nursery

- Duarte tissue culture nursery
- Agromillora tissue culture nursery
- International Nut Council
- Frucom
- Crop and Food NZ
- Plant and Food Research (now
- PollenPlus NZ
- Agfirst
- Bioenergy
- BASF
- Paramount Farms
- Geslives
- IRTA
- CITA
- Various US and Spanish growers and hullers involved with dehydration and storage technologies.

The project also funded the travel of the Almond IAC Chair, Dr. Greg Buchanan and Phil Haines to participate in the HAL Indian Research Co-operation Workshop held in Bangalore, India.

Methodology

The methodology of the project has been one of identifying overseas industry participants and researchers that have knowledge and experience highly valued by the Australian industry and travelling to meet them face to face to build a relationship that can be mutually beneficial in terms of sharing information, research ideas, and building towards collaborative projects on shared challenges and opportunities.

The information was distributed to industry through reports to appropriate sub committees, the ABA Board that has representation of all major supply chains, and through the website, publications and personal discussions.

Outputs

1) Closer working relationship with the Californian and Spanish industries delivering benefits in regard to:
    - Market access and trade negotiations with an emphasis on a move from subjective food safety assessments to objective measures in India. The change of name for almonds in China and the MRL negotiations with the EU for Fosetyl Al.
    - Food safety research and issue management drawing on their experience in relation to pasteurization, orchard hygiene and fumigation.
    - Aflatoxin pre-shipment sampling and testing program for Europe to reduce cost and delays of port inspections.

- Access to US human nutrition research findings which they invested $15 million.
- Monitoring almond varietal and rootstock improvements in California and Spain leading to new rootstocks now available in Australia.
- Closer plantings as the basis for new production systems.
- Agromillora establishing a tissue culturing facility in Mildura.
- Researcher visits, workshops and field days conducted covering production systems, nutrition, pollination, food safety, pest and disease management.
- Industry statistical data exchanged to provide enhanced monitoring of sales and supply capacity for industry planning purposes.
- Collaborative research projects being developed.

2) Increased involvement with the International Nut Council to assist with gathering global statistics, nutritional research, and interaction on trade issues.
3) Improved access to Spanish varieties and rootstocks and monitoring of their research developing high density production systems. A new Research for Profit project proposal has been submitted based on developing advanced production systems for the Australian temperate nut industries based on higher density orchards.
4) Development of key contacts in dried fruit and nut organisation Frucom.
5) An improved understanding of the management of bee hives post Varroa Mite incursion and new technologies to enhance pollination efficiency.
6) Travel for almond representatives Almond IAC Chair, Greg Buchanan and Phil Haines of DPIE Victoria to India to participate in HAL's Indian Research Co-operation Workshop held in Bangalore, India.

Outcomes

The outcomes of the project are found in several areas. These are:

1. Continued market access to the European market that underpins Australian almond exports.

2. A move to collaborative research projects with the USA almond industry. The Californian industry is ten times the size of the Australian almond industry and has a gross value of production worth more than the total of Australian horticulture. The linkage with the US industry has the potential to add to the research capacity of both countries that share many of the same challenges and opportunities. Spanish research providers have also expressed a desire to collaborate. The outcome is a more efficient and cost effective R&D program.

Evaluation and Discussion

This project was very valuable. It has facilitated the meetings required to develop an open and trusted dialogue with key international organisations and individuals. The three year funding has enabled this development rather than the normal study tour which tends to be a one way exchange of information and does little to develop ongoing relationships.

The benefits of the project will continue into the future now that many important relationships have developed enabling the flow of knowledge and laid a foundation for collaborative research.

Recommendations

The Almond Board of Australia should continue to develop the relationships with international bodies such as the Almond Board of California, International Nut Council, Frucom, IRTA, SITA, University of California Davis, and other bodies that provide insight into improved production practices, processing technology and market development methods.

Scientific Refereed Publications

Not Applicable

Intellectual Property/Commercialisation

Not Applicable.

References

Not Applicable.

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The Almond Board of Australia wishes to acknowledge the generous sharing of knowledge by those contacted as part of this project. In addition the funding support of almond industry levypayers and the Commonwealth government via Horticulture Innovation Australia Limited is acknowledged.

Appendices

1. Report on 2012/13 Activities.
2. Report on 2013/14 Activities.
3. Report on 2014/15 Activities.

REPORT ON 2012/13 NETWORKING ACTIVITIES

The key objective of this project is to build a network of contacts and develop relationships with organizations and individuals that provide a value add to the Australian almond industry by providing advice on international issues, access to research results, data, knowledge and processes in areas of production, processing, market access and development, nutrition, technology transfer, IP commercialisation and organizational management.

The 2012/13 itinerary and list of participants as submitted was as follows:

1. November 2012 – Crop and Food NZ, Agfirst, PollenPlus, NewZealand: Brendan Sidhu, Ross Skinner and Ben Brown.
2. December 2012 - US Almond Conference, Sacramento, California, USA: Ross Skinner, Ben Brown and Joseph Ebbage.
3. May 2013 – International Nut Council, Barcelona, Spain: Neale Bennett and Ben Brown.

1. Plant and Food New Zealand.

Plant & Food Research receives funding from four major sources – commercial contracts, contestable government funding, the Core Funding from the New Zealand government and commercialisation activities such as royalties.

Their most significant sources of contestable funding are the Ministry of Science and Innovation (the administrators of the New Zealand government's science and technology investment), the Ministry of Agriculture and Forestry's Sustainable Farming Fund, the International Science & Technology Linkages Fund and the European Seventh Framework Programme (FP7). Through this funding, they also have a number of co-funded research projects with commercial partners, Universities and other Crown Research Institutes.

Plant & Food Research works closely with industry bodies, such as Horticulture New Zealand, MAF Biosecurity and Horticulture Australia Limited, to identify and develop research programmes applicable across the horticultural industry. In addition, they are a major research provider to sector and grower organisations in New Zealand and internationally.

They provide research services for a number of scientific and commercial partners, on a fee-for-service basis or through collaborative agreements. They also receive royalties and licensing fees through the commercialisation of our science, such as proprietary cultivars and other IP.

Plant & Food Research is expanding its organisation into Australia with not only undertaking research for Australian horticulture industries such as apples and pears but are also is in the process of locating research scientists in Australia.

Delegation Participants:

- Brendan Sidhu, Chair Almond Board of Australia
- Ross Skinner, CEO Almond Board of Australia
- Ben Brown, IDM Almond Board of Australia
- Dan Ryan, Business Manager Australia Plant and Food NZ

Duration:

October 23 to October 26, 2012

Itinerary: Meetings and Topics Discussed:

Oct 23	Travel to Auckland and arrive evening
Oct 24	Drive to Hamilton **09.00** Meeting with Mark Goodwin, Plant and Food NZ re bee health, and pollination **12.30** Meeting with Peter Schaare, Plant and Food NZ re pollination boom, fruit quality. assessment, and automated vehicles **13.30** Drive to Tauranga **15.00** Meeting with Steve Saunders, Pollen Plus re pollen harvesting and application, automated vehicles, and horticulture incubator centre
Oct 25	Drive to Hastings **15.00** meeting with Ross Wilson, AgFirst re extension program and technologies for the Australian apple industry **17.00** Drive to Havelock North
Oct 26	**09.00** Meeting with Stuart Tustin re highly productive orchard designs. **14.00** Drive to Napier airport **15.15** Fly to Auckland **17.50** Fly to Melbourne arrive evening
Oct 27	**08.00** Fly to Adelaide or Mildura

LEARNINGS:

Pollination

Varroa Mite:

- Resistant Mites likely to have greater impact when reach Australia than non resistant did when they reached NZ
- Plant and Food have been breeding bees for tolerance against Varroa Mite. They have selected promising queens but the cost of this research has been expensive and will require ongoing investment as it is not easy to "control" the sexual reproduction and thus the gene pool with the beneficial characteristics.
- Mark's video info
- Alternative bee access strategies
    - Mass rearing bees for pollination service
    - Honey / Pollination service incorporated into almond business

Supplementary Pollination

- Aims to increase the diversity of the "right" pollen in the orchard, where bees through their natural pollen foraging behaviour collect and carry compatible pollen for improved outcrossing.
- Grow blocks purely for pollen, harvest pollen at balloon stage, mill flowers, dehydrate anthers to force dehiscence, and then process anthers in a cyclone to remove "pure" pollen. Can store kiwifruit pollen in the freezer and maintain viability for many years. Need to understand the storage and viability characteristics of almond pollen.
- Application techniques.
    - Wet – Hand applicators are used, but expensive. Wet applications are weather hardy as the pollen doesn't get washed or blown off as easy. Plant and Food NZ are developing new automatic sensing equipment to apply wet pollen solutions but it has stalled due to a lack of funding.
    - Dry – Most common method for pollen application in kiwifruit, but has the disadvantage of not being as weather hardy. Applications are made with either: handheld blowers such as the domestic and commercial Stihl types; or flow rate controlled volutes fitted to quad bikes.
    - Hive trays - Modified design using material to force bees to walk through pollen harvested from the techniques above.
    - All these were good learning's for the almond industry and the current pollination project. For example, the almond industry could grow Peerless blocks (or alternative cultivars with 100% compatible pollen), harvest the pollen and apply it to Nonpareil rows, or the wider orchard. Check with USA companies such as Firman and Antelis regarding this technology.
- Other Fruit Set Factors
    - Investigate the impact of fungicide application at flowering and the sterility of the pollen and/or the stigma.
    - In light of the above, investigate whether almond flowers open at a consistent time to facilitate spray management practices.

Mark Goodwin from Plant and Food NZ on the left.

Steve Saunders from Pollen Plus on the left.

Pollen extraction equipment.

Pollen application equipment.

Automation

- Autonomous harvesting machine developed to pick Kiwifruit with capability of picking 4 fruit per second.
- Possible collaboration with or alternative to University of Sydney project.
  - Guidance system
  - Mummy removal
  - Pruning
  - Specific orchard haulage vehicle rather than tractor conversion

Industry Benchmarking / Extension Technologies (AgFirst)

- Has developed an online system for benchmarking orchard performance against other producers
- Learning's obtained from the orchard analysis of selected growers are available on line
- Good information planning and dissemination scheduling
- APAL's page to direct grower searches for information
- Mapping world experts in topic areas

Advanced Production System

It is all about growing fruit not trees. Intensive orchards based on dwarfing rootstocks have enabled yields to increase threefold in NZ orchards compared to older systems with tall, full canopies.

Stuart Tustin, tree crop physiologist.

Summary of actions followed up:

- Check viability of almond pollen with University of Adelaide, and with USA companies Firman and Antelis regarding almond pollen harvesting, viability, application, etc. (Completed).
- Almond pollen harvesting trial in Australia in 2013 with Steve Saunders of Pollen Plus. (Completed).
- Application trial of harvested pollen in 2013 to assess impact on yield. (Equipment failure caused trial to be postponed until 2014).
- Improved pollen traps in hives with forced walkway. (Incorporated into CSIRO's pollination efficiency project)
- Impact of fungicide sprays on pollen and flower viability during bloom. (Followed up with Almond Board of California who have researched issue).
- Determine if there is a consistent opening time for almond flowers.
- Mark Goodwin to peer review current pollination efficiency project. (Completed).
- Link Pollen Plus work on robotic kiwifruit harvester with HAL's automation work with University of Sydney. (Completed).
- Investigate the suitability of the grower benchmarking work of AgFirst for the almond industry and the other extension techniques developed for APAL. (Project has been contracted utilising DPIE Victoria funds and is underway).

2. US Almond Conference, Sacramento.

The ABA delegation visited California in December, 2012 to meet with the Almond Board of California staff, attend the ABC's Annual Conference, visit the Californian breeding programs and inspect on farm dehydration facilities.

Delegation Participants:

- Ross Skinner, CEO Almond Board of Australia
- Ben Brown, Industry Development Manager Almond Board of Australia
- Joseph Ebbage, Market Development Manager Almond Board of Australia

Duration:

December 9th to 15th

Market Development

The key Australian almond industry topics discussed during the meeting with ABC staff were:

1. Overview of the Australian almond industry – including a forecast that while our crop size is growing, our current market share position will remain relatively unchanged. This will allow for a realistic appraisal of our industry's capacity to drive global consumer demand of almonds.
2. Share our key health and nutritional programs, particularly 'after-school' snacking and sports recovery.
3. Discuss the opportunity for a shared R&D projects around nutrition and health benefits focussing on the 'sports recovery' theme.
4. Other production R&D opportunities to co-operate.
5. Discussion relating to orchard management of Salmonella and the US pasteurisation program.

The market development related presentations at the ABC's annual conference were:

- *California Almond Supply: Ensuring It's Future*
  Moderator: Richard Waycott (ABC) Speakers: Bill Harp (ABC Chairman), Charlie Arnot (Center for Food Integrity)CCA Units: 1.0 Professional Development
- *Trade Development Challenges in Europe and Asia*
  Moderator: Peggy Fyffe (ABC) Speakers: Vincent Rieckmann (August Topfer & Co.), Julie Adams (ABC), Daniel Chan (PR Consultants)
- *Marketing Around the World* (note this session is repeated at three different times during the two days)
- *California Almond Demand: Looking to the Future*
  Moderator: John Talbot Speakers: Lu Ann Williams (Innova Market Insights), Joel Siegel (USDA-ARS)
- *Study Provides New Way to Measure Calories Using Whole Almonds*
  Moderator: Stacey Humble (ABC) Speakers: Karen Lapsley (ABC), Stacey Humble (ABC), Peter Pitts (Porter Novelli
- *Social Media Update - Don't Just Update Your Status, Share Your Story*.
  Moderator: John Talbot (ABC) Speaker: Christopher Barger (Voce, a Porter Novelli Company)

2012 California Almond Conference

The Conference was held over three days from December 11-13 in Sacramento, California. This was the first year the Conference was held outside of Modesto with the move associated with increased space for delegates and trade show exhibitors, superior venue facilities, etc.

The first day consisted of small workshops that people could attend (e.g. spray coverage, orchard sustainability, economic update, and honeybee colony strength) with day 2 and 3 consisting of the normal Conference program.

A USB stick with the 2012/13 research reports is provided. The presentations can be found at this link:
http://www.almondboard.com/AboutTheAlmondBoard/Pages/Conference2012.aspx

The conference was well attended with a very large trade show.

Key learnings that should be considered for the Australian conference were:

- Use a large digital countdown timer for speakers.
- Increase the poster session.
- Have an increased ABA presence with a trade show stand.

