

# **Dried Grape Study Tour to California, USA**

Phil Chidgzey  
Australian Dried Fruits Association

Project Number: DG10001

## **DG10001**

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## **Final Report**

**Project DG10001**

**“Dried Grape Study Tour To California, USA”**

**April 2011**

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**HAL Project Number DG10001**

**HAL Project Title:** **Dried Grape Study Tour To California, USA**

The main purpose of this project was to enable representatives from all sectors of the Australian dried grape industry to observe at first hand the management practices and technologies being employed by the world's leading producer of dried grapes.

The Study Tour had a broad focus and included visits to farms and processing plant, meetings with researchers, processor/marketers, water managers, irrigation researchers and others involved in the US raisin industry.

## ACKNOWLEDGEMENTS

Funding for this project was provided by Dried Fruits Australia Inc. and Horticulture Australia Ltd.

Dried Fruits Australia thanks the US raisin industry contacts listed later in this report for their valuable assistance and cooperation which contributed to the success of this project.

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# 1 MEDIA SUMMARY

In September 2010 a study tour group visited California to investigate dried grape production. The group was made up of mostly dried grape growers, two Dried Fruits Australia staff members and one processor/marketer.

The tour covered numerous visits and meetings with some of the major players in the California raisin industry, including producers, raisin processors/marketers, researchers (including USDA vine breeders) and others involved in irrigation management research. Other visits included dried tree fruits and prune processors and the California Table Grape Commission.

The study tour objectives included:

- On-farm visits – to observe and discuss best practice production management and the various Dried On the Vine (DOV) mechanical harvesting options being used to achieve high quality raisins. It was also an opportunity to better understand the biosecurity issues facing Californian viticulture due to serious pests and diseases such as Pierce's disease.
- Raisin processor/marketers visits – to observe best practice processing using the latest available technologies to produce high quality end products. It was also an opportunity to assess the latest raisin market outlook and gain insight into US consumer trends.
- Research (vine breeding) – to discuss and review USDA raisin breeding programs and the potential for further imports into Australia. This matter was important, given Dried Fruits Australia's impending involvement in commercialisation of two new varieties.
- Water management – to review and gain an understanding of the water management and response to reduced availability of water for irrigation purposes and need to cater for environmental water requirements.
- Californian raisin industry contacts to establish a range of new industry contacts to open up the Communication channels between the US and Australian industries, then maintain these relationships and ensure growers in both countries are better informed.

Some of the main observations by the study group included:

- The climate in the Centre Valley based around Fresno and Selma is reliable for drying with no rainfall during the harvest period of July to September and average maximum temperatures of 35.5°C (96°F) peaking at 43.3°C (110°F). This provides ideal conditions to dry fruit on paper trays on the ground
- The soil is deep sand, up to 49m (160ft) deep. In parts of the valley there is a compacted zone somewhere between 0.9–1.8m (3–6ft) deep which restricts vine root depth
- Vines are planted almost universally to 2.1m (7ft) vines spacings and where traditional hand harvesting is still the practice, are grown on a single wire trellis. As a result, most vines seem more vigorous than those in Australia, but do not produce extra fruit. There appeared to be little attention to vigour balance and subsequent shading
- There is a large swing over to new varieties to replace Thompson Seedless, with a focus on either Fiesta or Selma Pete to take advantage of their earlier maturity and better production capability. In addition, longer drying periods for the new varieties have given growers the opportunity to adopt trellis drying, a practice that is relatively new to them.
- Despite the change to new varieties, the US still has relatively low consumption of about 0.6kg per capita compared to Australia's 2kg per capita.

