# Hort Innovation

# **Final Report**

# Dried Grape 2017 Industry Research & Development Exchange Program

Anne Mansell Dried Fruits Australia

Project Number: DG17000

#### DG17000

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## **Summary**

The Dried Grape 2017 Industry Research and Development Exchange Program took the form of a study tour to California, USA. Dried Fruits Australia (DFA) used its existing relationships with Californian industry participants to develop a program that included farm, processor and retail visits as well as including some of the latest production research and biosecurity issues.

The study tour group departed from Mildura on the 18<sup>th</sup> of September. The tour began in San Francisco and, after a short detour to Sacramento, proceeded south through California's San Joaquin Valley right at the peak of the raisin (dried vine fruit) harvest, finishing at Los Angeles on the 24<sup>th</sup> of September. The tour group then returned to Mildura arriving on the 26<sup>th</sup> of September.

Key meetings were held with the following groups:

- Pierce's Disease Control Program Californian Department of Food and Agriculture (CDFA)
- University of California, Kearney Agricultural Research and Extension Center.
- Raisin Administrative Committee
- Sun-Maid Growers of California
- Raisin Bargaining Association
- Fresno Irrigation District
- Sun world grape breeding program
- Vision Robotics Corporation

As a result for these meetings the tour program identified three areas for potential research / development:

- 1. assessment of new varieties for dried grape production in Australian systems and environmental conditions,
- 2. Investigation of methods to minimize impact of heat stress on berry maturity
- 3. Investigation of mechanical and robotic solutions suitable for Australian dried grape production systems

Evaluation of the tour program also identified that continued work maintaining relationships with the Dried Grape industry and research community in California by DFA and Hort Innovation will provide significant benefits to the Australian industry including:

- Understanding trends in global dried fruit production
- Building synergies between the contracting scientific research communities in both industries
- Building trust between the industry organisations responsible for industry development and international market development

# **Keywords**

Dried Grape California Sunpreme Pierce's Disease Robotics

## Introduction

To enable productivity increases for the Australian dried grape industry, it is important to gain first hand research knowledge and insights from the world's leading producer of dried grapes (referred to in the USA as raisins). California has over 185,000 acres of vines that are dedicated to growing raisins, producing over 300,000 tonnes per year on average. They are a dominant world producer and are highly regarded and respected for their research into new varieties; pest and disease risks; and on farm production techniques.

Australian dried grape producers have established an ongoing and long lasting professional relationship with their counterparts in California through the Raisin Administrative Committee and the California Raisin Marketing Board. This strong network has been integral in providing technology transfer and information exchange for important issues such as yield; vine health; risk management; and market opportunities.

Due to the similarities in production systems, climate and topography, the Californian industry has been identified as offering valuable information to Australian growers for on-farm integrated management practices, trellis systems, irrigation systems and other key R&D areas.

Objectives for the USA Study Tour 2017 included:

- Exposure to the most up-to-date research and development in dried grape production focusing on varieties; yield; and disease, to assist in growth and quality of Australian production;
- experiencing on farm innovative systems and techniques to improve productive capacity;
- gaining knowledge of production and processing systems, including brands, to meet global and domestic demand

# Methodology

The Dried Grape 2017 Industry Research and Development Exchange Program took the form of a study tour to California, USA. Dried Fruits Australia (DFA) used its existing relationships with Californian industry participants to develop a program that included farm, processor and retail visits as well as including some of the latest production research and biosecurity issues

A group of participants was selected from the Australian industry following an advertising process. Participants were selected by DFA in conjunction with Hort Innovation according to agreed criteria:

- 1. Level of participation in the industry as either levy payer, industry stakeholder or value chain member
- 2. Meeting 50 % co-investment criteria
- 3. Ability to communicate results to the broader Australian industry

The final group of selected participants is listed in the table below.

Name	Industry Role
Aworth, Anita	Grower
Dichera, Larry	Grower Liaison
Dolic, David	Grower
King, Mark	Grower / DFA Board
Liakos, Peter	Grower
Martin, Tony	Grower / DFA Board
Putland, Stuart	Grower Liaison
Pye, Marcus	Grower
Sharp, Shannon	Grower
Simpson, Garry	Grower Liason
Michael Treeby	Researcher / Grower/ SIAP Member
Surgey, Adam	Grower / Grower Liaison
Swain, David	Grower Liaison / DFA Board

One further participant had to withdraw from the program one week before departure due to overwhelming business commitments.

Participants attended a briefing session the week prior to departure to confirm arrangements and familiarize themselves with the detail of the visit program.

The study tour group departed from Mildura on the 18<sup>th</sup> of September. The tour began in San Francisco and, after a short detour to Sacramento, proceeded South through California's San Joaquin Valley right at the peak of the raisin (dried vine fruit) harvest, finishing at Los Angeles on the 24<sup>th</sup> of September. The tour group then returned to Mildura arriving on the 26<sup>th</sup> of September.

The bulk of the time was spent in Fresno, the heart of the Californian raisin industry located roughly in the middle of the San Joaquin Valley.

Details of the tour including organizations visited and contact details are listed in the table below.