It was noted that the following Californian representatives should be considered for inviting to the Australian conference:

- Roger Duncan (UC Cooperative Extension Specialist)
- Bruce Lampinen (UC Davis, Integrated Orchard Management/Walnut and Almond Specialist)
- Mario Viveros (UC Cooperative Extension Specialist)
- Linda Harris

Both Roger and Bruce have accepted invitations to present at the 2013 Australian Almond Conference.

Trade exhibition space.

Plant Improvement & Advanced Production Systems

The ABA Board has previously determined that Ben Brown should visit Breeding programs in the USA annually and in Spain every two years to monitor developments and to build relationships to obtain rights where possible to import and commercialise promising new varieties and rootstocks in Australia.

The delegation visited Ted DeJong (UC Davis) and his trial site at Kearney Agricultural Centre. Ted has been breeding and recently commercialising dwarfing *prunus* rootstocks. The initial driver of this program has been the summerfruit industry with no trials to date on almonds. Dwarfing rootstocks may provide the first genuine opportunity to facilitate higher density, smaller compact orchards for better light interception, fruitfulness, spray coverage and, shake and catch harvesting. The list of rootstocks is provided below:

- Controller 5 (formerly K146-43) is a peach x P. salicina hybrid. It produces a small tree (~50% of Nemaguard).
- Controller 6 (HBOK 27) is a Harrow Blood peach x Okinawa peach hybrid. Has root-knot resistance. About 60-70 % of trees on Nemaguard
- Controller 7 (HBOK 32) same as above but a little more vigorous. (70-80 % of Nemaguard)
- Controller 8 (HBOK 10) same as above but 80-85 % of Nemaguard.
- Controller 9 (P30-135) similar cross as Controller 5. About 90% of Nemaguard. Actually the trees are about the same size as trees on Nemaguard but with many fewer water sprouts.
- Controller 9.5 (HBOK 50) same cross as other HBOKs. About the same size as C9.

Ted DeJong with a Contoller dwarfing rootstock tree.

Dehydration of Almonds

Three visits were made to facilities that dry field product in the north of California: Gary Pronsolino at Cortina Hulling and Shelling; Jim Paiva at Paiva Hulling and Shelling; and Bruce McClintock. Both Cortina and Paiva use the same setup with secondhand open top semi trailers fitted with a false bottom floor and connected to gas fuelled blowers and heaters manufactured by Blueline (http://www.bluelinedryers.com/). It was said the blowers need to be matched to the specifications of the screen floor. The trailers hold approximately 6 tonne of unclean field product and with the dryers set at 54°C, it takes approximately 12-15 hours to dry product with 15% kernel moisture. The product is not completely dry (i.e. 5% kernel moisture) at this stage but the product is stockpiled and the moisture is said to dry a little further and "even out". The trailers are mobile to facilitate dumping and stockpiling, but are stationary while connected to the permanent gas lines.

The concept originates from the peanut industry and a modified trailer and dryer costs approximately $11,000 US.

Jim Paiva explains his field trailer dryer.

Bioenergy

The delegation visited Steve Johnson from Community Power Corporation (CPC) at Dixon Ridge Farms. CPC are manufacturers of modular bioenergy gasification systems and Dixon Ridge grow organic walnuts. Dixon Ridge have installed a BioMax 50, a 50kW biogas powered generator that uses gasification to convert walnut shell into a clean synthetic fuel gas, heat and biochar. Dixon Ridge are also in the process of installing a BioMax100. The energy fuels their drying facility in the autumn, generates electricity, and heats their buildings during the winter. The biochar is used as a soil amendment in their orchards.

The majority of the IP resides with the automation, software and in particular the ability to produce "clean" fuel that is low in tar and enables optimal and reliable operation of generators.

CPC lease their equipment and have customers in USA and abroad. The equipment is low on man hours, with filling the hopper of feedstock the only regular manual activity. The other manual requirement is scheduled servicing.

BioMAX100 generator

3. International Nut Congress, Barcelona.

Delegation Participants:

- Neale Bennett, Chair Almond Board of Australia
- Ben Brown, Industry Development Manager Almond Board of Australia

Duration:

May 9th to 15th

This trip investigated dwarfing *Prunus* rootstocks, tree training systems, increased planting densities and alternative harvest systems that would see a holistic approach to developing future almond orchards and an appropriate R&D program to accomplish this.

In addition, the study tour included attendance at the 30th Anniversary World Nut and Dried Fruit Congress to evaluate the position of Australian almonds in the global market, and more broadly how almonds are fairing as a commodity.

The key outcomes of the study tour were:

- Understanding of three dwarfing rootstocks currently available for almonds.
- Approximate row and tree spacing's that require R&D for high and super high density plantings.
- Potential tree training systems are available for high and super high density plantings.
- Improved understanding of the challenges and opportunities in adopting a new orchard production system.
- Techniques and equipment exist for the successful drying of Spanish almonds that have been purposely harvested early or accidentally wet by rain.
- Techniques and equipment exist for the successful tissue culturing and micro-grafting of almond trees.
- The consumption of nuts decreases the risk of cardiovascular disease.

The key implications for the Australian almond industry are:

- Rootstocks are available for alternative production systems.
- It's critical to match the scion growth habit with a dwarfing rootstock in a high or super high density planting.
- Improved relationships with specialist nurseries consisting of tissue culturing and micro-grafting capabilities.
- The positive health message of tree nuts can continue to underpin market development activities.
- The current fundamentals of the global almond market indicate the industry should experience a positive outlook for the next short to medium term (i.e. 4-6 years).
- Water security in Australia and California will limit further rapid expansion of almond plantings.
- Improved international relationships.

Plant improvement
Spanish government research stations, IRTA (Francisco Vargas, Xavier Miarnau and Ignasi Iglesias) and Agromillora (Xavier Rius and Jordi Mateu) were visited to obtain an update on their dwarfing rootstock selections, evaluations and tree architecture/training systems for high density orchards.

Dwarfing rootstocks

IRTA selections
Historically, almond rootstock (Garrigues) was the rootstock of choice in Spain due to its tolerance to calcareous soils and dry grown conditions. The almond industry then moved towards GF677 (Peach x Almond) for improved vigour and more recently Garnem (Peach x Almond) for improved root knot nematode tolerance.
In the 1980's IRTA crossed Peach x Almond and obtained approximately 100 progeny with a selection criteria incorporating:

- Propagation by hardwood cuttings, not tissue culture.
- Reduced sprouting.
- Tolerant to calcareous soils.
- Vigour.

This cross resulted in four progeny that were of interest, three vigorous selections and one dwarfing (MB 1-37) selection. All rootstocks were tolerant of calcareous soils but not tolerant to nematodes. MB 1-37 was only evaluated at the time under dry grown conditions and not under irrigation. MB 1-37 is now currently under evaluation as a potential dwarfing rootstock in irrigated, high density orchards.
IRTA and our other hosts indicated the matching of the scion to rootstock in high density orchards is critical. IRTA's preferred variety for HD orchards was Marinada.

Agromillora selections
Agromillora began rootstock breeding in 1998 to develop new rootstocks more adapted to intensive fruit production. They have selected rootstocks of low vigour, good soil adaptation and high productivity. Two dwarfing rootstocks are available:

- Rootpac-40 **(**Prunus dulcis x Prunus persica) x (Prunus dulcis x Prunus persica) – medium vigour, approximately 65-70% of GF677. Compatible with peach, nectarine and almonds. Highly suitable for high density plantings, moderately tolerant of asphyxia, and moderately tolerant of calcareous soils, salinity, and root knot nematodes. Susceptible to lesion nematodes. Very precocious.
- Rootpac-20 (Prunus besseyi x Prunus cerasifera) – low vigour, approximately 50-60% of GF677. Even though it is a plum hybrid it is reported to be compatible with peach, nectarine, almonds and Japanese plum. Highly suitable for super high density plantings, tolerant of asphyxia (plum heritage), adapted to heavy soils, moderately tolerant of calcareous soils and salinity, resistant to root knot and lesion nematodes and very precocious.

Agromillora also has three other rootstocks available for different scenarios:

- Rootpac-R (Prunus cerasifera x Prunus dulcis) – Withstands numerous soil limitations, in particular well adapted to replant orchards.

- Rootpac-90 (Prunus persica x Prunus davidiana) x (Prunus dulcis x Prunus persica) – High vigour, tolerant to calcareous soils and moderately resistant to root knot nematodes. Alternative to GF677, Garnem, etc.
- Rootpac-70 (Prunus persica x Prunus davidiana) x (Prunus dulcis x Prunus persica) – Medium to medium/high vigour, approximately 80% of GF677. Red leaf rootstock tolerant to calcareous soils and moderately resistant to root knot nematodes. Suitable for moderate intensification of planting densities.

Field evaluation trials

IRTA

IRTA planted a selection of grafted dwarfing rootstocks to investigate effects on yield, growth habit and other characteristics. Hybrids with traditional vigour were also planted in the same trial for comparison. The trees were planted in 2010, trained with a medium pruned vase and planted with row and tree spacing's of 5m and 4m respectively.
Rootstocks included:

- Cadaman
- Garnem
- GF677
- Ishtara
- MB 1-37
- (PxA) x Myrobalan
- Puebla de soto
- Rootpac-20
- Rootpac-40
- Rootpac-R

The trial is young, but MB 1-37 and Rootpac-40 visually had a good balance of vigour. Rootpac-20 looked very (too?) dwarfing and some of the graft unions showed signs of benching. This was not consistent across the trial and not consistent with Agromillora trials seen later. Some suckers were also observed, but not as many as the clonal plum rootstock Puebla de soto. In spite of Agromillora's recommendation about compatibility, etc it is highly recommended to extensively trial Rootpac-20 given its unique parentage.

Vayro/MB 1-37 (left) and Vayro/Rootpac-20 (right)

Tree architecture/training systems for high density orchards

Following the visits with IRTA and Agromillora, it appears they have taken different approaches to developing high density orchards. IRTA have taken the approach of trialling different tree spacing's and training system's to investigate the most productive orchard with a management system to be developed following R&D. Agromillora has selected rootstocks from its breeding program and matched it to a production system well adapted to existing mechanisation (i.e. over-the-row grape harvester, hedge pruning, etc) with the objective of reducing costs of production at a target yield.

IRTA

Two trials have been established, high density with GF677 and high density with MB 1-37.

High density with GF677

This was the first HD trial, planted in June 2009 on GF677 rootstock. GF677 was the only available rootstocks at the time. Cultivars were Vayro and Marinada. Six training systems were investigated.

1. Vase – traditional Spanish vase with 3-4 scaffolds, medium quantity of pruning in the first three years and minimal thereafter. 2012 (3rd leaf) harvest produced approximately 1,100 to 1,400kg/ha. Row and tree spacing's were 6m respectively.
2. Minimal vase – vase shape but with minimal pruning. Central scaffolds, vertical limbs and closely spaced scaffolds removed. Similar system to many Australian orchards. Visual observations indicate a larger canopy but a lower fruit count per canopy area in comparison to the traditional vase system. The yield is larger in this system in comparison to the traditional vase but it is unclear whether this will remain the same based on the lower fruiting density observed. 2012 (3rd leaf) harvest produced approximately 2,000kg/ha. Row and tree spacing's were 5.5m and 3.5m respectively.
3. Minimal central leader – typical apple system with a single central leader, conserve all side branches other than those competing with central leader. Minimal pruning and looked well balanced in comparison to the intensive central leader system above. 2012 (3rd leaf) harvest produced approximately 2,000kg/ha. Row and tree spacing's were 5m and 2m respectively.
4. Intensive central leader – typical apple system with a single central leader, thin out some of the side branches and tip side branches. Pruning is quite technical and time consuming. The tipping of branches led to increased vegetative vigour and the tree appeared out of balance. 2012 (3rd leaf) harvest produced approximately 2,000kg/ha. Row and tree spacing's were 5m and 3m respectively.
5. Hedge (minimal prune) – similar to a two wire vertical system in wine grapes but with multiple side branches chosen and bent sideways along the row axis either side of the main trunk. This system had yielded less in the first harvest in comparison to the other systems. 2012 (3rd leaf) harvest produced approximately 2,000kg/ha. Row and tree spacing's were 4.5m and 3m respectively.
6. Hedge (heavier prune) – Same as the previous hedge system but with winter and summer box hedge pruning. 2012 (3rd leaf) harvest produced approximately 2,000kg/ha. Row and tree spacing's were 4.5m and 3m respectively.

A trellis system consisting of wires is not recommended as the machine harvesting causes a shockwave to run through the wire and knock fruit to the ground from several trees in front of the shaker.
The pruning system is unique to each system, but variations are also needed based on the growth habits of different cultivars.
In our opinion, the minimal pruned central leader system visually looked the most natural and balanced. It was too early to confidently say which system performed the best but it was clear the single leader and the hedge systems were superior to the vase systems.

High density with MB 1-37
This was the second high density trial, planted in March 2012 on MB 1-37 rootstock. This trial investigated three training systems based on the outcomes from the first trial.
Cultivars were Vayro and Marinada. The trees were too young to crop but the trees looked good.

1. Minimal vase – vase shape but with minimal pruning. Central scaffolds, vertical limbs and close scaffolds were removed. Row and tree spacing's were 6m and 2.8m respectively.
2. Single leader – typical apple system with a single leader. Row and tree spacing's were 5m and 1.6m respectively.
3. Hedge – similar to a two wire vertical system in wine grapes but with multiple side branches chosen and bent sideways along the row axis either side of the main trunk. Row and tree spacing's were 4m and 1m respectively.

Agromillora
Semi-commercial grower trial of super high density
Agromillora showed us a semi-commercial trial of its super high density system planted in July 2010 (3rd leaf) with Rootpac-20 and Rootpac-40. The trial was part of a commercial orchard with the following management program.

- Grafted to Soleta and Mardia (CITA) cultivars.
- Row and tree spacing's were 4m and 1.5m respectively.
- Mechanically hedge the top and side of trees.
- Mechanically hedge at each 30cm growth increment of the laterals to encourage ramification.
- No central leader.
- Maintain hedge depth of 80-100cm to facilitate mechanical harvesting.
- Maintain hedge height of 2020-2040cm to facilitate mechanical harvesting.
- Mechanically harvest with wine grape harvester.
- Harvest at approximately 20% kernel moisture and immediately deliver to the local processor for drying.
- Once the hedge is established, hedge once per season following harvest (e.g. September in northern hemisphere).
- Yield target of 2,000 to 2,500kg/ha.