- About 6,000ac (2,424ha) of poorer vines are being removed each year due to replanting to higher returning crops such as almonds, walnuts and Clementine mandarins. As a result, there is a slow reduction of surplus fruit which should see the price of TS raisins slightly increase on the world market
- In terms of water and environment, Californian growers currently have access to cheap reliable sources of water. Snow melt from the Sierra Nevada Mountains provides flood irrigation and replenishes the aquifer. Despite this, the water table is getting deeper beneath the soil, making it more difficult to pump for irrigation
- Another area of potential change could be occupational health and safety – the study tour group saw little evidence of use of things such as ear plugs/muffs, eye protection and dust masks when on the farm and there were no cab tractors or cabs on machinery. This is vastly different to Australia and Europe where attention is given to protecting those that grow the crop as well as those that eat it.
- Study Tour group members were required to prepare a report and participate in a grower forum upon their return to Australia. The conclusion from one such report stated:

*The California raisin industry faces similar problems to the ones we face in Australia. They have an uncertain water supply, with agriculture having to compete with the urban population for a scarce resource. The industry is in decline, losing 6,000 acres each year. Labour costs are increasing and are becoming shorter in supply. Mechanisation is their way of the future, with significant advances made in the last ten years. Selecting new varieties with desirable traits is seen as the next advancement in their industry.*

*The market expects a California raisin to be a naturally dried sultana type. The industry produces 5,000 tonnes of a 'Golden' raisin which has been sulphured to give it that light colour. California could easily produce the light sultana type our industry strives to achieve; however, there would not be a market for this type of fruit. Australia should not feel threatened by the California raisin industry as it produces a different product.*

## **2 EXPECTED OUTCOMES AND HOW THEY WERE ACHIEVED**

The expected outcomes or objectives of the Study Tour are outlined in the Media Summary.

To reiterate, the objectives and how they were met are again outlined below:

- On-farm visits – enabled study tour members to observe and discuss best practice production management and the various Dried On the Vine (DOV) mechanical harvesting options being used to achieve high quality raisins. It was also an opportunity to better understand the biosecurity issues facing Californian viticulture due to serious pests and diseases such as Pierce's disease.
- Raisin processor/marketers visits – allowed members to observe best practice processing using the latest available technologies to produce high quality end products. It was also an opportunity to assess the latest raisin market outlook and gain an insight into US consumer trends.
- Research (vine breeding) – visiting a major research station enabled members to discuss and review USDA raisin breeding programs and the potential for further imports into Australia. This matter was important, given Dried Fruits Australia's impending involvement in commercialisation of two new varieties.
- Water management – another meeting that enabled members to review and gain an understanding of the water management and response to reduced availability of water for irrigation purposes and need to cater for environmental water requirements.
- Californian raisin industry members – these meetings enabled study group members to establish a range of new industry contacts to open up the communication channels between the US and Australian industries. Members will seek to maintain these relationships and ensure growers in both countries are better informed. All study group members now receive a regular electronic newsletter prepared and circulated by the Raisin Administrative Committee.



### 3 RESULTS OF DISCUSSIONS

The Study Tour has provided the members who participated and the industry in general with a much better understanding of the current situation in the US raisin industry and immediate outlook for world supply and demand.

The findings from the Study Tour are outlined in various summary articles that have been published in The Vine publication (a joint Dried Fruits Australia, Australian Table Grape Association magazine) which is distributed to all dried grape and table grape growers on a quarterly basis.

In addition, a detailed report has been produced by a Study Tour group member, Ashley Johnstone, who participated after being awarded a young grower scholarship. This report has been included as an appendix to this final report and covers a wide range of topics including:

- Resources – soil & geology, water, climate, labour
- The Raisin Industry – Californian Raisin Marketing Board, the raisin crop reserve, fruit prices, market outlook
- Dried fruit practices – traditional harvesting practices, the continuous tray system, trellis drying systems - the pergola system, the Open Gable system, new drying varieties
- Plant Biosecurity – Pierce's Disease – management of the disease and breeding for resistance

## 4 IMPLICATIONS FOR AUSTRALIAN HORTICULTURE

The Study Tour findings have confirmed that the US raisin industry faces similar issues to those confronting growers in Australia.

There is a significant decline in raisin acreage each year which suggests that investment in other industries such as almonds is more attractive.

Problems relating to security of water supply appear to be developing in California, due to the strong competition for urban supply.

With labour costs increasing, increasing mechanisation in the US is following the trend seen in Australia for some years.

However, the US consumer is used to and requires a naturally dried Sultana type, which differs from the light fruit produced in Australia.