Time	Activity	Contact People
Monday 18	<sup>3<sup>th</sup> of September</sup>	
9:30 am	Arrived San Francisco	
3:30 pm	Travel to Davis	
Tuesday 1	9 <sup>th</sup> of September	
8:30 am	Pierce's Disease Control Program – Californian Department of Food and Agriculture (CDFA) 2800 Gateway Oaks Drive, Ste. 200. Sacramento, CA	Bob Wynn – Senior Advisor, CDFA Roger Spencer - CDFA Craig Hanes - CDFA Stacie Oswalt - CDFA Beth Stone-Smith - USDA Tom Esser – CDFA (tom.esser@cdfa.ca.gov)
	95833 • 916-900-5024	
10:30 am	Travel to Fresno	
3:00 pm	Supermarket walk. Viewed dried fruit retailing in three supermarkets in Fresno.	
Wednesda	y 20 <sup>th</sup> of September	
9:30 am	Kearney Ag Research and Extension Centre 9240 South Riverbend Avenue Parlier, CA 93648 Phone: (559) 646-6500	Dr Matt Fidelibus – extension Viticulturist, University of California, Kearney Agricultural Research and Extension Center. Dr Larry Williams - Professor Plant Physiologist, University of California, Kearney Agricultural Research and Extension Center
	Discussed and viewed new Sunpreme dried grape variety. Discussed irrigation and vine nutrition	Rodrigo Espindola, a visiting scientist from INTA (Argentina)
3:30pm	Raisin Administrative Committee 2445 Capitol Street, Suite 200 – Fresno, CA 93721-2236 Discussed Californian generic raisin marketing and statistic collection	Larry Blagg Senior Vice President of Marketing
4:00pm	Farm visit – to view dried grape	Monte Shultz, Chair of Raisin Administrative Committee
<b>T</b> L	harvesting.	
Thursday 2	21 <sup>st</sup> of September	Diale Chards, Constanting of Managers, C.O. D. 1. 11
9:00am	Sun-Maid Growers of California 13525 South Bethel Avenue Kingsburg, CA 93631-9232 Processor tour and visit growers' properties.	RICK Stark, Secretary and Manager of Grower Relations (Rstark@sunmaid.com)
3:30pm	Raisin Bargaining Association 2444 Main Street Suite 160 Fresno, Ca. 93721-2730 Discuss industry pricing influences	Kalem H Barserian, CEO, Raisin Bargaining Association (americandfc@hotmail.com)

Time	Activity	Contact People
Friday 22 <sup>n</sup>	<sup>d</sup> of September	
9:00am	Fresno Irrigation District 2907 S Maple Avenue	Bill Stretch, Assistant General Manager, Fresno Irrigation District. (BStretch@fresnoirrigation.com)
	Fresno, CA 93725	Garry Serrato, General Manager, Fresno Irrigation District.
	and policy. Viewed irrigation infrastructure	Lynn B. Rowe, Executive Assistant, Fresno Irrigation District.
3:30 pm	Travel to Bakersfield	
Saturday 2	23 <sup>rd</sup> of September	
8:30 am	Sun world grape breeding program.	
	Viewed new varieties for potential dried fruit production.	
10:00 am	Travel to Long Beach	
1:00pm	Vision robotics	Tony Koselka, Vision Robotics
	Discussed robotic pruning system and remote controlled tractor and development required for commercial application	(tkoselka@visionrobotics.com)
	Travel to Los Angeles	
Sunday 24	th of September	
	Free time in Los Angeles	QF 94 departs 10:10 pm
Tuesday 2	6 <sup>th</sup> of September	
4:55 pm	Arrive Mildura	

The tour was led by DFA Consultant Field Officer, Stuart Putland. Stuart was responsible for program development, coordinating applicant selection and delivery of the project extension, R&D and evaluation components.

Anne Mansell, DFA CEO, provided overall project management and reporting, ensuring the project was managed in line with DFA project management processes including oversight by the DFA Board finance subcommittee. Dolores Shaw-Wait, Administration Officer, provided administrative support to the project coordinating payment of growers' contribution, assisting with booking arrangements, and providing printed information.

# **Outputs**

The Dried Grape 2017 Industry Research and Development Exchange Program California Study Tour delivered the following outputs:

- 13 dried grape producers and processors participating in the study tour
- A report on the outcomes of the study tour. See Appendix 2 for the Study Tour Technical Report
- A presentation to the Australian Industry on the outcomes of the tour. See Appendix 4 for presentation on the Californian study tour delivered to Australian growers at DFA Growers Forum

- Articles in "The Vine" and "Hortlink" on the outcomes of the tour. See appendix 3 for article submitted for publication in the next editions of "Hortlink and "The Vine"
- Daily posts on the DFA Facebook page provided industry participants in Australia with a snapshot of the key issues being investigated by the tour participants. - See Appendix 1 for details of statistics for each post
- Discussion of tour outcomes at DFA branch meetings, led by tour participants. See Appendix 4 for presentation on the Californian study tour delivered to Australian growers at DFA Branch meetings in Merbein, Mildura and Red Cliffs.
- 3 applications submitted into the Hort Innovation concept funnel.
- A presentation to the Hort Innovation Dried Grape Strategic Investment Advisory Panel (SIAP). Initial discussion held at SIAP meeting 4<sup>th</sup> October immediately after the conclusion of the tour. Further discussion at following meeting associated with the submission of project concepts

## Outcomes

#### **Production systems**

The Californian industry offers some parallels to the Australian industry making it an important partner in sharing of production information. The industry is much bigger than Australia's, although annual production has dropped over the last ten years from 350,000 to 260,000 tons with a production average remaining at about 1.7 tons per acre.