Super high density trial with Rootpac-40 (left) and illustration of ramification from hedging cuts (right)

The lessons learnt from the trial by Agromillora and the grower are:

- Plant closer with row and tree spacing's of 3.5m and 1.0-1.5m respectively (2,222 to 2,857 trees/ha).
- Wine grape harvester removes approximately 5% of next year's buds.
- Need to match cultivar to this system. The hedging stimulated vegetative and non-productive growth of vigorous cultivars such as Bolena and Mardia.
- They plan to "rejuvenate" the tree on a four year cycle by undertaking a heavier winter hedging cut on one side of the tree every two years. For example, heavy hedge eastern side in year 1, no heavy hedging in year 2, heavy hedge western side in year 3, no heavy hedging in year 4.

The grower had also just planted a super high density trial of Rootpac-20 grafted with Californian cultivars and it will be important to follow this trial.

Super high density trial illustrating unbalanced vegetative growth habit by scion cultivar

CITA super high density evaluation trial

Agromillora showed us a trial of its super high density system planted in June 2011 (2nd leaf) with Rootpac-20 and Rootpac-40. The trial was part of a small research plot run by CITA. Three management systems were under trial using Rootpac-40.

1. Central leader – typical apple system with a single central leader, conserve all side branches other than those competing with central leader. Row and tree spacing's were 4m and 1.3m respectively.
2. Hedge – similar to the Agromillora hedge system where there is minimal training. The system incorporated several hedge cuts to encourage ramification. Row and tree spacing's were 4m and 2m respectively.
3. Minimal hedge / prune – trees are let grow naturally with some minimal pruning and hedging for row access, weediciding, harvesting, etc. Row and tree spacing's were 4m and 2m respectively.

Once again, the central leader looked well balanced in comparison to the other systems. The vigour of Rootpac-40 also looked well balanced and was not too dwarfing.
Jose Luis Espada from CITA, Zaragoza was the project leader for this project but wasn't present at the time of the visit.

Tissue culture

The delegation visited Agromillora's tissue culture and micro-grafting facility at Sant Sadurní d'Anoia near Barcelona. Globally, Agromillora has eleven nurseries, but not all of them have tissue culture facilities.
The Sant Sadurní facility produces olive trees, grapevines, *prunus* rootstocks and micrografted trees for wholesale nurseries. The facility produces approximately 14 million plants per year, contains 40 work stations and runs two shifts. It takes approximately two weeks for each growth stage and eight months to produce one tree. Smaller trees are sold at 3.00-3.50 €/tree and larger trees are sold at 5-6 €/tree. The facility is well automated with machinery used at every opportunity; for example they manufacture their own jiffy pots with a self filling and cutting "sock", a robot loading trays with small plants, and a dolly collecting benches from the greenhouse. The facility had expanded significantly since our first visit in 2007.

A new initiative of providing a complete tree ready for planting was observed. It was branded the "smarttree" and included a small grafted tree with a small tree stake and tree guard already fitted.

Post Harvest

Drying

The delegation visited a facility that could accommodate almond drying of fruit prematurely harvested “green” or wet by rainfall. The system included a dryer, silos and an automated handling system. Due to language difficulties it was difficult to understand and gain a detailed understanding of the system operations. The contact has been provided to Associate John Fielke of the University of South Australia who is supervising PhD research projects on almond dehydration.

Almond drying silos

Recommendations

Dwarfing rootstocks

Increased planting densities have the advantage of earlier and possibly higher production levels but it comes at the expense of increased orchard establishment costs. It is recommended to investigate the most appropriate dwarfing rootstocks and scion combinations to obtain a balance between vegetation, fruit production and orchard establishment costs. It is noted that too higher dwarfing may not suit the hot, dry climate of the Australian almond growing regions.

Tree architecture/training systems for high density orchards

Dwarfing rootstocks will facilitate increased planting densities but as mentioned above, it is recommended to investigate the most appropriate dwarfing rootstocks and scion combinations to obtain a balance between vegetation, fruit production and orchard establishment costs. Several management systems were observed for high density orchards on the trip and whilst they were all quite young, the variability in tree behaviour was already noticeable. It is recommended to take an approach of maximising fruit production by firstly designing the right combination of rootstocks, cultivars, planting densities and tree architecture/training systems. This approach should then be followed by designing the machinery and management system to suit. Undertaking the opposite approach or beginning with the primary goal of minimising costs of production will limit orchard potential.

Tissue culture

ABA to encourage Agromillora to incorporate its tissue culture and micro-grafting expertise into its existing olive nursery in Waikerie, South Australia.

Drying

Continue to invest in R&D that can aerate and dry almond product to manage early harvested fruit using a shake and catch system or manage rain affected fruit. Suitable equipment exists for Spanish in-shell product, but it does not exist for in-hull or in-shell Californian varieties.

Nutrition Research

INC World Forum for Nutrition Research and Dissemination

The delegation attended the World Forum for Nutrition Research held in Reus prior to the 30th Anniversary World Nut and Dried Fruit Congress. Key points from the seminars are listed below.

- PREDIMED (www.predimed.org) is an acronym for **"**Effects of the Mediterranean diet on the primary prevention of cardiovascular diseases". It was a study launched in Spain 2003 and is the largest of its kind. It is a large randomized clinical trial of dietary intervention in persons at high risk of cardiovascular disease. The main objective is to evaluate whether the Mediterranean diet supplemented with extra-virgin olive oil or tree nuts prevents cardiovascular diseases (cardiovascular death, myocardial infarction and/or stroke), in comparison with a low-fat diet. The study began in October 2003 and ran for over 5 years. The study included more than 7,000 asymptomatic participants with a high cardiovascular risk over a 5 year period.
- A history of bad diets does count towards cardiovascular disease, but it is reversible, and consequently the future counts.
- A switch to the Mediterranean diet is longer lasting in comparison to low fat and low carbohydrate diets.
- Nuts reduce blood cholesterol and decrease the risk of cardiovascular disease by 30%.
- Nut consumption of greater than five servings per week can equate to an 18-51% reduction in cardiovascular risk.
- Olive oil seems to have a specific and additional advantage.
- Mediterranean diet is more effective on cardiovascular disease than cancers, but it still has some positive effect on cancer risk.
- Nuts can reduce the incidence of diabetes and thus reduce the risk of cancer.
- A Mediterranean diet incorporates eating a meal over a longer period of time and this has advantages.
- Diets need to increase the quantity and variety of plant foods such as legumes, whole grains, olive oil, nuts, fruit and vegetables.
- The way food is combined can have a positive or negative effect on the Glycaemic Index (GI) of meals.
- Nuts can decrease the GI of meals.
- Diets and meals need to be considered as a whole and not individually. For example, bread has a high GI but studies have shown if bread is removed from the diet the food substituted can be worse.

2013 International Nut Congress Barcelona

Market Research

INC - Almond Satellite Meeting

Five individuals participated in a forum discussion at the almond satellite meeting, four Californians (Brian Ezell, Warren Cohen, Ago Dermenjian and Craig Duerr) and one Spaniard (Jordi Marti). A summary of the key points are listed below.

Do quality standards need updating?

- Standards do not need updating because sellers and customers generally develop their own specification that suits the transaction and customer specifications drive the standard regardless of what universal specifications exist.

Water issues in California

- Rapid orchard expansion is being limited by water shortages which will result in modest Californian growth into the future.
- California has just experienced the driest January to May period in recorded history. This period is normally their wettest and responsible for the major rainfalls.
- Supplementing the aqueduct water with groundwater irrigations is becoming difficult with increasing salinity levels in the wells.

Why is China's demand for almonds decreasing?

- Numerous issues are at fault such as: the name change of almonds; new government and anti corruption stance; desiccant producers had a food recall; and there has been a decrease in Chinese economic growth.
- Longer term the above issues will work themselves out and the market will continue to be a positive major market.

Is the European Union (EU) still a major market?

- The EU is still a major market and contributes to 30% of world consumption. Consumption of raw almonds in the EU is mature but the snack market is increasing.

Will there be an oversupply situation in 7 years?

- There is unlikely to be an oversupply situation in the near future with increasing demand from emerging markets such as China, India, Middle East, Eastern Europe and South America. The Almond Board of California is currently investing in Brazil as a new market opportunity.
- California is unlikely to rapidly expand its supply base due to: water issues; minimal access to suitable soil; and there are still other successful horticultural crops such as walnuts, pistachios and wine grapes that are limiting any conversion to almonds.

What is the current situation of the Spanish crop?

- The 2013 harvest will be down by 30-40% to approximately 30,000 to 35,000 tonnes due to frosts and rain during bloom and fruit set. The 2013 crop will be the worst in ten years.

- The Spanish crop will increase to 80,000 to 90,000 tonnes over the next few years. This will be a function of new irrigated plantings and newer varieties with increased yield and improved agronomic characteristics.
- Overtaking Australia as the second largest almond producer is a priority.

Is the USDA certificate enough protection for the buyer?

- Generally the USDA certificate is enough, but many buyers, in particular India, prefer the in-line sampling sheets as one sample is never enough.
- There can be some variability in the "softer" categories such as chips and scratches due the difficulty in measurement and it can sometimes be subjective.
- Most handlers are increasing their specifications to meet buyer requirements.

How is the currency situation affecting the market?

- Large fluctuations are creating nervousness, but should only affect timing of purchases, not the volume.
- The Chinese Yuan is going to strengthen over time.

Will almond prices remain low in comparison to other tree nuts?

- California has 103 handlers and this makes it difficult to maintain a preferred steady price range.
- The past year has seen a more variable price.
- Monthly shipment information has fuelled price fluctuations.
- Only need to increase demand by 4% at 2 billion pounds to meet current supply.

Why does supply have to drive demand?

- The question was raised as to why planting needs to continue in order to "supply the world". Almonds are a commodity and the fundamentals of supply, demand and price are intimately related.
- Buyers would buy at high prices if they knew it was going to be stable.

Is pasteurisation of Californian exports occurring?

- The US Food and Drug Agency has no jurisdiction in other countries but pasteurisation of exports is occurring and increasing. Pasteurisation of exports is largely occurring based on customer requests.
- Pasteurisation is having no effects on product quality.

DISSEMINATION OF INFORMATION

The information from the visits has been and will be disseminated to industry via:

- Almond Board of Australia Board Meetings – February 2013, May 2013 and August 2013.
- Almond Industry Advisory Committee – 28th August 2013.
- Almond Plant Improvement, Production and Processing Committee Meetings December 2013.
- Circulation to industry & uploaded to almond industry website.

REPORT ON 2013/14 NETWORKING ACTIVITIES

The key objective of this project is to build a network of contacts and develop relationships with organizations and individuals that provide a value add to the Australian almond industry by providing advice on international issues, access to research results, data, knowledge and processes in areas of production, processing, market access and development, nutrition, technology transfer, IP commercialisation and organizational management.

The 2013/14 itinerary and list of participants was as follows:

- October 2013 – HAL Indian Research Co-operation Workshop, Bangalore, India:
  Greg Buchanan, Almond IAC Chair and Phil Haines, DEPI Victoria
- December 2013 - US Almond Conference, Sacramento, California, USA:
  Neale Bennett, ABA Chair and Jo Pippos, ABA Communications Manager.
- May 2014 – International Nut Congress, Melbourne:
  Neale Bennett, ABA Chair and Ross Skinner, ABA CEO, Joseph Ebbage, ABA Market Development Manager.

Dr Greg Buchanan, the almond IAC Chair, and Phil Haines of DEPI Victoria participated in the HAL delegation that visited India to investigate co-operative research arrangements. The report on this aspect of the project is included as Attachment 1.

In 2013-14, ABA representatives attended the US Almond Conference held in Sacramento in December and not only heard presentations on their extensive research program but also met with staff of the Almond Board of California to discuss market development, food safety issues, nutritional studies, sustainability programs, and communications and extension within their industry. Experiencing how they conducted the Conferences also provided valuable lessons for the ABA. The report on this aspect of the project is included as Attachment 2.

In addition to the US Conference, the ABA linked with the ABC to discuss export market access issues and statistical collection activities during a meeting held in Delhi, India in February. The report on this aspect of the project is included as Attachment 3.

From these regular inter Board meetings a strong relationship has developed with the open sharing of knowledge benefitting both industries. It has been agreed that during 2014, representatives of both organisations will present at each other's Conference.

The International Nut Conference held in Melbourne provided an opportunity to engage with the wider nut industry and a meeting of 42 nut and dried fruit bodies from around the world was held to progress the development of a forum for representative bodies to exchange views and knowledge on matters of mutual interest. The report on this aspect of the project is included as Attachment 4.

The ABA has maintained contact with Agromillora regarding dwarfing rootstocks and tissue culturing new planting material and this has been incorporated into the 2014/15 R&D program.

DISSEMINATION OF INFORMATION

The information from these networking events have been disseminated to industry via:

- Almond Board of Australia Board Meetings – February, May and August 2014.
- Almond Industry Advisory Committee – 27th August 2014.
- Almond Plant Improvement, Production, Processing and Market Development Committees' Meetings in 2014.
- Circulation of reports to relevant industry stakeholders and information gathered used in articles in the industry magazine.

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Report on Horticulture Research and Development Workshop

Bangalore, India; 3-5 October, 2013

Dr. Greg Buchanan, Chair, Almond Industry Advisory Committee

BACKGROUND

This HAL initiated workshop was aimed at exploring the potential for collaborative research projects between the Indian Council of Agricultural Research, and Horticulture Australia. HAL representatives at the workshop were Selwyn Snell (Chair, HAL Board), John Lloyd (Chief Executive Officer, HAL), Prof. Rob Clark (Deputy Director, HAL Board), David Moore, and Alok Kumar.

The principal Indian representative was Dr. Krishna Kumar, Deputy Director General (Horticulture), Indian Council of Agricultural Research (ICAR). ICAR manages 99 research institutes (10 in the Horticulture Division) and 53 agricultural universities across India. It awards scholarships for 200 PhD candidates each year.

The Horticulture Division of ICAR concentrates on the genetic improvement of crops, and production and post harvest issues. The major horticulture crops in India are mango, banana, coconut, cashew, papaya, and pomegranate.

The different horticulture industries at the workshop (almonds, table grapes, avocados, tomato, vegetables, mango, and strawberries) were represented by Australian researchers, industry extension officers, members of HAL Industry Advisory Committees, and State Government personnel. I represented almonds, and table grapes.

Indian representatives were Directors of the various Indian research institutes, research specialists, and in one session, growers and exporters.

The workshop took the format of industry specific sessions on the different crops represented, where an Australian representative and an Indian representative provided an industry overview and identified research needs for their respective industry, followed by a discussion session that identified potential research areas where collaboration was likely to be mutually beneficial.