As Ashley Johnstone concluded “Australia should not feel threatened by the Californian industry as it produces a different product.

As far as the market outlook goes, the Study Tour confirmed that US exports have led to significantly reduced stock levels. The firmer market outlook saw 2010 prices rise by 13.4% to US\$1500.

## **5 HOW THE INFORMATION GATHERED HAS BEEN DISEMINATED**

Immediately after returning to Australia, all Study Tour group members were required to contribute a report on their observations and conclusions.

As a result, a summary article was published in The Vine (Oct-Dec 2010 edition).

In addition, Ashley Johnstone prepared a detailed report, which was the basis of a 2 part article published in The Vine (Jan-Mar 2011, Apr-Jun 2011 editions). As explained earlier, The Vine is distributed quarterly to all dried grape and table grape growers in Australia.

Further, a special Dried Fruits Australia Branch Forum was held on 9<sup>th</sup> December 2010 at which Ashley Johnstone and other Study Group members reported directly to grower and processor members of the organisation.

## 6 ITINERARY

Date	Day	Travel / Organisation Contact / Meeting Activities	Location
Sat 11/9/10	1	<ul style="list-style-type: none"> <li>• Depart Mildura to Melbourne then Sydney &amp; onto San Francisco</li> <li>• Arrive same day – free day</li> <li>• Overnight – San Francisco</li> </ul>	San Francisco
Sun 12/9/10	2	<ul style="list-style-type: none"> <li>• Travel to Napa Valley to visit Beringer vineyards and meet researcher Bruce Kirkpatrick (UC Davis) &amp; Will Drayton (vineyard manager). Plant biosecurity &amp; Pierce's Disease impacts.</li> <li>• Travel to Fresno/Selma region</li> <li>• Overnight – Selma</li> </ul>	Napa Valley  Selma
Mon 13/9/10	3	<ul style="list-style-type: none"> <li>• Meeting with raisin industry researchers Matthew Fidelibus &amp; Peter Christensen (retired). Details TBC</li> <li>• Meeting with Ross Jones, Californian Table Grape Commission</li> <li>• Overnight</li> </ul>	Parlier Fresno Selma
Tues 14/9/10	4	<ul style="list-style-type: none"> <li>• Meeting from 8-9.30am with Dan Clawson, Center for Irrigation Technology, Fresno State University</li> <li>• Local tour (David Watte) – includes visits to 3 raisin and wine grape properties (various irrigation systems) and visit to local dam</li> <li>• Raisin Administrative Committee/Californian Raisin Marketing Board – Gary Schulz (President/GM). Noon to 3pm.</li> <li>• Dinner with Gary Schulz &amp; staff. TBC</li> <li>• Overnight</li> </ul>	Fresno Fresno region Fresno Fresno Selma
Weds 15/9/10	5	<ul style="list-style-type: none"> <li>• Visit to Sun-Maid, major raisin processor. Meeting with Barry Kriebel, President &amp; the Sun-Maid Board. Includes meeting, lunch, farm and plant tours</li> <li>• Overnight</li> </ul>	Kingsurg  Selma
Thurs 16/9/10	6	<ul style="list-style-type: none"> <li>• Visit to Lion Raisins – family owned grower/processor. Meeting with Kalem Barsarian.</li> <li>• From 2pm, meeting with David Ramming, USDA, Vine breeder</li> <li>• Travel to Yuba City</li> <li>• Overnight</li> </ul>	Selma Parlier Yuba City Yuba City
Fri 17/9/10	7	<ul style="list-style-type: none"> <li>• Visit to Sun Sweet, major Dried Tree fruit &amp; prune processor &amp; marketer. Includes farm and processing plant visit.</li> <li>• Option - retail visits – Wholefoods, Trader Joes TBC</li> <li>• Overnight</li> </ul>	Sacramento Yuba City TBC San Francisco
Sat 18/9/10	8	<ul style="list-style-type: none"> <li>• Free day – fly home late evening</li> </ul>	San Francisco
Mon 20/9/10	9	<ul style="list-style-type: none"> <li>• Return to Mildura</li> </ul>	

## **7 RECOMMENDATIONS**

### **New Vine Varieties**

That Dried Fruits Australia maintain regular contact with relevant US researchers so that the industry can capture any opportunity to import new vine varieties bred in the USA that may be suitable for dried grape production in Australia or indeed export Australian bred varieties that may be suitable for raisin production in California.