The production systems are relatively similar to those in Australia, but the biggest point of difference is the natural drying process (ie not using drying oils to begin the desiccation process) and the harvest method.

- 40 % of the growers hand harvest onto brown paper trays placed on the ground beside the vines to dry before being delivered to the processor
- 30% of growers cut canes mechanically harvest partially dried fruit onto continuous paper trays on the ground to dry before collection and delivery to the processor
- 30 % of growers dry the fruit on the vine without using drying oil before harvest and delivery to the processor.

As a whole, these systems are not applicable to the Australian environment, partially because of the length of time required to dry fruit on the vine without drying oil and the cost associated with the hand harvest systems and the chance of rain during the drying process.

However, a common issue, between Californian and Australian production systems, that arose during discussions with Sun Maid management was the increasing frequency of extreme weather events; principally, prolonged high temperatures and the impact is has on halting grape maturity. This was identified as a significant issue for both the Californian and Australian industries from both a risk management and production point of view. Delays in maturity have one of two negative impacts on the production system depending on the management decisions taken. Waiting for the fruit to reach a target production maturity will reduce the time available at the end of the season to successfully dry the grapes. Starting the harvest process at a lower maturity level will reduce the tonnage of fruit harvested at the end of the process.

Land values in the raisin growing region of California have risen dramatically over the last ten years due to pressure from other irrigated crop growth such as almonds and pistachios. This is a very similar situation to that in the Australian dried fruit production region except that the pressure on land value is created by the table grape industry. This may be one of the contributing factors to a decline in the Californian industry.

The cost of irrigation water in California is relatively cheap by comparison to Australian standards. Surface water is available at about \$US15 per megalitre and ground water is un-licensed or metered, so the costs are only those associated with pumping, sinking and maintenance of wells. There was little evidence of pressurized drip irrigation systems with most of the dried fruit being flood irrigated. Discussions with researchers indicated that there was also little uptake of irrigation scheduling by irrigators because of the low cost of water and the free draining and deep nature of the soils in the region. Also, where surface water is available irrigators are encouraged to over irrigate to help recharge the groundwater aquifer. As a consequence of these issues there was little new information available in the irrigation field.

Water availability is becoming a significant long-term issue for all irrigation industries in this region of California. Significant depletion of regional ground water, the region's predominant irrigation water supply has forced legislative change requiring newly established regional organisations to implement sustainable groundwater use by 2020

#### Marketing

Meeting with the Californian Raisin Administrative Committee highlighted the export marketing support that the Californian industry generates, with 3 million dollars annually of grower levies used to support 18 international markets. This highlighted the need for the Australian industry to be very strategic and well planned with the expenditure of promotional levies in our export markets.

As part of the study tour program the group took time to look at how dried fruit is marketed in retail stores. While much of the packaging was similar to that seen in Australia one big difference came to light. Dried fruit couldn't be found in the baking goods section but was located with the fresh fruit and vegetables creating a completely different image for dried fruits. Retail marketing of dried fruit appeared more closely aligned with healthy snacks than it is in Australia. It sat alongside packaged nuts including pistachios and almonds, all with a clear healthy snack food message. This is something that our tour participants with a marketing link were very keen to take back to our Australian domestic market.

#### Research

Important research opportunities were identified in three of the tours key visits

The University of California, Kearney Agricultural Research and Extension Center, just outside of Fresno was our second major stop. Sunpreme, a grape variety that "self-dries" grapes at the end of the season without any intervention was the focus of our interest at this stop. Dr. Matthew Fidelibus, the researcher running trials on this new variety developed by the US Department of Agriculture, discussed some of the pros and cons of this intriguing new variety. The vines in the research patch were only three years old so there is still a bit to learn with this variety as it matures. At present the vines yield about 6-9 tons per hectare and the fruit begins drying at about 16-17° Brix. The drying process probably begins a little early for Australian industry specifications but the potential for this variety to reduce labour costs associated with cutting canes makes it a worthy candidate for further investigation under Australian environmental conditions and production systems.

A visit to Sun World's table grape breeding program in Bakersfield gave the opportunity to understand the time and scale of operation required to breed new grape varieties commercially. Even though this was a table

grape program it was obvious from our discussion that there are a couple of new varieties that, while they may not be great for table grapes, could be well suited for dried fruit production. This is something that Dried Fruits Australia will follow up as a result of the study tour

Our last technical meeting was with the Tony Koselka from Vision Robotics. Their team has developed an autonomous robotic pruner for single cordon, spur pruned winegrapes. While the system is not set up for pruning on a dried fruit swing arm trellis, Tony and his team have proved that it could be done. Discussion with Tony convinced the participants that this is an area that Dried Fruits Australia should consider actively investigating as is it progressing all the time and may, over time, offer the next big step in reducing costs associated with dried fruit production in Australia.

#### **Biosecurity**

Tour participants discussed the impacts and management of Pierce's disease with the Californian Department of Food and Agriculture (CDFA) Pierce's Disease control program team in Sacramento.

Pierce's disease in grapevines was first noted in California near Anaheim around 1884 and is caused by a strain of the bacterium *Xylella fastidiosa*. Until the appearance of a very active insect vector of this bacterium, the Glassy winged sharp shooter, Pierce's disease hadn't caused much of a problem. However, between 1994 and 2000 it is reported that the disease destroyed over 1,000 acres of grapevines in northern California, causing \$30 million in damages.