The initial introduction by Dr. Krishna Kumar was inspirational. He gave a powerful message that emphasized the mission of his organization to provide technologies that would increase and improve local food production for India's rapidly increasing population. The Indian research centres tended to focus on crops specific to their region, with a strong emphasis on crop improvement, mostly using biotechnology (molecular markers) to guide their breeding programs. Crop protection and postharvest technologies were also important; crop protection because of humid, warm climates in many production areas; and postharvest technologies because of the relative lack of storage and transport facilities – most crops are harvested and directly sent to markets.

The Directors of the various Indian research institutes were technical experts in their field, rather than having a bureaucratic background. My impression was that ICAR was an organization where technical expertise was highly valued, the scientists were very competent and specialized in their

respective disciplines, new technologies were sought and adopted rapidly, and competent scientists had a “career for life”.

There are some differences between the scientific culture of the Indians and Australians. The Indian scientists were formal in their discussions and relationships (calling colleagues Dr. ….) rather than using first names, and nearly all of the Indian representatives were senior research scientists and/or Research Directors. In contrast, the Australians were a mix of research, extension and industry people, with a good mix of ages and experience, referred to each other using first names, and often used colloquial expressions which left the Indians bemused and asking for a translation of “Australian English”.

The workshop was interesting, and the technical areas where collaboration was likely to be beneficial were identified. Obvious areas of interest were in plant breeding and biotechnology, where both countries have good expertise and the technology is generic. Other opportunities are in sourcing PhD and/or post Doctoral scientists from India, potentially through scientific exchange visits. The difficulty in securing Australian PhD candidates and/or Post Docs to work in the almond industry is obvious, and this could be resolved through recruitment and involvement of young Indian scientists, provided they have the skills and work ethic required to be successful in the Australian industries.

ALMONDS

Almonds are an important food and source of plant protein in India, and India is an important export market for Australian almonds. Consequently, there should be mutual interest in collaborative research and development.

I gave a powerpoint presentation, that was a summary of current Australian production techniques, and then a slide on “future orchards” and the perceived advantages of high density plantings, which can be mechanically harvested by shake and catch systems.

In the discussion after my presentation, a question of Australian almond imports competing in India’s markets was raised, so potential competition may be a sensitive issue in India. My answer was that plant proteins were cheaper and better than animal proteins in feeding expanding populations, and thus were likely to complement rather compete with Indian needs, including almond production and their markets. This answer seemed to be accepted well.

The potential areas for research collaboration, as identified by the working group for almonds (facilitated by Phil Haines, Vic. DEPI) were:

1. Pollination efficiency – apparently this was a problem in Kashmir almond groves.
2. New varieties – there was interest in the Australian breeding project, especially self fertile varieties (and probably access to Australian bred varieties).
3. Orchard design – particularly tree density, and rootstocks for greater productivity.
4. Mechanical harvesting – although I think the Indian orchards were hand harvested.
5. Soil health and nutrients.
6. Harvest and post harvest management.

NEXT STEPS

David Moore, R&D manager for HAL, will prepare a report on the workshops and future actions, from a HAL perspective. While the discussions and potential areas of collaboration covered a wide range of technologies and crops, it was clearly stated that any collaborative project required that the outputs needed to be of mutual benefit to both Australian and Indian industries.

It was obvious from the concluding remarks by Dr. Krishna Kumar, that he saw opportunities for collaboration in the almond industries, and in new molecular technologies for identification and management of fruit flies. Any collaborative projects may be funded by HAL using Indian financial contributions as “matching funds” as in the apple research in collaboration with New Zealand, so that the relative amount required from individual industry levy funds would be 25% or less of the total research budget.

From an almond perspective, there was interest by Indian scientists in pollination, self fertile varieties, soil health and nutrients, and harvest/post harvest management. Exchange visits focused on younger but well qualified Indian scientists should have potential for both countries. There are probably commercial opportunities (testing and marketing Australian bred varieties of almonds and table grapes) where mutual benefits could be achieved, and these would be facilitated by exchange visits of growers and other industry personnel.

BRIEFING NOTE

2013 Californian Almond Conference

Prepared By: Neale Bennett & Jo Pippos

Background

The ABA visit to California in December, 2013 by Neale Bennett (ABA Chair) and Jo Pippos (ABA Communications Manager) included attendance at the ABC's annual Conference, and meetings with ABC representatives and US Machinery companies.

The conference was held over three days from December 3-5 in Sacramento, California. This was the second year the conference has been held outside of Modesto - the move associated with increased space for delegates and trade show exhibitors and superior venue facilities.

Sessions were held for growers and marketers/processors as well as joint information sessions. Presenters ranged from UC Davis Extension staff reporting on their research projects to Political lobbyists employed by the ABC to lobby government over interests and causes that would have both positive and detrimental effects to the Californian Almond Industry. As well as the sessions there was a comprehensive trade display of various businesses that are involved with the almond industry.

The aim of this report is to bring to the ABA's attention the highlights of the ABC Conference as well as a list of recommendations for the Board to consider.

This study trip:

- Built on the development of relationships between the ABA and ABC, current and potential AAC sponsors
- Enabled a review of the ABC Conference for ideas that can be incorporated into the AAC for future events to continuing development and improvement
- Assisted with identifying researchers/extension officers and presenters that should be considered to invite to Australia to both present at our conference and conduct field day workshops.
- Provided an insight into the US industry, the ABC as an organisation and their marketing and communication programs.

ABC 2013 Conference

Water & Salinity

The Californian Industry is currently facing drought conditions and as a result, reduced water availability. The sessions held on this were very familiar to Australian attendees as the US is today where the Australian industry was 5 years ago. Water savings, water usage and weed control were topics included in the ABA Conference program several years ago, and now the US industry is facing the same problems that we did.

From what we saw some of the US growers are in denial of the severity of the problem - things that an Australian grower takes for granted in the way of decisions making tools for irrigation (soil moisture monitoring, evaporation and controlled irrigation application - sprinklers or drip irrigation systems) are now being highlighted as a way of getting the most out of the water that the US growers have available. Ground water that has traditionally been used to supplement surface water restrictions is now becoming more saline and wells are being reworked deeper to get a better supply.

Driving around after the conference evidence of this was seen in the orchards with a very high incidence of leaf burn from salt uptake visible in a most orchards. The Southern part of the Valley (below Modesto down to Bakersfield) especially on the western side of the valley is the worst effected. Growers have been warned that unless there is an

exceptional snow pack this winter (2013/14) as well as significant rainfall, water restrictions will be heavier next year than they were this past year.

Added to water problems, 2014 will see the introduction of Nitrogen usage restrictions for growers. Poor irrigation management practices have allowed Nitrates to leech down to the aquifer, and high nitrate levels are now being found in groundwater. Whilst not a problem for agricultural usage, this ground water is also used for human consumption. Environmental legislation has been introduced to limit the amount of Nitrogen farmers can legally apply to their crops each year.

A lot of research has been conducted on this topic by Dr Patrick Brown and his team. Consequently, in conjunction with his work an 'App' has been developed to calculate the amount of Nitrogen each individual almond grower can apply to his crop. This is based on what the grower believes the size of the current crop is, as well as taking into account what has come off his trees historically. All Nitrogen applied must be taken into account - from compost fertilisers to foliar fertilisers. Once the information is fed into the app, a fertiliser budget is then developed. Before a grower can apply any of this fertiliser, his budget must be signed off by a Licenced PCA (Pest Crop Adviser). Records must be kept of all fertiliser application as growers' practices will be audited. The aquifers will be monitored over the next few years and if nitrate levels do not improve then the restrictions will be tightened again.

Bees & Pollination

Bee research is an ongoing topic of concern for not only the ABA, but also the ABC. A whole session was devoted to the current bee research program. To pollinate the Californian crop, 1.5 million hives are needed to be sourced not only from California but also brought in from other states. This equates to 3,409 truckloads of hives being brought in across the state borders. The ABC contributes approximately $USD 200,000 annually to bee research, while an additional $USD 400,000 comes from *'Project Apis M'* a privately funded project. Donations come from growers or industry interested in the research of bees. Campos Brothers are fairly large contributors. Studies done on bees include the following:

- Trying to minimise 30% hive loss during over wintering
- Wild bees and their positive effect on honey bees
- Wild flower and host crops trials to attract wild bees to help with pollination.
- How sprays (both fungicide and herbicide) affect bees by either disorienting them or killing them outright - encouraging growers to spray fungicides at night when bees are not active.

Beekeepers are required to supply an 8 frame hive of strong bees. A base fee is paid to the beekeepers and inspectors are brought in to inspect the hives. A bonus is then paid depending on hive strength. A beekeeper will be paid all up between $175 - 185 per hive.

In a discussion with a beekeeper at the American Beekeepers trade stand he mentioned that "Varroa mite is being dealt with and beekeepers take precautions through fumigating hives with chemicals." Ironically he was interested to know that we were from Australia as he said that was where he had to import the most effective fumigation chemical from Australia ('Tactic' - a sheep drench) as it had been taken off the market in the USA.

Food Safety

Food Safety is high on the agenda of the FDA. Currently up for comment are 5 proposed new FSMA (Food Safety Modernisation Act) rules. These include; produce standards, preventative controls for human food, foreign supplier verification, third party quality audits and preventative controls for animal food. These are "one size fits all" policies and comment will need to be made by the almond industry otherwise they will under the same ruling as vegetables.

Water is the big issue behind the food safety drive with a major focus on *E. coli* as a contaminant. In the draft policy, water quality would need to be tested before being used during the growing season - every 3 months for wells, monthly for protected surface water and weekly for surface water. This would not only be cost prohibitive but will not take into account other dangerous alternatives to *E. coli* such as Salmonella. Once enforced, the only variances that can be granted to industries are through either State or Federal governments.

A new quality assurance scheme is being looked at to be introduced called HARPC. While very similar to HACCAP, the emphasis is on the validation process of the controls put in place. This is something that the Australian industry will need to keep an eye on as it may affect our competitiveness on the world market place.

Marketing

One of the joint sessions held was an overview of current Marketing encompassing a report on how certain factors are driving global demand for almonds. Shipment records show that in the 1980 - 90's growth was fairly flat and since 2000 there has been annual growth of 8%, despite grower production quadrupling. In the 1990's, almonds were seen primarily as an ingredient and emphasis was that almonds were high in fat and cholesterol, whereas today almonds are seen as a healthy snack and an important dietary requirement. This turnaround has happened due to a strong marketing program promoting the positive benefits of eating almonds and dispelling the negative myths.

Nutrition research, close working relationships with health professionals and food professionals, positive consumer advertising and qualified health claims have been major contributors towards the growing demand for almonds. The ABC marketing team is now using those pillars to further promote almonds by highlighting the convenience of eating almonds as a snack.

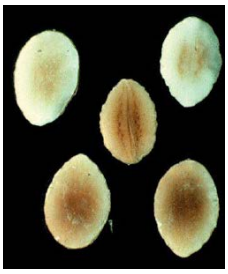
There is a worldwide desire to be healthy, to have high energy levels and to be beautiful. The ABC's latest campaign aims to show all of these qualities can be enhanced by eating almonds - slogans such as "There is power in the crunch of almonds" and "Crunch on" - videos and advertising can be found on the ABC YouTube channel http://www.youtube.com/user/AlmondBoardofCA as well as a relaunched website specifically for consumers http://www.almonds.com/Consumers as well as http://www.crunchonalmonds.com

Surveys have shown that almonds are only used in 1.5% of the products that they could be. China is a market that the ABC is finding the health message is working, and as it develops, more and more Chinese people are “trading up” to get a healthier and better lifestyle. The growing middle class of China is a much younger age group than the rest of the world. Due to the more easily achieved affluent lifestyle, China's health problems are starting to be seen as cancer, heart disease and diabetes to name but a few.

Traditional Chinese medicine is now being revisited to help to try and combat these problems. A lot of this medicine is based around food. Chinese relate different foods to different parts of the body. For example, Chinese believe walnuts are good for the brain because the nut looks similar to the brain and cashews are good for the kidney as they look like a kidney. As the Chinese people believe that "The heart is the monarch of the body", the ABC has come up with a campaign of a logo with two almonds together in a heart shape, therefore by eating almonds you are eating for a healthy heart. The Chinese have a proverb which they live by "we eat to live and live to eat".

Research Partnerships

One of the major strengths the US industry has over Australia is its partnerships with, and research work done by the many field advisers from UC Davis. This was highlighted in the presentations by the UC Davis staff on their research projects. Topics such as; drought, stock piling, weedicide resistance, disease research and canopy management as well as wide range of research posters on various topics. The content and standard of these emphasised the need for the ABA to not only maintain it’s relationship with UC Davis, but also to strengthen it with joint projects and knowledge sharing. As we have knowledge to gain from them, they could also learn from us.



In one of the combined research reporting sessions, a presentation was made by Franz Niederholzer regarding a relatively new problem that has come to processors attention, known as "concealed damage" it is being found in the Monterey variety. From the outside the shell looks normal, the kernel looks normal on the outside but has a brownish stain inside the nut and when the nut is eaten it has an unpleasant flavour. It cannot be visibly detected by external screening.

Studies have shown that because Monterey is a late variety nut it can be harvested when there are late rains in the season. When wet or damp nuts are windrowed this sets off the biomechanical mechanisms causing the damage.

In 2012, a project was undertaken that set out a way to try and control this condition. Nuts were wet several times and left to dry for varying times. The nuts left to sit for 12 days of good drying conditions, picked up and hulled straight away, showed very little damage. However, nuts not left to dry for as long and then stockpiled showed higher instances of the "concealed damage". It also showed that by physically conditioning damp windrows with either a harvester or specific conditioner that removed dirt, leaves etc, nuts could be successfully harvested dry up to several days earlier than if left to try to dry in damp windrows with trash mixed in.

Another highlight was an invitation to a breakfast meeting with the Strmiska Crop Consulting Company, A family owned PCA (Pest Crop Adviser) company now into the 4th generation. Their knowledge of almonds is far superior to anything in Australia and their reputation in the industry is so good that they have been contracted by Olam to monitor crops in both Australia and the USA.

With what we saw and heard from both UC Davis researchers and Strmiska, it drove home the argument that Australia's independent support knowledge is sorely lacking. One way to improve our knowledge base would be to ramp up and redesign the Phil Watters award by investigating the possibility of opening the award to include researchers and consultants. Funding support through sponsorship of the award could be based around spending a 3 month sabbatical in California working with researchers and consultants such as Strmiska and UC Davis. This should encourage more professionals into the Australian almond industry, and provide more support to growers.