### **Networking with US Raisin Industry members**

That Dried Fruits Australia actively maintain direct contact with relevant US raisin industry members so as to keep Australian growers fully informed about market trends and new technologies that may be adapted for use by Australian growers.

## **8 ACKNOWLEDGEMENTS**

Project funding was provided by Dried Fruits Australia Inc. and Horticulture Australia Ltd.

Dried Fruits Australia thanks the US raisin industry contacts listed later in this report for their valuable assistance and cooperation which contributed to the success of this project.

## 9 CONTACT LIST

### US Contacts:

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- 5 Tour of wine & raisin properties and visit to Friant Dam with David Watte (tour guide).  
  
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## **10 APPENDICES**

- 10.1 Appendix 1 – Summary article published in The Vine (Oct-Dec 2010 edition) entitled “Study tour investigates dried grape production in California”
- 10.2 Appendix 2 – Part 1 - Article based on Ashley Johnstone’s report, published in The Vine (Jan-Mar 2011 edition)
- 10.3 Appendix 3 – Part 2 – Article based on Ashley Johnstone’s report, published in The Vine (Apr-Jun 2011 edition)

# Study tour investigates dried grape production in California

As a major producer of dried grapes, predominantly raisins (naturally dried Thompson seedless), and a country with increasing input costs and a wide range of mechanisation options, California was a logical choice for the Australian Dried Fruits Association (ADFA) study tour.

A group of nine dried grape growers, one processor/marketer member and two ADFA staff members left Australia on an eight day tour of California

The tour (Table 1) included a range of visits and meetings with raisin producers, raisin processor/marketers, dried tree fruits and prune processors, the Californian Table Grape Commission, researchers including US Department of Agriculture (USDA) vine breeders and others involved in production and irrigation management research related to reduced water availability. In addition, the group observed irrigation systems on farm as well as visiting an Irrigation Technology unit at the Fresno State University and part of the local dam infrastructure.

Study tour participants included: Mark King (Chairman), Allan Long (Deputy Chairman), Tony Martin, Peter Hammond, Ivan Shaw, Stephen Bennett, Ashley Johnstone, Lex French, David Swain, Wolf Duda, John Hawtin and Phil Chidgzy.

The study tour had a range of objectives including:

- On-farm visits – to observe and discuss best practice production management and the various Dried On the Vine (DOV) mechanical harvesting options being used to achieve high quality raisins. It was also an opportunity to better

understand the biosecurity issues facing Californian viticulture due to serious pests and diseases such as Pierce's disease.

- Raisin processor/marketers visits – to observe and discuss best practice processing using the latest available technologies to produce high quality end products. We would also be able to assess the latest raisin market outlook and gain insight into US consumer trends.
- Research (vine breeding) – to discuss and review USDA raisin breeding programs and the potential for further imports into Australia. This is particularly important, given the ADFA's impending move to take on the Commercialiser role for two new varieties in the near future.
- Water management – to review and gain an understanding of the water management and response to reduced availability of water for irrigation purposes and need

Table 1. Itinerary.