As there is currently no known cure for Pierce's disease the focus of the CDFA program has been to control the spread of the vector to restrict development of Pierce's disease while research looks for disease control measures. Their program has focused on;

- Containment of the vector, Glassy Winged sharp shooter by controlling movement of host plants,
- State wide surveying to establish extent of the vector and identify new infestations,
- Rapid response to eradicate new infestations in urban areas and roll out area wide control programs in agricultural regions, including the release of natural parasites of the vector.
- Public education to help with the roll out of the control programs and the identification of new infestations.
- Research into the control of the disease including programs such as breeding resistant vine varieties

The results of this work have successfully restricted the movement of Glassy winged sharp shooter and significantly reduce the numbers appearing in the trapping grids in infection regions.

The clear take home messages for our group were the potential devastating impacts of Pierces' disease for the Australian industry if ever combined with a vector like the glassy winged sharp shooter and the scale of the biosecurity control program required to hold the spread of such a disease while research efforts are still looking for a control mechanism.

# **Evaluation and discussion**

Evaluation of the tour was completed using a qualitative interview evaluation process focusing on the quality and usefulness of the information presented. The session was completed as a facilitated group discussion on the last evening of the tour with responses. The session included all participants and took just over an hour to complete. The key themes from this session are presented below.

The group's consensus with respect to the quality of the information presented as part of the visits was that they were all of a high standard.

Given the quality of the information in the presentations participants had significant leaps in their understanding of the issues. The most notable was understanding the issues associated with irrigation. The presentation from Fresno irrigation was cited by a number of participants as being the area in which they learned the most. Having seen low technology irrigation systems during the first part of the tour the information provided by the water authority provided the background that allowed participants to understand the key elements of why this was the case.

The usefulness of the information was dependent on the particular situation of the tour participants.

For example, grower participants found the most useful sessions were the ones spent with Californian growers. This was their best opportunity to understand the nature of the industry in their own terms.

Group participants also identified that it was extremely valuable to establish and maintain the links with the Californian industry as a means to help them understand the nature of the dried fruit industry globally.

The discussion around the likelihood of using the information in the future provided the most insight.

Generally, the group agreed that the dried grape production systems that they had seen in California were not directly adaptable to Australian conditions.

The group identified that the most exciting opportunities identified on the trip would need to go through a further development phase before being applicable to the Australian system. The key issues identified in this discussion included trialing potential new dried fruit varieties under Australian production systems and environment, and investigating the application of robotic technologies to the farming system.

Finally, the discussion process highlighted another issue that didn't relate to the evaluation questions but provides some real insight for the future of dried fruit industry. Reflecting on the outcomes of the tour in the discussion processes allowed participants who had seen the Californian industry previously to compare its current status to what they had seen previously. It was clear that the Californian industry no longer had the significant level of government scientific research support it once had with much of this effort being diverted to other growth irrigation crops. So from an Australian perspective this is a clear message that we have to drive our own R&D agenda and capability perhaps in conjunction with the Californian's as we can no longer look towards the California R&D community as a source of new production concept.

# **Recommendations**

The tour program identified three areas for potential research / development being:

- 1. assessment of new varieties for dried grape production in Australian systems and environmental conditions,
- 2. Investigation of methods to minimize impact of heat stress on berry maturity
- 3. Investigation of mechanical and robotic solutions suitable for Australian dried grape production systems

These will be recommended to the Hort Innovation SIAP through the concept ideas process.

Evaluation of the tour program also identified that continued work maintaining relationships with the Dried Grape industry and research community in California by DFA and Hort Innovation will provide significant benefits to the Australian industry including:

- Understanding trends in global dried fruit production
- Building synergies between the contracting scientific research communities in both industries
- Building trust between the industry organisations responsible for industry development and international market development

# **Scientific refereed publications**

None to report.

# Intellectual property/commercialisation

No commercial IP generated.

# Acknowledgements

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Dried Fruits Australia thanks members of the US raisin industry for their invaluable assistance and cooperation which helped ensure the success of this project

# **Appendices**

- Appendix 1 Face book data from tour social media posts
- Appendix 2 Study tour technical report
- Appendix 3 Post tour Media release.
- Appendix 4 Post tour presentation to Australian industry participants

# Appendix 1- Facebook data from tour - social media posts

ost Details				×
	271 People Reac	hed		
Published by Lauren Roden [?] · September 19 · 🥥	10 Likes, Commer	nts & Shares		
Our group of Aussie dried grape growers has arrived in California, USA for an industry study tour. This week they will have plenty of opportunities to earn from the world's biggest producer of dried fruit.	9 Likes	8 On Post	1 On Shares	
he visit begins soon after vineyards in the San Joaquin valley were hit by ain. Read more from Capital Press about what the rare event means for rowers whose grapes are drying on the ground.	0 Comments	0 On Post	0 On Shares	
	1 Shares	1 On Post	0 On Shares	
See Company and the second second	27 Post Clicks			
	0 Photo Views	12 Link Clicks	15 Other Clicks (i)	
	NEGATIVE FEEDBA	ск		
	0 Hide Post	0 Hide	e All Posts	
Raisin producers assessing damage from rain during harvest FRESNO, Calif. — Raisin producers who were already expecting a smaller crop are assessing the damage from stray showers that spritzed grapes that were drying CAPITALPRESS.COM	Reported stats may	be delayed from what	it appears on posts	
Get More Likes, Comments and Shares Boost this post for \$10 to reach up to 2,000 people.				
271 people reached Boost Post				
Stephen Bennett, Delfim Falcão Da Silva and 6 others 1 Share 🔔 🗸				
Like 💭 Comment 🛱 Share				
<i>#</i>				

Dried Fruits Australia Published by Lauren Roden (?) - September 20 - @

Our study tour crew has arrived safely in the USA!