Sponsorship

BASF Chemicals have been a long-time supporter of the ABC Conference both as a Platinum Sponsor as well as an exhibitor. We were able to briefly meet with Trevor Schlunt, one of the senior BASF representatives in attendance. In Australia, BASF products have been historically distributed by NuFarm Chemicals, a partnership that has recently ended (January 2014) and BASF will now be marketing their own chemicals. A verbal invitation has been extended to BASF to sponsor or be part of the ABA Conference in 2014 and beyond. This was met with enthusiasm and Jo will follow up with more information for them once sponsorship packages are decided and become available.

As a platinum sponsor BASF conducted a session presentation, during which they announced that they would have a new chemical for almonds called *'Merivon'* on the market in 2014. *'Merivon'* is a new residual fungicide (from the Xemium family, the next step on from the strobulim family) that will control a wide range of diseases including brown rot, jacket rot, anthracnose, shot hole, scab and rust. The presentation brought home the fact of how disadvantaged the Australian industry are as growers, with a lot of chemicals available to Californian growers, yet years away from registration in Australia. An example of this is *'Pristine'*, another BASF chemical not yet available to us in Australia, yet it will be superseded to make way for *'Merivon'*. As an industry we need to explore what can be done to expedite chemical registration for our growers to get us on a more level playing field.

Other things of note were that Marketers are invited to sponsor sessions or supply gifts for speakers. This involves the Marketers as well as promotes their brand.

Conference Management

As the ABC staff were focused on the running of the Conference, limited time was able to be spent with them to ask questions and gain insights to their organisation. Jo was able to spend around 2 hours with several staff including their Conference Manager and Exhibition Hire Company asking questions and comparing our Conference to the ABC. Some things we do much better, but there are also things that we can improve on.

Useful information was gained on running of sessions and the event. Extra help for the staff was supplied through the Future Farmers of America (FFA) program who were used to usher, run errands and help with microphones during question time. Something like that could be looked at with agricultural students being used to help at the ABA Conference. This would also help give them exposure to the Almond Industry and perhaps convince them to be involved with the industry in the future.

It was interesting to note that the Gala Dinner was held on the last night and as a separate ticketed event to conclude the Conference. It would be worth considering how feasible it would be to have ours on the last night. By doing this it could eliminate the current situation we currently have with the "morning after" first session - where whoever has the job of presenting that first session is usually working to a poor attendance. By having the dinner last it would finish the Conference off on a high note and those wanting to "party on" could do so without having to worry about missing the first session the next day.

The trade displays were varied and covered all aspects of the industry from Beekeepers to processing equipment, harvesting equipment to nurseries. We spoke to many and all seemed keen to be part of our industry with a number expressed interest in attending our conference, however all asked for dates and venues for the 2014 event which (we could not give as yet) so as to help with their planning. Jo has taken details from all of the interested parties and will forward Conference Sponsorship and registration information packs as soon as available.

Conversations were also held with John Duarte from 'Duarte Nurseries' (ABA Study Tour visited his property in the USA in 2010). John has heard about our breeding program and would be quite interested in distributing any of our successes, especially if there is a self-pollinating variety. He also mentioned coming out to Australia in February 2014 and is interested in looking at our breeding program. If he does come out it may be worth discussing his nursery and its experience in tissue culture production of rootstocks.

Other Items of Note

Through discussions with Richard Waycott, we were informed out that the ABC has a policy of educating all of its staff members about the almond industry. Staff days are held every 3 months, where they are taken on a field trip to some part of the industry, whether it be to a machinery manufacturer or a huller. The principle is that they want all of their staff to have as much knowledge about the industry in which they work as possible. While their industry has more range and scope to do this in the USA it is something that would be good to do for our staff.

While at the conference we had the unusual experience of being approached by two people working for an investment firm who are looking to develop an orchard in Australia. Initially this orchard would be around 2,000 acres in size but would look to develop more if successful. They already own water out here and know the area. They are in the process of putting the final touch to a business case. They have kept in touch and have a visit to Australia pencilled in for either late January or early February to further investigate land and management options. It is interesting to see that a there are a few companies in the USA that see that Australia is the new California - with limited new land available, expensive land and water, new almond developments are becoming rarer in the USA so options are now being investigated outside the US, with Australia at the top of the list.

Speaker Contacts & Suggestions for 2014 AAC

- **Franz Niederholzer** (UCCE – Sutter, Yuba, Colusa Counties) – Concealed Damage
- **Nick Schewizer or Richard Lillingston** (BASF) – New chemical releases into USA & Australia. ***In February 2014 BASF will take over the distribution of their chemicals from Nufarm Australia. As the premier sponsor of the ABC Conference this is a great opportunity for the AAC to acquire a new high tier sponsor and develop relationship***
- **Bradley Hanson** (UC Davis) - Weed Specialist Plant Sciences & Chemical Resistance
- **Gordon Wardell** (Bee biologist with Paramount Farms),
- **Blake Sanden** (UC Davis - water management)
- **Kevin Brooks** (Strmiska Consulting) – Stink Bugs & spray program advice
- **Neal M. Williams** (UC Davis) - Bee forage and sustainable pollination for almonds
- **Gordon Wardell** (Bee Biologist Paramount Farming Company & Chairman: Project Apis m) - Getting the Most Out of Your Bees and Your Trees - Pollination from a Grower's Perspective and a Bee's Perspective
- **Buddy Ketchner** (President & CEO of Sterling Rice Group) – Driving Global Demand & Positioning of Almonds
- **Aaron Lau** (Cheil Greater China) – The Chinese almond market and Traditional Chinese medicine influence on consumers
- **Stacey Humble** (ABC) – Growth by Leveraging Consumer Insights
- **Peggy Fyfe** (ABC) **–** Almonds & Chocolate – The Dynamic Duo

Logistics & Learnings

Initial figures from the Conference Manager are that it was attended by approximately 2,600 delegates (200 more than 2012 conference), with a trade show consisting of 223 booths and 80 research posters. Notable learnings and logistics to be considered for the 2014 and future AAC's were:

- Set dates and venue for 2014 ABA Conference as soon as possible (first ABA Board Meeting of each calendar year). A date and venue released now will help not only with our planning but also prospective visitors and exhibitors. Traditionally this has been left until later in the year and making it difficult to coordinate with US visitors and missing out on some speakers. Some potential exhibitors have expressed interest in bringing equipment, so a venue big enough needs to be considered.

- Large digital countdown timer and presentation screen to be situated on the floor near the stage for all speakers. Speakers can then time themselves and 'keep on track'.

- All researchers to be invited to produce a poster for inclusion in a dedicated poster area and a "Speed Dating" update (no more than 5 minute presentation) to be coordinated and presented in the program proper. Poster presenters then to stand by each poster in a dedicated session for delegates to ask questions on these topics.

- ABA to continue to send delegates to the ABC Conference. This not only allows us to be kept up with the latest research updates but also continue to strengthen our relationship with the ABC.

- Continue to strengthen our relationship with UC Davis and its researchers. Down the track it would be nice if joint projects could be run. By doing this with our counter seasonal times, 2 seasons of data could be done in one year.

- Investigate the possibility of gaining outside sponsorship to ramp up the Phil Watters award. Also open it up to technical officers and scientists to gain a broader knowledge across the industry. Look to set it up so the Awardee would gain at least 3 months exposure to UC Davis or PCA's such as Strmiska.

- Investigate either with APVMA and Chemical companies why there are lengthy delays in the release of chemicals and registration. We are a big enough industry now to have some authority or influence with Chemicals companies that we need to use this as leverage. We also need to monitor what chemicals are being used or released in the USA so as to keep our members up to date with the latest tools.

- ABA stand to be increased further in size from the AAC 2013 to include sales of almond tins and merchandise, ABA and external publications and copies of reports and fact sheets. This would require dedicated staffing at this booth at all times.

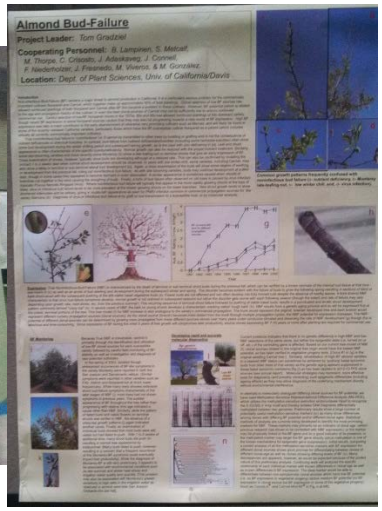
- Look at possibly shifting the Conference dinner to the last night of the Conference to allow for attendees to network with unrestricted hours. To cater for this, the Conference could have a half day start followed by 2 longer days.

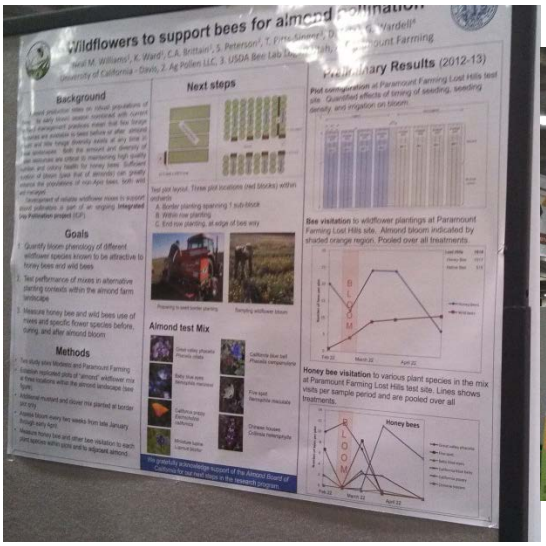
- Conference 'helpers' to increase staffing levels and help with workload of ABA staff at the AAC. Consideration should be given to inviting Growsmart students or students from Urrbrae Agricultural College (Adelaide) to act as ushers/information staff, collect/scan tickets for events, run microphones during Q&A sessions, pack conference satchels and other simple tasks. This could be useful for students as an insight into an agricultural industry conference and possible work experience or similar.

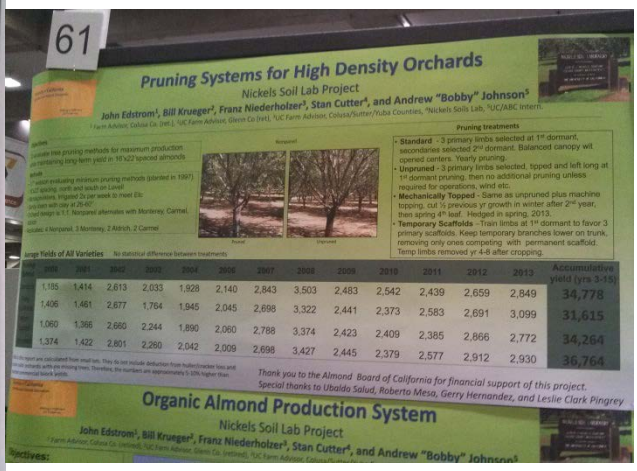
- Two way radio for ABA staff to contact Conference Manager during event. Many questions arise during registration times, breaks and events that cannot be answered by registration desk staff – constant contact with the Conference Manager would help to alleviate problems/concerns that may arise from these situations.

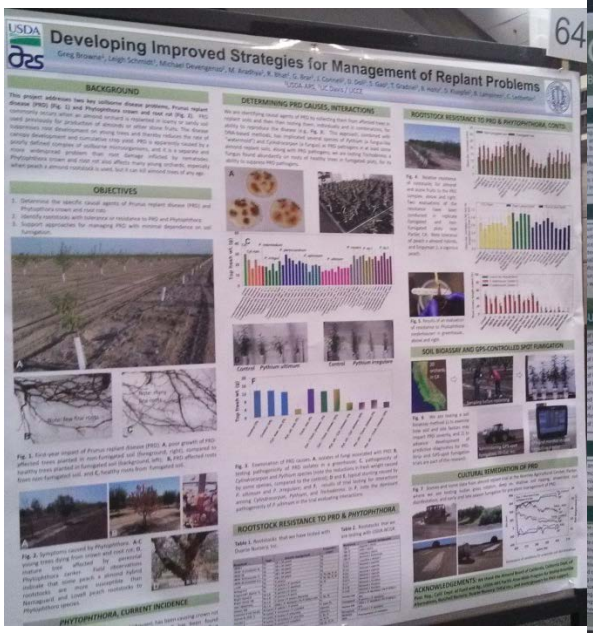
- Wireless barcode scanner and software for conference ticketing. A handheld barcode scanner for registration and ticketed entry events such as Conference Dinners would remove the need for separate tickets, allowing delegates to wear only their name badge at all times and be "scanned in" to the event. Stops loss of tickets and allows ABA to track times of arrival to events.

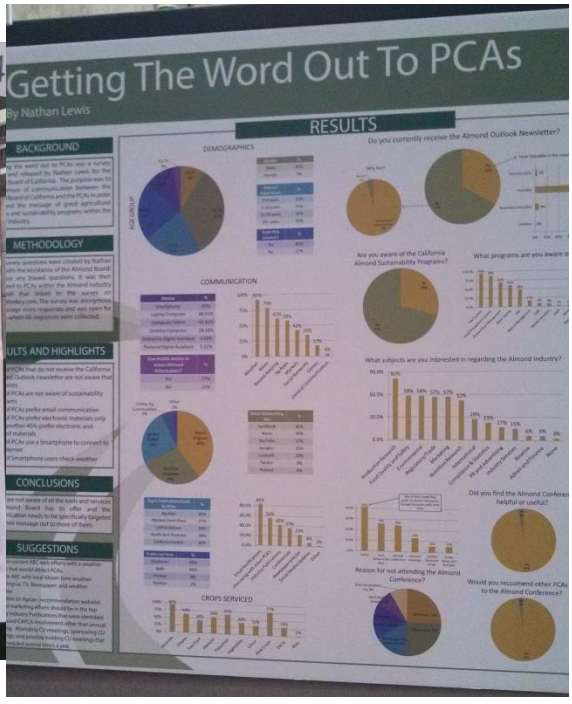
Poster Session











Post Conference Tour

Post Conference, we took up invitations to tour both the Orchard Machinery Corporation factory in Yuba City as well as the Flory factory in Salida. From talks with OMC President, Don Mayo, they have built a prototype shaker which is completely autonomous. This is being tested and will be further tested in 2014. If things go well they hope to release it in 2015. OMC are also working on a GPS Docking system for unloading carts to shuttles in the field on the fly. Again they hope to have something for release in 2015.

Presentations attended at the ABC's 2013 conference were:

- **Nitrogen Management & Budgeting;** Dr Patrick Brown (UC Davis) & Sebatian Saa Silva (UC Davis)
- **Irrigation Strategies for Drought Management;** Ken Shackel (UC Davis), David Doll (UCCE Merced County), Allan Fulton (UCCE – Tehama County), Blake Sanen (UCCE – Kern County) & Bruce Lampinen (UC Davis)
- **What will Ag Look Like Tomorrow?;** Richard Waycott (ABC)
- **Food Safety and FSMA: Leveraging our Almond Industry Practices;** Tim Burmingham (ABC)
- **Water - Are We Still at the Wishing Well;** Richard Waycott (ABC) & Phil Isenberg (Delta Stewardship Council)
- **Field Quality: Stockpile Management and Concealed Damage;** Bruce Lampinen (UC Davis) & Franz Niederholzer (UCCE-Sutter, Yuba, Colusa Counties)
- **Sustainability & Almonds: Where are we?;** Gabrielle Ludwig (ABC), Tim Brimingham (ABC) & Jeff Dlott (SureHarvest Inc)
- **Honeybees & Pollination: Looking at the Bigger Picture;** Christi Heintz (Project Apis m), Neal Williams (UC Davis) & Gordon Wardell (Paramount Farming Co)
- **Pest Management Update: Insect, Disease & Weeds**; Bob Curtis (ABC), David Haviland (UCCE – Kern County), Brand Hanson (UC Davis), Thermis Michalides (UC Davis at Kearney Agricutlural Centre) & Jim Adaskaveg (UC Riverside)
- **Not all Fungicides are Created Equal: Introducing Merivon Fungicide for Almonds;** Nick Schewizer (BASF)
- **Growth by Leveraging Consumer Insights;** Buddy Ketchner (Sterling Rice Group) & Stacey Humble (ABC)
- **Almonds and Chocolate: The Dynamic Duo;** Karen Lapsley (ABC) & Peggy Fyffe (ABC). *Particular attention was paid to this presentation by Karen Lapsley as she was on the shortlist to present at the 2014 Australian Conference.*

PDF copies of presentations are available from the ABA - contact Jo Pippos

New Delhi and Gulfoods Report

Prepared By: Ross Skinner and Brendan Sidhu

INDIAN MARKET VISIT

India is Australia's largest export market with just under $100 million in sales during 2013. Indian sales represent 29% of Australian exports and we have approximately 30% market share in India compared to 3% in China.

The visit to India from February 18th to 20th follows similar visits in the previous years to hold discussions with the major Indian traders to build the Australian brand by providing an opportunity to discuss any matters of concern and to reinforce the positives of the Australian industry at a time when the Almond Board of California are also visiting Delhi and holding their Indian marketing forum. Being the third time that we had visited the market we found a greater openness with the traders to discuss issues now they understand the role of the ABA from their attendance at the Australian marketing forums and our previous visits.

A key learning was the rise of the Mumbai traders in the Indian market. Since the taxes paid for almonds entering Mumbai are now the same as for product entering Delhi the trade in Mumbai is no longer feeling compelled to trade through the Old Delhi market and have moved to take this margin out by dealing direct. We had dinner in Delhi with a Mumbai trader who had established his own modern facilities to warehouse, shell and distribute almonds. The rise of Mumbai was reinforced at the ABA's Gulfoods information forum where a number of traders from there attended for the first time.

The Delhi traders explained that their business was down a little on the back of the Mumbai traders importing directly. The traders also advised that the rising prices after an initial setback were being accepted in the market and they expected a step change in regard to the base price for almonds in future. We were extensively questioned regarding the drought in California and whether it was a genuine concern and the likely immediate and future impact on supply and nut quality.

There was great interest in the Australian new season crop and similarly to the previous year the traders praised the comparative quality of Australia's 2013 crop and were looking forward to the 2014 arriving with comments such as "the sooner the better as the market always lifts when Australian product lands".

There were some brickbats as well as bouquets with the most common being the lack of promotional support to build consumer demand in India similar to that provided by the Almond Board of California given the 30% market share Australia now had in India.

The main quality issue raised was borer damage. Brendan explained the on orchard efforts to overcome the issue with the registration of new chemicals, attention to the removal of the mummies from trees and the fumigation of storage stockpiles. They

accepted that the Australian industry did not like to use broad spectrum chemicals as these also killed the beneficial insects without which other pests were difficult to control. The industry's investment in research to address the issue was outlined.

Our overall impression was there is a lot of goodwill towards the Australian industry and a desire to see it continue to grow.

On the afternoon of our second day in Delhi, we had a three hour meeting with the Almond Board of California following their Conference and gala luncheon function for the Indian trade at the Meridien Hotel. Present at the meeting was Richard Waycott (ABC President), Julie Adams (ABC Vice President), John Talbot (ABC Vice President Global Market Development), Sudarshan Mazumdar (ABC Indian Market Manager), Allan Mustard, Minister Counsellor for Agricultural Affairs US Embassy Delhi, Brendan Sidhu (ABA Chair of Market Development Committee), and Ross Skinner (ABA CEO). Slava Zeman (Agriculture Counsellor at the Australian High Commission) was away from Delhi and unable to attend the meeting.

The major matters discussed during the meeting included:

- Use by dates for almonds required on packaging for India including in-shell sacks and the definition of bulk product.
- Recent Ochratoxin B contamination trade incidents in Europe and available INC assistance.
- Moves by India to strengthen food safety regulation on imports.
- Port inspections and the current lack of interruption to container movement.
- An update on the change of name for almonds in the Chinese market. Julie Adams advised that the name change in China to now call almonds Ba Dan Mu had been a difficult exercise with a lot of negative publicity that the ABC had attempted to counter by investing heavily in promotions to make consumers aware of the new almond name. It was reported that there had been major disruption to supply channels. It was advised that the new industry standard in China had been delayed in being provided to the Chinese trade and US Authorities.
- Variances in the MRL's for glyphosate herbicide between Codex and international markets.
- The proposal of the the IAC to undertake collaborative research projects with the Californian industry in areas of physiology, automation, higher density plantings and internships.
- The ABA position regarding a five year delay in allowing the commercialisation overseas of new varieties from the Adelaide University breeding program was advised and the reasoning behind the decision understood.
- The development of joint monthly shipment statistics and improved orchard planting statistics. The ABC advised that they were about to embark on an exercise with the nurseries to collect their sales figures for almond trees over the past few years to gain a better picture of new plantings. The ABC agreed to use this data to project future supply growth to assess this against projected demand.
- The Californian drought. The ABC explained the dire situation facing the State and is very interested in the Australian experience in managing orchards with reduced allocations and our deficit irrigation research.
- Richard Waycott committed to attending the 2014 Australian Almond Conference. The ABC advised that they were not concerned at the Californian almond researchers attending and presenting at the ABA Conference. It was noted that some within their industry would not support this occurring.

The overall assessment is that the relationship between the ABA and ABC has developed into a strong one with the ABC now prepared to be generous with their time in meeting with the ABA to discuss issues of mutual interest. Our commitment to attending their Conference, the INC Congress and agreeing to their request to meet in Delhi has all helped as has our open door policy on visits and the sharing of research outcomes.

GULFOODS

Gulfoods trade exhibition was held in Dubai from February 23rd to 27th, 2014.

All four Australian almond marketers as well as the ABA Chair of the Market Development Committee, CEO and Market Development Manager attended the Gulfoods exhibition which is our key annual show. In 2013, the region of India, Middle East and Africa was the most important to the Australian almond industry with total sales of $156 million. Gulfoods 2014 had more than 77,000 visitors and over 4,200 exhibitors with another 3,000 companies on the waiting list.

The members of the Australian almond industry delegation were: Brenton Woolston of Almondco Australia Limited; Toby Smith of Olam Orchards Australia; Laurence Van Driel of Select Harvests Limited; Nigel Carey and Ben Harrison of Nut Producers Australia; Brendan Sidhu, Ross Skinner and Joseph Ebbage of the Almond Board of Australia.

The timetable for the Gulfoods exhibition was:

- February 21st: Review of the UAE food market for almond products and the nut category with a focus on retail packaging and pricing.
- February 22nd: Set-up the Exhibition booth at Gulfoods 2014.
- February 23rd-27th: Attend Gulfoods and man the Australian almond booth.
- February 24th: Australian Almond Breakfast Seminar.
- February 24th: Meeting of Brendan Sidhu, Ross Skinner and Joseph Ebbage with the Hon. Peter Walsh, MP, Minister for Agriculture and Water and senior staff of the Department of Environment and Primary Industries (DEPI).
- February 24th: Australian industry delegation attended the “Put Victoria on the Plate” gala function for Victorian businesses and the UAE business community.

The ABA conducted the Australian Almond Seminar held on day two of Gulfoods. This event was very well attended by over 60 of the industry’s trade contacts, particularly from India and the Middle East countries. A number of representatives of the Californian almond industry also attended further helping to develop the relationship between our two industries.

The Gulfoods Forum was held as a breakfast function to allow those invited guests involved in their own trade stands to attend.

Ross Skinner provided an overview on the Australian industry and the review of the 2013/14 growing season was presented by Brendan Sidhu. The presentation featured a video of Brendan in the Jubilee Almond's orchard showing the crop on the trees and quality of the nuts taken straight from the tree. This aspect of the presentation was very well received. The question time was dominated by questions regarding the Australian industry's experience coping with drought which Brendan addressed.

This was the third time the ABA has conducted a seminar during Gulfoods and it continues to grow each year and is recognised as an important element in building the relationship with the Indian and Arab markets. There was a notable presence of traders from Mumbai at the function.

Brendan shared his experience in growing the 2014 crop and addressed concerns over the rain event that occurred just prior to Gulfoods noting the Australian industry were now much better prepared to cope with wet harvests.

The consensus of the Marketers was the presentation and function was well done and they have agreed to again hold as a similar breakfast format in 2015.

MEETING WITH THE HON. PETER WALSH, VICTORIAN MINISTER FOR AGRICULTURE

The Victorian trade mission to the UAE brings a heavy Victorian political presence to Gulfoods. The ABA has been pushing the significance of the Australian almond industry and this has gained traction with the State and Commonwealth governments. In the lead up to Gulfoods, the Hon. Peter Walsh, MP, Minister for Agriculture and Water, requested Brendan and Ross attend a luncheon meeting with himself and senior staff of the Department of

Environment and Primary Industries (DEPI) including Adam Fennessy the Secretary of DEPI who leads the Department in boosting productivity in Victoria's food sector and protecting Victoria's environment and James Flintoff the Deputy Secretary. An invitation for Joseph Ebbage to participate was also arranged.

A broad range of information was exchanged and issues addressed including the ABA's concern with the management of the recent spill events. Research funding and staffing, DEPI's mid area property, pollination risks, salinity impact zones were all discussed and there was great interest in the large increases in production and export sales during the year since the Minister opened our Gulfoods' function last year. The presence at the meeting of the Department's senior staff was also very valuable.

There is little doubt the Victorian government is supportive of the almond industry expanding and invited the ABA to a future meeting to look at the impediments to further growth of almonds in the state. In a time when other industries are not having any success in getting co-funding of research, the positive attitude of the Minister and DEPI towards almonds is valuable.

In a letter dated April 14, the Minister thanked the ABA and advised he had "asked DEPI to lead a strategic session with the ABA to look at a range of topics including pest and disease control, research and development and the opportunity to grow almonds in high impact salinity zones".

TRIP FUNDING

Trip funding was provided by Horticulture Australia Ltd from the Almond account levies and matching Commonwealth Government funds.

Almond Delegation Report from INC Melbourne, May 2014

Prepared by Neale Bennett, Brendan Sidhu and Ross Skinner

The Australian almond industry delegates to attend the International Nut Congress were:

Ross Skinner	Almond Board of Australia
Neale Bennett	Almond Board of Australia
Brendan Sidhu	Almond Board of Australia

SUMMARY

The International Nut Congress provided an opportunity for the Australian almond industry delegates to:

- Provide presentations at the Conference by Damian Houlahan and Brenton Woolston.
- Listen to well respected individuals in the almond and nut industries present on factors impacting on supply and demand as well as researchers discuss their nutrition research.
- Attend a meeting with the Chair and Senior Executives of the Almond Board of California to discuss market access, trade issues and product quality matters as well as exchange research information mostly in relation to drought management strategies.
- Participate in the global consultation meeting of nut industry bodies that overviewed their market development and research programs.
- Liaise with participants from the global almond and other nut industries on various issues.
- Build further a network of contacts in the almond industry/trade.
- Further build recognition of the Australian almond brand.
- Access statistical information on almond and other nut production and sales.

GLOBAL SUPPLY AND DEMAND:

- The impact of the Californian drought specifically on the 2014 almond crop, their orchards and future water supply issues.
- Approximately 200,000 acres of almonds in severe drought conditions.
- 34% of Californian acreage will be affected by the drought. This 34% provides 42% of the Californian crop.
- Approximately 200,000 acres of almonds are in severe drought conditions.
- The water prices have increased. In January, the top price was $1,230 per acre foot but in February it was $2,300 per acre foot.
- US crop needs four acre feet to grow a crop. Allowing for this in current water supply there is a 155% shortfall in water to achieve this
- US growers are continuing to plant where and when they can. Currently there is an annual increase of plantings of 2-3%
- Suitable land and secure available water are the major constraints.
- If no or little rain in the next US winter (2014/15) then there will be significant orchard acreage lost.
- Almond consumption in Europe has been resilient and growing.
- In 13/14 US sales are up by 13%.

- Shipping in the USA could be slowed by potential industrial action from the Longshoreman in June when wages are reviewed.
- The 2014 US crop is estimated to be 1.95 billion pounds.
- Carryover of the US crop into the new season will be down to 280 million pounds
- Current price is US$3.90 per pound.
- There is a strong confidence in the almond industry in California for the continuing growth in consumption of almonds. They believe that almonds can be substituted for soy as almonds have the same flavour carrying characteristic of the soy bean.

FOOD SAFETY

- There is a growing emphasis on food safety with microbial contamination and pesticide contamination being the main focus.
- The Food and Drug Administration are doing a tree nut risk assessment as there is a belief that there will be a global requirement to have a standard.
- The US has 170 MRL's registered compared to Codex has only 59 MRL's.
- The MRL review for Phosphine is coming up in 2019.
- New labelling rules come into force in December 2014 for food sold in the EU.