Their first official stop was the California Department of Food and Agriculture, where they learnt about the impact and management of Pierce's Disease. Our growers gained a clear understanding of the potential impacts of the disease should it ever reach Australia. The visit also showed how a large-scale disease containment program could be rolled out.

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Keep checking back for daily updates #DFAintheUSA



<b>26</b> Likes	25 On Post	1 On Shares
2 Comments	2 On Post	0 On Shares
<b>2</b> Shares	0 On Post	2 On Shares
175 Post Clicks		
105 Photo Views	0 Link Clicks	70 Other Clicks (i)
NEGATIVE FEEDBAC	ск	
1 Hide Post	0 Hide	All Posts
0 Report as Spam	0 Unli	ke Page
Reported stats may	be delayed from wha	t appears on posts

Dried Fruits Australia added 2 new photos. Published by Lauren Roden [2] - September 21 - @

Our study tour group spent some time out under the Fresno sun today.

Harvest is well underway in California, so the team visited a farm to see the latest in their continuous paper drying techniques. At Kearney Research and Extension Center, they looked at a new variety called Sunpreme, which dries without cutting canes. There are still some management issues to sort out, but it may be worth keeping an eye on.

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#### #DFAintheUSA



27 Likes, Comment	ts & Shares		
<b>25</b> Likes	23 On Post	2 On Shares	
0 Comments	0 On Post	0 On Shares	
2 Shares	1 On Post	1 On Shares	
72 Post Clicks			
<b>29</b> Photo Views	0 Link Clicks	43 Other Clicks	
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0 Hide Post	0 Hide	All Posts	
O Report as Spam	0 Unlike Page		

Reported stats may be delayed from what appears on posts

#### ×



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21 Likes, Comment	ts & Shares		
20 Likes	20 On Post	0 On Shares	
0 Comments	0 On Post	0 On Shares	
1 Shares	1 On Post	0 On Shares	
108 Post Clicks			
78 Photo Views	0 Link Clicks	30 Other Clicks (i)	
NEGATIVE FEEDBAC	к		
2 Hide Post	0 Hide	0 Hide All Posts	
0 Report as Spam	0 Unlii	0 Unlike Page	

Dried Fruits Australia added 2 new photos.
 Published by Lauren Roden [?] - September 23 - @

Irrigation was on the agenda today for our California tour group.

Fresno Irrigation general manager Bill Stretch explained the ins and outs of irrigation in the region and the challenges they will face in the future.

...

They looked at some of Fresno's ground water recharge systems, which are designed to store surface water in their ground water aquifers. Their storage ponds can drop up to 25mm a day into the ground water, saving it for future irrigation via ground water pumping.



#### 243 People Reached 9 Likes, Comments & Shares 9 On Post 9 0 On Shares Likes 0 0 0 On Shares On Post Comments 0 0 0 On Post On Shares Shares 26 Post Clicks 16 10 0 Link Clicks Other Clicks Photo Views NEGATIVE FEEDBACK 0 Hide Post 0 Hide All Posts 0 Report as Spam 0 Unlike Page

Reported stats may be delayed from what appears on posts

Dried Fruits Australia added 3 new photos. Published by Lauren Roden 191 - September 24 - @

Today was the last day of the US study tour.

They kicked off the day with a visit to Sun World. They are table grape breeders, but one or two varieties may be of interest for dried grape production. We will keep an eye on the development of these varieties.

The group met with Vision Robotics in the afternoon. They have developed a prototype robotic vine pruner – another development DFA will be keeping any eye on upon our return.... See More



15	15	0
Likes	On Post	On Shares
0	0	0
Comments	On Post	On Shares
<b>1</b>	1	0
Shares	On Post	On Shares
58 Post Clicks		
24	0	34
Photo Views	Link Clicks	Other Clicks
NEGATIVE FEEDBAC	к	
1 Hide Post	0 Hide	All Posts
0 Report as Spam	0 Unlii	ke Page

352 People Reached

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Reported stats may be delayed from what appears on posts

🖒 Like 🔘 Comment 🔗 Share

Post Details			
Dried Fruits Australia ···· Published by Lauren Roden [?] · September 29 at 4:27pm · @	316 People Rea 3 Likes, Commen	ched ts & Shares	
One of the highlights was the visit to Vision Robotics, where they have developed an autonomous grapevine pruner and remote controlled tractor. Check it out here	3 Likes	3 On Post	0 On Shares
#DFAintheUSA	Comments	On Post	On Shares
Pruning Overview 2014 3 2014 Autonomous Grapevine Pruner Update	0 Shares	0 On Post	0 On Shares
YOUTUBE.COM	11 Post Clicks		
	Photo Views	Link Clicks	1 Other Clicks (i)
Boost this post for \$10 to reach up to 2,000 people.	NEGATIVE FEEDBA	чск	
316 people reached     Boost Post	0 Hide Post 0 Report as Spam	0 Hide 0 Unli	e All Posts ke Page
r Like □ Comment お Share	Reported stats ma	y be delayed from wha	at appears on posts