INC INTER BOARD MEETING

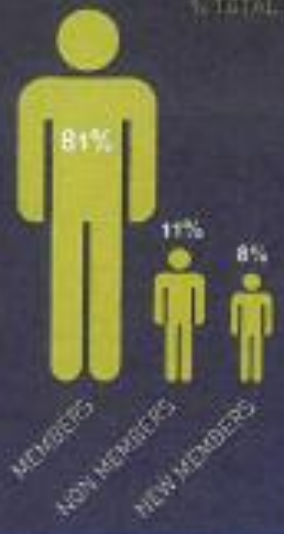
- Boards from around the world were invited to give a brief overview of what they do.
- Funding of 200,000 Euro is available for projects.
- INC has respect for the activities of the nut Boards and are offering co-operation with and coordination of projects if required.
- Asking for expanded presentations at the next INC in Turkey 2015.

Overview

XXXIII World Nut and Dried Fruit Congress Melbourne 2014

PARTICIPANTS

% TOTAL



CONGRESS PROGRAM

- 70 Short Industry Speakers
- 9 Round Tables & Seminars
- 4 Satellite Parallel Meetings
- 2 Keynote Speakers
- 1 Opening Seminar & Nutrition Update

THE NUMBERS

- 861 ATTENDEES
- 46 COUNTRIES

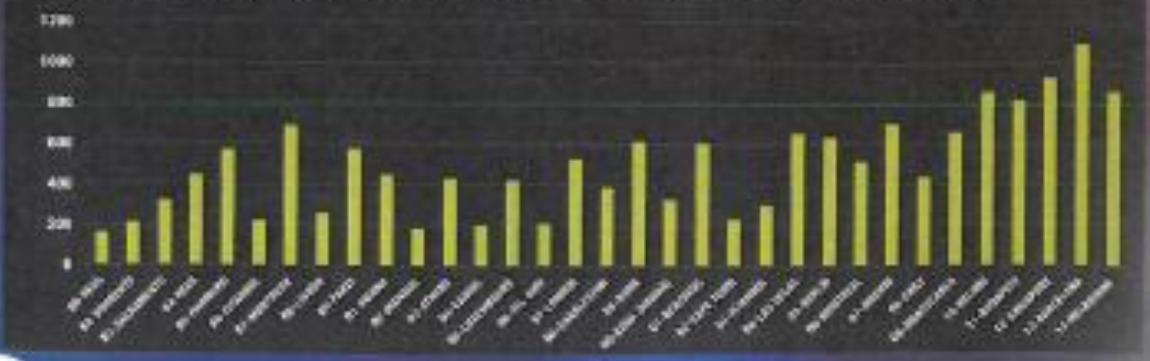
TOP 10 VISITOR COUNTRIES

COUNTRY	TOTAL	%
USA	290	34
Australia	152	18
China	77	9
Turkey	51	6
UK	35	4
Spain	29	3
Japan	27	3
India	23	3
Germany	18	2
Netherlands	14	2

Other countries: 15%

VISITORS BY REGIONS

TOTAL CONGRESSES PARTICIPATION 1980-2014



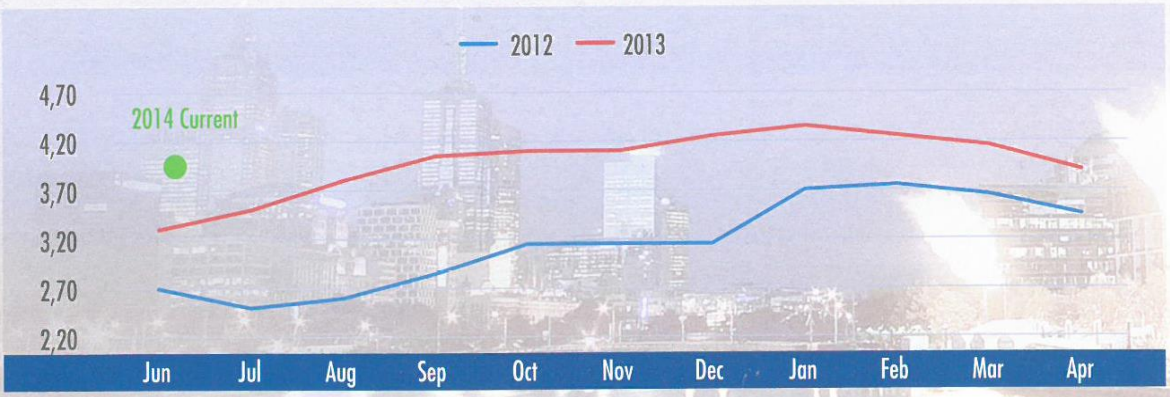
Chair:
Craig Duerr, Campos Brothers, USA.

Panel:
Mark Jansen, Blue Diamond Growers, USA.
Brenton Woolston, Almondco, Australia.

Almonds

Estimated World Almond Production. Kernel Basis. Metric Tons								
COUNTRY	2013 /2014				2014/2015			
	BEGINNING STOCK	CROP	TOTAL SUPPLY	ENDING STOCK	BEGINNING STOCK	CROP	TOTAL SUPPLY	ENDING STOCK
USA	144.181	892.468	1.036.649	159.090	159.090	868.636	1.027.726	125.000
AUSTRALIA	1.000	73.800	74.800	1.000	1.000	70.000	71.000	1.000
SPAIN	2.000	32.000	34.000	1.200	1.200	48.000	49.200	2.000
IRAN	0	15.000	15.000	0	0	35.000	35.000	0
TURKEY	0	15.000	15.000	0	0	16.000	16.000	0
TUNISIA	1.600	13.000	14.600	500	500	14.000	14.500	500
GREECE	1.000	13.000	14.000	0	0	14.000	14.000	0
CHILE	0	10.000	10.000	0	0	10.000	10.000	0
MOROCCO	500	6.000	6.500	0	0	9.000	9.000	0
ITALY	500	5.000	5.500	0	0	9.000	9.000	0
OTHERS	0	30.000	30.000	0	0	30.000	30.000	0
WORLD TOTAL	150.781	1.105.268	1.256.049	161.790	161.790	1.123.636	1.285.426	128.500
WORLD CONSUMPTION (T. Supply - End. Stock)				1.094.259				1.156.926

2013 Crop Market Prices Reflecting Limited Supply



REPORT ON 2013/14 NETWORKING ACTIVITIES

The key objective of this project is to build a network of contacts and develop relationships with organizations and individuals that provide a value add to the Australian almond industry by providing advice on international issues, access to research results, data, knowledge and processes in areas of production, processing, market access and development, nutrition, technology transfer, IP commercialisation and organizational management.

1. Attendance at the US Almond Conference in Sacramento, California, USA – December 2014.

The ABA Chair Neale Bennett attended the 3 day Conference. Ben Brown, ABA Industry Development Manager, had planned to attend as part of this project but he left the employ of the ABA in November 2014. Ben attended the Conference as a Select Harvests employee.

The 2014 Almond Board of California was held in Sacramento at the Sacramento Convention Centre on December 9 - 12. Registrations were up this year from 2300 in 2013 to 2900 this year. Due to the drought, the general mood of growers was sombre but still positive despite the concerns of where they had come from to what they were going to expect this coming season in 2015.

Unlike in the Australian drought, where growers had to buy water with lower priced almonds and go into heavy debt to survive, the Californians are seeing record prices with which to purchase water or develop water infrastructure. Whereas in our drought, the planting of new acreage was put on hold, development of new orchards is still going ahead. The only restrictions seem to be the price of land and the availability of reliable water. This is happening despite State surface water deliveries dropping this year. Depending on where growers are situated in the San Joaquin Valley the reduction in surface water supply ranged from 0 - 40%. Crop tonnages were down due to the water issues which caused smaller sizing, as well as other issues such as salinity and leaf burn.

Normally the industry average yield is 2300lbs/acre (2.3 tonne/hectare) produced with 35 inches of irrigation, however the better parts of the valley can get up to 4000lbs/acre (3.7tonnes/ha) but apply up to 56 inches of irrigation to get this result. Where surface water was only available, then growers were only able to apply between 14 - 22.5 inches of irrigation. If available, then groundwater was used to help supplement the shortfall.

Speaking to one grower who relies on surface water, he is in the process of changing from flood irrigation to sprinklers over this winter. When questioned if he had or could access groundwater, he replied that he didn't have access and by the time he got approval to drill a well, it would be sometime in 2016 that he could commence work on it.

Over the history of the Californian Almond industry, the theme has been "When in drought ….PUMP more water". With more pressure on aquifers, there has not been the chance for them to adequately recharge on a yearly basis. Due to this, pumping at these continued levels has been identified as unsustainable.

Below is a table which shows how each section of the Valley is at following a Drought survey of 2013 conducted by NASS.

Location	Bearing Acreage	Average Rainfall	Aquifer Level Decline / Year	Salinity	Average Area Production	Average Production
North	87,000	15 - 23”		None	216.5million pounds	1892 - 3072lbs/acre
Eastside	36,000	17 - 25”	3’	Slight	64.7 million pounds	1600 - 1800lbs/acre
San Joaquin V	232,551	12 -13”	5 – 4’	Increasing	595 million pounds	2100 - 2800 lbs/acre
Madera/Fresno	182,739	12 – 13”	5 – 45’	Increasing	615 million pounds	2880 - 3700 lbs/acre
South San Joaquin	175,105	5 - 8”	10 – 60’	Increasing	5.5 million pounds	2900 -3900 lbs/acre

On January 8, 2012 reservoirs were at normal levels. By December 1, 2013, reservoirs were at 45%. Water designated for environmental flows 70,000 acre feet. At November 30, 2014 reservoirs are at 28% Water designated for environmental flows 1.4 million acre feet. Water for Agriculture and Urban use 410,000 acre feet.

Consequently more ground water had to be used to subsidize water needs for almonds in 2014. To use the Oakdale area as an example, in 2013 surface water allocation was 95% however in 2014, surface water allocation was down to 25%. The extra use of ground water has caused the Californian almond industry to have an estimated increase in irrigation pumping costs of $454 million and an estimated lost crop revenue of $810 million. This crop loss is worked on the premise of for every inch of irrigation not applied then 15lb of crop is lost. Livestock and Dairy have an estimated loss of $203 million in 2014.

Common belief is that it will take between 12 - 20 storms dumping an average of between 4-6 inches each time or around 30feet of snow pack to recharge the Reservoirs back to normal. Ground water levels and groundwater quality are declining. Use of groundwater for Agriculture is now competing with Urbans for potable water. At the time of the Conference several days of rain were received with between 3 -5 inches of rain falling across the valley and good snow fall in the hills but it was warned that any recovery could be short lived. Part of the future success of almond growers in California will be dependent on the willingness to adapt new irrigation technologies into their practices such as those commonly used already in Australia, e.g. soil moisture monitoring, converting from flood irrigation to a pressurized system.

Water Policy is coming under heavy scrutiny. Counties are being given a chance to come up with their own self-regulating policies, however if these cannot be agreed on, then the State will step in and regulate the County policy. There is a push for 4 projects to expand Reservoir capacity. This will require Government funding so it will depend on the business cases put up for these projects to succeed. Also there is a push for more surface storage as well as a more dedicated groundwater recharge system. Evidence is strong to support the need for expanded water storage.

In 1977 there were 22 million people in California and gross farm revenue was $9.6 billion. In 2014 there are 38 million people and agriculture has a gross farm revenue is of $45 billion.

There is a strong feeling of discontent and anger towards government regarding the water problems. The sentiment is "Congress is creating drought" due to the Environmental Policies that are being invoked. The prospect for meaningful water relief via legislation has been materially diminished. The feeling is that Congress does not want to change environmental policies and legislation.

The trigger for changes would be to get the ESA (Endangered Species Act) softened but this seems unlikely as key politicians are coming under increasing pressure from environmentalists to keep the status quo.

The Almond industry has become a target by water environmentalists and the industry is being seen as high water users. The figure being quoted is that it takes 1 gallon of water to produce 1 single almond. The Almond Board will need a strong publicity campaign to promote almonds as environmentally friendly and get community support to show it is trying to save water.

The 2013/14 season was an all-time high for both almond shipments and prices. Almonds are now the number one commodity produced in California, taking up 11% of the agricultural land and are a $4.163 billion dollar export industry. This equates to 11 million trees planted on 1 million acres. Since 1994, average yields per acre have doubled from 1190lb to 2380lb using 33% less water to produce 1 pound of almonds.

The Almond Board has been able to secure Pre Export certification for almonds entering into the EEU, meaning less inspection at the other end and less charges which will be a financial gain for growers. Every 3 years the ABC goes to its growers with a referendum for the continuance of the marketing order. 2014 was the latest year for this procedure and produced a grower's vote of 91% supporting the marketing program. With the increase of new plantings, Californian almond production is projected to be 2.5 billion pounds by 2019.

In 2014, the Almond Board of California commissioned an Economic impact study of the Californian Almond Industry. It found that the output of the industry contributed $21.5 billion dollars to the Californian economy. It created 104,000 jobs to the Californian job market. The breakdown of jobs was 68,000 through Farming and a further 36,000 jobs through the Processing and Marketing sector. In the Central Valley alone, 97,000 jobs were created by both direct and indirect economic activity. This study will help the ABC lobby all forms of Government both in the future and immediately to help defend its position as a responsible water user in California.

As part of a revamped marketing strategy the ABC will also be using this study as a message to the community that the almond industry is a sustainable industry. They have identified that consumers are now seeking products that are environmentally safe and responsibly sustainable which leave a minimal carbon footprint.

As well as water being a major topic, pollination and problems with successful pollination was also a popular topic in California. Already facing Varroa mite problems, another major threat to successful pollination is Colony Collapse Disorder.

This coming season, California will need 1.72 million hives to pollinate the bloom. While it varies from beekeeper to beekeeper the average loss a beekeeper suffers is 50% of their hives. This has risen in the past 12 months from an estimated 30% loss of hives. Contributors to hive losses can be malnutrition (losing habitat to feed), Parasitism (such as Varroa mite), Infectious diseases (such as Kashmir Disease) and Nosema ceranae (a fungal disease).

Pesticides are also causing problems as they are increasing in toxicity to combat mite resistance. Once it was the overwintering period where most hive losses occurred but now the summer season is also starting to show significant hive loss numbers.

Something that has been noticed is that hive strength has played a part in whether a bee colony survives or dies. Research is starting to show that hives fed mainly on supplementary food (pollen cakes or sugar syrup) are more susceptible to hive death than hives that have been able to naturally forage for food. Trials that are ongoing are showing good results if a flowering cover crop is grown in close proximity (either at the end of rows or as a cover crop up the middle of the row) to the blooming trees. Once it was thought that flowering competition took bees away from their job of the pollination process. However findings are showing that if a bee is kept in the foraging for food mode, they will pollinate more efficiently than if there is no natural food source available.