## Appendix 2- Study tour technical report

#### DRIED VINE FRUIT CALIFORNIA STUDY TOUR - SEPTEMBER - 2017

#### The University of California's Kearney Agricultural Research and Extension Center<sup>1</sup>

The group met research scientist Matthew Fidelibus and Rodrigo Espindola, a visiting scientist from Argentina. The latter was part of an Argentinian program to find alternative uses for the large amount of table grapes that are difficult to export due to economic conditions in that country. Matthew has established a trial of a USDA-bred putatively self-raisining variety called Sunpreme (Figure 1). This variety is fruitful in the basal buds and early observations by the USDA suggested that it may mature earlier than Thompson seedless under comparable conditions.

The vines established at Kearney were on own roots, 1103 Paulsen or Freedom. The vines were trained to bilateral (i.e. on a single wire trellis) or quadrilateral cordons (i.e. on a Tee trellis). The vines were in their third season, and their full cropping potential had not yet been fully established.

One observation was that the self-raisining trait is not expressed uniformly (Figure 2). It also appeared to start when the berries were at 16-17°Brix; a maturity level that most Australian dried vine fruit producers would not consider cutting or harvesting at.

The variety also tended to shed drying berries (Figure 3).

Figure 1. Dried bunch on the self-raisining variety Sunpreme



Figure 2. Differential drying on small bunches of the self-raisining variety Sunpreme



Figure 3. Shed raisins on the surface beneath a Sunpreme vine



Discussion with the researchers involved led to the conclusion that that the physiology of the self-raisining trait was largely unknown, and the environmental circumstances triggering the expression of the trait also largely unknown.

Given the economic importance of the trait, consideration should be given to importing the variety into Australia and establishing a trial to assess the usefulness of the variety in the production systems used by the Australian industry. Some members of the visiting group mentioned that the USDA had been reluctant to release the variety to other countries when approached some years ago.

<sup>&</sup>lt;sup>1</sup> http://kare.ucanr.edu/

A round table discussion with researchers Larry Williams, Matthew and Rodrigo in respect of irrigation and fertiliser management highlighted a number points of difference between the circumstances each industry operates under. Due to the vey porous nature of the soils in the Central Valley and their depth, the more-or-less universal use of flood irrigation, and the low cost of that water, it has been difficult to maintain nitrate-nitrogen fertiliser in the rootzone. This has resulted in significant amounts of nitrate ending up in the aquifer. In some cases, the amount that had been leached down into the aquifer was such as to raise the concentration of nitrate in aquifer sufficiently to amount to a supply of 60 kg N/ha/year when the aquifer water was extracted and used for irrigation. In field trials being conducted to improve fertiliser supply, this amount of nitrogen more or less amounted to back ground supply, and swamped out any responses to additional deliberately added nitrogen fertiliser. This observation highlights the need for caution when applying recommendations developed in edaphic circumstances different to our own.

In contrast to the experience of Australian winemakers, none of the Kearney researchers felt that grape maturity had advanced over the last two decades. The limited data available for grape varieties used for dried vine fruit production in Australia concur with the Kearney researchers' experience. It is difficult to imagine that wine grapes make up a unique subset within the larger group of Vitis vinifera genoptypes.

#### Fresno Irrigation District<sup>2</sup>

Bill Stretch, Assistant CEO of Fresno Irrigation District (FID), briefed the group on the aftermath of the recent drought, and the circumstances that have led to the approaches being taken to ensure sustainable use of groundwater resources into the future.

The Central Valley has a large aquifer fed by snow melt from the Rocky Mountains to the east. Anyone owning land has the right to access any amount of ground water for whatever purpose. FID supplies surface water extracted from the Central Valley's rivers to some irrigators and to the major urban centres in its remit. But, the majority of irrigators' water needs are met by pumping water from the aquifer. This resource was severely depleted during the recent drought to the point that land subsidence was strongly evident in some areas. The California State Government's response has been to legislate targets for ground water recovery. The responsibility to achieve those targets has been devolved to local purpose-established boards in each irrigation district.

One strategy already being implemented is to use surface water, currently in good supply, to replenish the aquifer through percolation. Large (10s of ha scale) reservoirs have been set up that store the water diverted from the rivers traversing the area. Percolation rates of 1 ML/ha/day were quoted, and presumably that rate applies all year round. The suggestion was made that given the similarities of the climates, evaporation losses of 2 m per year could be expected; this would amount to 20 ML/ha/year (*i.e.* 100 mm of water across a ha is 1 ML). On that basis, the efficiency of this method would be around  $[100-(^{20}/(_{20+365})\times100) \approx]$  95%. In other words, for every 100 L of water delivered to the storage, approximately 95 L will end up in the aquifer. It is also pertinent to point out that the ground and surface water is very high quality, so the issue of salt build up in the soil is not relevant here. The soils are mostly free draining fine glacial sands.

Nonetheless, there are some deep saline aquifers along the western side of the valley, and the fear was that during the drought these may have been inadvertently accessed as irrigators sunk deeper wells to find water.

One notable feature of the strategy being developed was the close co-operation between water authorities

<sup>&</sup>lt;sup>2</sup> https://www.fresnoirrigation.com/index.php

and water consumers; notably urban water supply authorities.

#### Sun Maid<sup>3</sup>

This grower co-operative was established in 1920, and currently has around 700 raisin producers. It packs about a third of the Californian raisin crop.

An inspection tour of the receival and processing line, particularly the washing component, was conducted by the processing plant manager.

The company agronomist then conducted a tour of a number of member producers, vineyards to allow the group to gain an appreciation of the range of production technologies being used to grow Thompson seedless grapes and then dry those grapes to produce the raisins that are the industry's mainstay.

It is pertinent to point out here that the soils are most free draining fine sands with very little organic matter. The sand particles are easily moved by wind and the traffic.

Most of the vineyards were planted 80 or more years ago and very few have pressurised irrigation systems. The vines are on their own roots and generally of poor vigour compared to vines used to produce dried vine fruit in Australia. Furthermore, most vines were trained to a single wire trellis, and were cane pruned; less common was a narrow Tee-trellis arrangement.

In these types of vineyards raisins are produced by a number of methods

• Handpicking the grapes into plastic tubs, arranging the contents of a full tub onto a paper tray in the mid row area (Figure 4). The paper trays replace the wooden trays used in the past. This method maximises the exposure of the grapes to sunlight and high temperatures, and is the basis for the caramel-like flavours in Californian Thompson seedless raisins. When the grapes are dry the trays are folded up, and picked up by hand.

• Summer pruning the bearers, waiting for a week to 10 days and then mechanically harvesting the berries onto continuous sheet of paper in the middle of the row (Figure 5). The period of time between cutting and mechanically removing the grapes is sufficient to allow the clusters shatter with very little force. The continuous paper tray is picked up mechanically (Figure 6), the dried grapes directed to bins of approximately the same dimensions as used here.

• Summer pruning the bearers and mechanically harvesting the dried grapes 4-5 weeks later. Grapes dried in this way are not viewed as being the same as raisins. They are the equivalent of "naturals" here.

Figure 4. Dried Thompson seedless raisins on paper trays in the inter-row area Figure 5. Partially dried Thompson seedless grapes on continuous paper trays in the interrow area

Figure 6. Dried Thompson seedless raisins on continuous paper trays being mechanically collected

<sup>&</sup>lt;sup>3</sup> http://www.sunmaid.com/



With grapes being dried on the ground, and given the nature of the soil, sand particles being trapped in the folds formed as the berries dry is an on-going problem for those raisin producers using paper trays.

Other raisin production technologies included pergola and wide Tee trellis. Both relied on summer pruning, were more likely to be using grafted vines and were more likely to feature pressurised irrigation systems. In addition, the newer developments were more likely to be an earlier maturing variety such as Selma Pete or Fiesta. The rootstocks used, if at all, were 1103 Paulsen and Freedom. Little advantage could be seen in the pergola system, and the wide Tee trellis more-or-less amounted to the status quo in Australia 30 years ago.

Another issue that arose during discussions with Sun Maid management was the increasing frequency of extreme weather events; principally, prolonged high temperatures. The Australian industry is well aware of this problem having seen grape maturation come to a halt during such events, and taking some time to recommence following the return to milder conditions. The significance of the delay in maturation is that the likelihood of suitable drying conditions diminishes with every day delay in starting the drying process. Starting that process before a suitable level of soluble solids have been accumulated by grapes amounts to a yield loss for producers, and less "meaty" DVF for processors/marketers. This is an issue that spans the horticultural industries in north west Victoria/south west NSW region, and is a significant gap in the tools that horticultural producers have available to cope with a variable weather patterns in a changing climate.

#### Sun World – grape breeding<sup>4</sup>

Sun World's business model is based on breeding new varieties of grapes suitable for the table grape market. The company both grows the their varieties themselves and licences other growers to grow and market the varieties as well. Licenced growers must pay a fee of 5% on the price received for each box of grapes.

The traits bred for are maturity timing, flavour, berry size and cropping consistency. Yield expectations are around 1,500 to 2,400 18-lb boxes per acre, equivalent to approximately 12-20 tonnes of marketable fruit per ha.

The program was based on conventional breeding and embryo rescue. Large numbers of progeny were screened to eliminate unsuitable types, and then establishing larger trials to make final selections based on the application of standard agronomic practices. The use of molecular markers to hasten the process of

<sup>&</sup>lt;sup>4</sup> http://sun-world.com.au/types-of-grapes/variety-development

identifying hybrids with suitable traits was being introduced into the breeding program.

The propensity of mature grapes to split following rain was not a breeding or target selection criteria, but it was acknowledged that it was a heritable trait.

Identifying varieties suited to drying wasn't a priority for the company, although some of the company's hybrids had proven to result in attractive dried vine fruit when dried; Sugraone, was one such hybrid, and is being currently evaluated on local DVF properties. Sugra 39, Sugra 41 and Sable Seedless were all viewed as having potential as a drying variety.

#### Vision Robotics Corporation<sup>5</sup>

The group met with Tony Koselka of Vision Robotics, a San Diego-based company.