Bees will turn from foragers to nectar gatherers to find a natural food source. If a bee looks for nectar in the almond flower they will not pollinate the flower. Different flowering sources have been trialled ranging from wild flowers to clovers to a mix of brassicas such as canola, mustards and daikon radish. Sown after harvest, these will flower around bloom time and help provide a food source for bees while they are in the orchard.

These flowering cover crops provide complete proteins, clean carbohydrates and important micronutrients that are not found in supplementary feeding.

Other benefits from these cover crops provide are soil structure improvement, help alleviate soil compaction, increase water infiltration and add organic matter as well help beneficial insects for IPM control.

As mentioned earlier, Varroa mite is still a major concern, however this has been somewhat controlled by beekeepers using pest strips in hives. There is now a concern that Varroa mite may be developing some resistance to some of the pest strip chemicals used in the hives. Trials are now being done on a rotation of chemicals throughout the year that would give a thorough control but not increase the Varroa Mite to develop a resistance.

A best practice manual for growers having bees in the orchard has been released. It is being heavily promoted to growers that it is a set of standards that should be adopted while bees are working in their orchards. Not only is it aimed at protecting the bees but maintaining and improving a better relationship between grower and beekeeper.

Small things such as providing water for bees to drink from in close proximity to the hives so as they don't have to go looking for a water source, to spraying as little as possible during bloom. If spraying is to be done, then it should be done either late in the afternoon or at night.

Fungicide sprays change the natural orchard scent to a chemical scent that is unfriendly to bees. It has been proved that by spraying during the day, bees will stop working but their sensory memory tells them not to go back the next day. By spraying late afternoon or night when bees are finishing flying for the day, the spray residue can dry and the orchard scent will not be changed. Even diesel fumes can change an orchards scent, so care needs to be taken with the times when spraying is done.

The continuing drought in California has seen growers having to deal with salinity and plant stress problems. Researchers are now concentrating on a variety of trials dealing with a range of stresses (salt, moisture and heat). Trials are being done on rootstocks to see if there are particular varieties that are more salt tolerant than others.

So far, results have shown that rootstocks Hansen 386 is more tolerant to salt than Nemaguard however Viking is superior to both. Moisture stress is a known crop reducer but can this be directly correlated to a figure? For example, will a 25% deficit in water reduce a crop by 25% or is it greater or less. A predictive model is trying to be developed so as growers can deal with the exact water deficit and adjust inputs accordingly.

Heat stress is also being looked at. Not heat stress caused by air temperature rather heat stress in leaf temperature caused by lack of adequate water in the leaves. Again this is being looked in different scion varieties as well as if there is a direct correlation to crop loss.

BASF was again the Conference Platinum sponsor. A presentation by BASF introduced their new chemical "Merivon" which will be registered for use in almonds to Californian growers in 2015. This chemical has been built on the "Pristine" of systemic fungicide but with a new mode of action. While Pristine is registered in almonds in California, in Australia it is only registered for use in apples and pears. Currently there are no plans to register Pristine or Merivon in Australia. However, after several approaches from industry stakeholders in speaking with Larry Wanken, one of BASF's managers, he has promised to look into getting BASF to look at the Australian market and see what could be done to get these chemicals registered or at least on permit.

It would be beneficial for Australian growers to gain access to Merivon. As well as having protective capabilities against brown rot, alternaria, rust, and shot hole it also has some protective control against hull rot. While these are the chemical company claims, it would be a bonus to have something that would help control hull rot.

The relationship between the Almond Board of California and Almond Board of Australia continues to strengthen. They are very appreciative of the many Australian growers and processors who are now starting to attend the annual Conferences in Sacramento. Relationships are now starting to be formed between growers and processors from both countries. This needs to be maintained and encouraged.

The funding provided by HIA Project AL12007 has been important in funding the ABA's attendance at meetings where this relationship has developed.

Not only is Australia learning from them but they are now starting to take notice of our research and advances in irrigation management. The market demand for almonds continues to grow and it is vital to continue to work together on the topics of food safety and market security. While Australia can in no way match the Californian funds used for R&D or market develpment, it would be a positive for our industry to collaborate on joint projects.

Recommended speakers to follow up to present at the ABA's future conferences are:

- Gordon Wardell - Head of pollination at Paramount Farms
- Brad Hanson – UC Davis specialising in weed management and resistance
- Ted DeJong – Tree physiology
- Blake Sanden – Irrigation management
- Matt Strmiska – Effective spray coverage

2. Liaison with Indian and Middle East trade, Almond Board of California and High Commission staff regarding market access issues - February 2015.

Joseph Ebbage and ABA Director Brenton Woolston met with the Almond Board of California representatives Richard Waycott, ABC President and Julie Adam, Vice President, Global Technical & Regulatory Affairs and discussed a range of issues but with food safety and market access the main focus.

One of the areas discussed was the Indian generic standards that had previously arisen as a global issue when the ABC / ABA had tried to develop a specific almond standard that more closely reflected existing grades to avoid subjective assessments at the ports.

The sampling and testing programs used by the Californian industry were discussed and laid the base for ongoing dialogue between Australia and the US regarding the pre-shipment testing regime appropriate for Aflatoxin which the Californian industry had previously addressed and Australia was currently confronted with.

The Australian delegation also conducted a trade forum at Dubai at which the ABA Director Brenton Woolston provided an overview of the Australian industry. This forum was attended by members of the nut trade in India and the Gulf as well as representatives of the US almond industry.

Unlike previous years it was not possible to meet with the Australian Agriculture Counsellor.

ABA Director, Brenton Woolston addresses the forum.

3. Attendance at International Nut Congress in Turkey - May 2015.

The ABA Deputy Chair Damien Houlahan and ABA Director Brenton Woolston attended the Congress, presented on the Australian industry and participated on the panel.

The key sessions for the almond industry were:

The **Almonds Satellite Parallel Meeting** was moderated by Antonio Pont Jr of Crisol de Frutos Secos (Spain)

The **Almonds Round Table** session was Chaired by Mark Jansen of Blue Diamond Growers (USA)

The **Scientific Seminar** was Chaired by Pino Calcagni, the Chairman of INC's Scientific and Government Affairs Committee. The Seminar addressed the key challenges and issues facing the nut and dried fruit industry, such as food safety and food control, among other scientific-technical topics

The ability to develop a direct relationship with Pino Calcagni at the Congress was important for the Australian almond industry as it addressed key food safety issues in Europe in June 2015 that threatened the export trade to the EU worth nearly $300 million.

Guest Speakers were:

- Dr. Damiano Avanzato
  Chair Commission Plant Genetic Resources, International Society for Horticultural Science, ISHS.
  'Role of Agronomic and Genetic Factors to counteract the effects of climate change on Nuts crop production'
- Mr. John O'Neill
  Technical Manager, Commodities, Tesco Stores Ltd.
- Dr. Luciana Tavella
  Associate Professor, Department of Agriculture, Forest and Food Sciences, DISAFA, University of Torino.
  'Control Strategies for the Improvement of Hazelnut Quality and Yield'

Nutrition Research Update

Jordi Salas-Salvadó Chaired the INC World Forum for Nutrition Research and Dissemination and provided the latest scientific literature and clinical studies on the health benefits of nuts consumption.

Guest Speakers were:

- Assoc. Prof. Cesarettin ALASALVAR (FIFT)
  TUBITAK Marmara Research Center
  'New Findings on Dried Fruit Phytochemicals and Health'
- Maureen Ternus, M.S., R.D.
  Executive Director, International Tree Nut Council Nutrition Research & Education Foundation
  'Research funded by NREF'

The Congress enabled the collection of global statistical data, insights into planting and marketing trends, food safety issues and provided an opportunity to personally meet key figures in the international almond and nut industry.

It is noted that HIA's nut industry services manager Astrid Hughes also attended the INC Congress.

The attendance at the INC Congress was to be followed by a study trip by Ross Skinner and Ben Brown to evaluate the Spanish industry and the rootstock and varietal breeding programs they are undertaking. With the resignation of Ben Brown, the visit to Spain was undertaken by Ross Skinner and ABA Chair Neale Bennett in June 2015 to coincide with the Frucom Workshop to discuss food safety issues in the EU for dried fruits and nuts and a Forum on the market access issue, the default MRL for Fosetyl-Al, that threatened to disrupt Australia's $300 million trade in Europe.

4. Spanish Study Tour – June 2015

In June, after the Frucom Conference, Ross Skinner (CEO) and Neale Bennett (ABA Chair) travelled to Spain to investigate the latest developments from the Spanish almond breeding program.

In Zaragoza, a meeting was held with Maria Jose Rubio Cabetas from CITA who has taken over the breeding program for rootstocks and some cultivars in the CITA program.

Maria's breeding program has the following aims as the basis for her work:

- Low vigour for high density plantings
- Low chilling requirement
- Drought tolerance
- Resistance to Armillaria
- Good propagation from cuttings

Since the ABA's last visit to Spain, there has been a shift of support from GF677 to Garnem rootstock.

Garnem is a Nemared (Prunus) x Garfi (Peach) cross. It is a more vigorous rootstock than GF677 and is ideal in a replant situation. It is also an easy rootstock to propagate from cuttings. Maria noted that an application of "Cultar" (plant growth regulator) will keep Garnem in control if placed in good ground, rather than a more marginal ground. A negative to Garnem is that it does not like "wet feet" so a well-drained soil is preferred. Agrimillora has used Garnem as a basis of its Rootpac dwarfing rootstock series to provide the vigour. While Garnem is showing a resistance to nematodes in Morocco, constant exposure to temperatures over 40degrees can weaken the tree to allow some nematode damage. This result has also been noticed in Nemared and Nemaguard rootstocks.

Other rootstocks starting to grow in popularity are Monegro and Adesoto. While not as vigorous as Garnem, Monegro has shown a tolerance to drought conditions. Adesoto has shown a tolerance to water logging. These need to be tested more thoroughly as Adesoto is a shallow rooted and may have some graft incompatibilities as it has Plum parentage. Maria suggested importing Montiso rootstock, which has similar characteristics to Adesoto in waterlogging.

While the majority of Maria's work is around the breeding of the rootstocks, she has also studied other characteristics of the almond tree cultivars. A belief that Maria has been able to disprove is that the papershell varieties were more productive than the hard-shell varieties. Her research has shown productivity is all linked back to the inputs that the tree has received.

The CITA laboratory evaluates all varieties from its trials. Samples were provided to see the different shapes and characteristics that each variety has from the vast collection it has. A noticeable find was a hard-shell Nonpareil variety TNonpareil or Tardino Nonpareil. Similar shape to the CPS Nonpareil but perhaps a slightly darker kernel colour.

In Reus, Ross and Neale met with Dr Ignassi Battle Caravaca from IRTA and discussed their breeding program.

Traditionally, the Spanish varieties have produced a darker kernel than our markets prefer. One of the KPI's of IRTA's program is to produce a kernel that is lighter in colour. They have been trialling traditional plantings, high density and super high density (1600trees/ha). The almond industry seems to be going through resurgence as returns for peaches, apples and olives have dropped. In the last 12 months, there have been 9 million almond trees sold. Again the message was that Garnem is the preferred rootstock now selling in Spain.

IRTA is keen to develop a partnership with the ABA and work with Australian researchers such as Dave Monks and Grant Thorpe on various projects. They are also showing interest in our breeding program and have been monitoring Michelle Wirthensohn's work. They also expressed a positive attitude towards Spanish researchers undertaking sabbaticals in Australia.

At Lleida, a meeting was held with Xavier Reus from Agrimillora. A commercial grower's property was visited as well as Agrimillora's own trial property to view the Super High Density (SHD) plantings they are experimenting with. The first commercial SHD trial is now 5 years old.

On a rootstock of Rootpac 40 the plantings are 4m x 1m with a single leader of the Spanish variety Soleta. The aim is to produce 2000kg/ha using 200-250 units of N and 200 units of K. The trees are grown in a hedge row with branches no longer than 40cm and a canopy wall thickness of 70cm. The height is kept to 2.7m to allow for harvesting by a modified grape harvester. Trees are harvested earlier and the product dried by dehydrator. With a maximum of windfalls of 1%, this process seems to work.

The aim is for growers to spend no more than 20 hours per hectare growing the crop. This includes spraying, weedicide, pruning and harvesting. Irrigation is not included in this time. Irrigation is 4-5 Megs/ha with approximately 5" of rainfall to top up soil moisture.

Agrimillora's own trial site has been modified in its plantings with a density of 1m x 3m 2700 trees/ha on the rootstock Rootpac 20. In this trial were the traditional and newer Spanish varieties as well as the Californian varieties. The tree are 3 years old and while they have some crop on them, bee hives were not brought in to help pollination. The Spanish varieties seemed to be performing slightly better with both crop and growth however it would be interesting to see what would happen if bees were placed in the orchard to help with pollination of all varieties.

Xavier also arranged a tour of the Agrimillora nursery. With demand for trees such as olives, almonds and fruit trees, Agrimillora has expanded its operations again to cater for demand throughout Spain and Morocco.

The Agrimillora Australia development was also discussed. In the next 12 months Agrimillora will develop the old Boulevard Nursery site in Mildura by adding an 8000m^2 extension. This will include hot houses, growing rooms, autoclaves and laboratory facilities to upgrade tissue culturing capacity for Australian horticulture. It is hoped the development will be finished in 2016.

5. Additional International Networking Activities

a) The ABA facilitated a visit to the Australian almond industry in the Riverland and Sunraysia of Dr Linda Harris of University of California – Davis.

Dr. Harris's research focuses on microbial food safety emphasising the microbiology tree nuts. She works to develop and validate standard microbiological methods and uses these methods to evaluate the behaviour of food borne pathogens on tree nuts under different storage and processing conditions. She uses these methods to evaluate antimicrobial treatments including various sanitizers and thermal processes for their efficacy in reducing microbial populations on various cut and intact produce and tree nut surfaces.

Linda met with the ABA, Nut Producers Australia, Select Harvests, Olam and Almondco as well as holding discussions and touring almond orchards and processing facilities with Australian researchers Chin Gouk (Victoria) and Jessica Tan (SA).

b) John Slaughter, Plant Breeder with Burchell Nursery California, Australian Visit

John Slaughter attended a number of forums in Australia organised by the ABA to discuss almond varietal improvement in California. John is a valuable contact for monitoring plant material development in the US.