The company has invested heavily in the development of an autonomous vine pruning system. The system is being developed to prune a bi-lateral single-wire cordon. It uses two vision cameras to gather enough information to enable the construction of a 3-D model of the cordon, spurs and canes. Each cane and node then has *x*, *y* and *z* co-ordinates. Two robotic arms then prune each spur to the number of nodes specified by the user using the x, y and z data. The number of nodes per vine or metre of cordon are user programmable, but the user can also specify that the lower shoots on a 2-node spur be kept, and the shoot spurred to two nodes, or that the shoots on the first and second nodes both be spurred to two nodes. The time consuming step is the actual pruning because of the amount of movement each robotic pruning arm must do to get the pruning shears perpendicular to the axis of the shoot to be pruned.

A commercial unit is still some time off. Some development remains to be conducted, and, indeed, the company is seeking co-investment of US\$1 million from the major North American wine companies to complete the development and put a system on the market.

As it stands, the system can cope with a single cordon; a vastly simpler situation than that of the fruiting/nonfruiting cordons used for swing arm or hanging cane dried vine fruit production systems in Australia. Undoubtedly, the next generation of autonomous pruning systems will be able to cope with more complex cordon arrangements, but for the time being, the system being developed by the company offers very little for the Australian DVF industry. It will, however, be important that the Australian industry maintains a watching brief on developments in this space. The conversation included a quite frank assessment of the technology as it stands. The conversation served too as a reality check because expectations and hopes of the technology on the part of industry may have been in danger of becoming separated from what can be delivered in the short to medium term.

As mentioned, the pruning solutions the DVF industry needs are more complex than can be delivered in the short to medium term. This doesn't preclude the possibility that other robotic—semi-autonomous or otherwise—solutions to the problem of moving soft/semi-hard shoots into some desired arrangement may have application in the DVF industry. This type of material handing is probably part and parcel of large scale floriculture enterprises, for example. Perhaps, as a first step, an assessment of technologies in the public domain that may have application, and then an inspection and evaluation of engineering solutions to plant material handling tasks of a similar nature to those faced by the DVF industry should be considered.

<sup>&</sup>lt;sup>5</sup> https://www.visionrobotics.com/



# Mildura Independent 🏠

New varieties uncovered as potential farm crops during USA study group tour

#### **Details**

Max Thorburn

02 November 2017

Dried Fruits Australia's recent study tour to the USA uncovered potential new varieties for dried grape production in Australia.



Growers from Mildura and Swan Hill attended the seven-day Californian Raisin Industry Study Tour, which was funded by Hort Innovation.

The group visited leading research centres, processors and marketers, government agencies and other industry organisations.

DFA Chairman Mark King said the University of California's Kearney Research and Extension Center showed the group a new grape variety that dries without any intervention at the end of the season.

"Sunpreme is a self-drying variety, so it has the potential to reduce labour costs associated with cutting canes," Mr King said.

"The vines in the research patch were only three years old, so there is still a bit to learn about this variety as it matures.

But it is worth investigating under Australian environmental conditions and production systems."

Mr King said the group also identified opportunities for automation of vineyard operations and collaborative research into vine physiology.

"The team at Vision Robotics has developed an autonomous robotic pruner for wine grape vineyards and proved it could also be set up to prune dried grape vines," he said.

"This area is progressing all the time and may offer the next big step in reducing costs involved with dried grape production in Australia."

Mr King said the growers also investigated how dried fruit was marketed in retail stores.

"While the packaging was similar to ours, the location of dried fruits in supermarkets revealed one big difference," he said.

"We didn't find it in the baking section - It was near the fresh fruit and vegetables alongside the packaged nuts, which sends a clear healthy snack-food message."

"This is something we would like to see more of in the Australian domestic market."

#### Sunraysia Daily Monday, November 6, 2017

# Growers bring ideas back from the US

MILDURA and Swan Hil growers have learned about a new dried grape variety that could cut labour costs.

Growers from Mildura and Swan Hill attended Dried Fruit Australia's (DFA) Californian Raisin Industry Study Tour recently, visiting leading research centres. processors and marketers, government agencies and other industry organisations.

"The University of California's Kearney Research and Extension Centre showed the group a new grape variety that dries without any intervention at the end of the season," DFA chairman Mark King said.

"This self-drying variety has the potential to reduce labour costs associated with cutting canes.

"The vines in the research patch were only three years old, so there is still a bit to learn about this variety as it matures, but it is worth investigating under Australian environmental conditions and production systems."

Collaborative research

into vine physiology and opportunities for automation of vineyard operations were also discussed.

"The team at Vision Robotics have developed an autonomous robotic pruner for wine grape vineyards and proved that it could also be set up to prune dried grape vines," Mr King said.

This area is progressing all the time and may offer the next big step in reducing costs involved with dried grape production in Australia.

The growers also investigated the marketing of dried fruit in retail stores.

"While the packaging was similar to ours, the location of dried fruits in supermarkets revealed one big difference - we didn't find it in the baking section. It was near the fresh fruit and vegetables, alongside the packaged nuts, which sends a clear healthy snack-food message," Mr King.

"This is something we would like to see more of in the Australian domestic market."



-Ashlee Falvo Local growers attended the Californian Raisin Industry Study Tour in California.

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#### Appendix 4- Post tour presentation to Australian industry participants























# Sum World Commercial table Grape breeding company Some interesting varieties that may be good for dried fruit. Sugar 41 Sugar 38 SableSeedless