Day	Travel / Organisation Contact / Meeting Activities	Location
1	Travel to San Francisco.	San Francisco
2	Visit to Beringer vineyards in Napa Valley and field walk to observe Pierce's disease impact with researcher Bruce Kirkpatrick (UC Davis) and Will Drayton (Regional Viticulturist, Foster's Wine Estates Americas).	Napa Valley
3	Kearney Agriculture Centre, Parlier. Meeting with raisin industry researchers Matthew Fidelibus and Peter Christensen (retired) to discuss current research activities.	Parlier
	Californian Table Grape Commission – meeting with Ross Jones, Vice President, Viticulture Research and Technical Issues to discuss their table grape patenting and licensing program.	Fresno
4	Center for Irrigation Technology, Fresno State University – meeting with Dan Clawson, Project Manager. Briefing on "Water Issues and Technology in California" and role of the International Centre for Water Technology in providing independent third party performance testing of water equipment.	Fresno
	Water Tour – visit to Friant Dam and three raisin and wine grape properties (with various irrigation systems).	Fresno region
	Raisin Administrative Committee/Californian Raisin Marketing Board – lunch and briefing from Gary Schulz (President/General Manager) and Larry Blagg (Senior Vice President of Marketing). Discussed the role and operations of the Committee and Board.	Fresno
5	Sun-Maid, major raisin processor. Meeting with Barry Kriebel, President and grower members of the Sun-Maid Board. Also included farm and processing plant tours.	Kingsburg
6	Lion Raisins, a large family owned grower/processor. Meeting with Kalem Barserian and also farm and processing plant tours.	Selma
	USDA Agriculture Research Centre, Parlier. Meeting to discuss vine breeding program.	Parlier
7	Sun Sweet, major prune processor and marketer. Included farm and processing plant visit.	Yuba City
8	Return to Australia.	

to cater for environmental water requirements.

- Californian raisin industry contacts – to establish a range of new industry contacts to open up the communication between the US and Australian industries, then maintain these relationships and ensure growers in both countries are better informed.

## New varieties and plantings

The climate in the Centre Valley based around Fresno and Selma is reliably drying with no rainfall during the harvest period of July to September



Vines are dead (right) within three years of visible signs of Pierce's disease infection (left).



The touring party outside Sun-Maid offices and processing factory at Kingsburg



*Dan Clawson of the Centre for Irrigation Technology explains the testing of all sprinkler nozzles in the testing shed, sprinkler specifications are verified which are recognised internationally*



*Friant dam - the start of some of the canal system which provides irrigation water around the Fresno area.*

with average maximum temperatures of 35.5°C (96°F) peaking at 43.3°C (110°F) making ideal conditions to dry fruit on paper trays on the ground.

The soil is deep sand, up to 49 metres (160 feet) deep and could only be best described as 'beach'. In some parts of the valley there is a compacted zone somewhere between 0.9-1.8m (3-6ft) deep which restricts vine root depth.

Vines are planted almost universally to 2.1m (7ft) vines spacings and where traditional hand harvesting is still the practice, are grown on a single wire trellis.

As a result most of the vines seem more vigorous than those in Australia, but do not produce any extra fruit. Furthermore there appeared to be little attention to vigour balance and subsequent shading.

There is a large swing over to new varieties to replace Thompson Seedless, with a focus on either Fiesta or Selma Pete to take advantage of their earlier maturity and better production capability. In addition, longer drying periods for the new varieties have given growers the

opportunity to adopt trellis drying, a practice that is relatively new to them.

Mr Hawtin said that while Fiesta and Selma Pete offered genuine improvements to Californian growers, he was not sure that they would work well in Australia. "Both varieties have a high concentration of the browning enzyme and so trellis-dried fruit they dry a lot darker than Thompsons. While this style of fruit suits the US markets, it may not be as suitable for the Australian market where the emphasis is on producing light coloured fruit," he said.

Despite the change to new varieties, the US still has relatively low consumption of about 0.6 kilograms per capita compared to Australia's 2kg/

capita. This struck the group as rather ironic considering the millions of dollars spent on promotion and advertising.

About 6,000 acres (2,424ha) of poorer vines are being removed each year due to replanting to higher returning crops such as almonds, walnuts and Clementine mandarins. As a result there is a slow reduction of surplus fruit used to subsidise extra export markets, which should see the price of TS raisins slightly increase on the world market.

### **Harvest methods/ mechanisation**

Mr Shaw said there didn't appear to have been any major

concept development with respect to mechanisation in the last 15 years. However, a range of approaches that were in their infancy then were now widely adopted and about half of the region was making some attempt at mechanisation. These methods include:

- The method developed by Earl Rocca of harvesting recently summer pruned conventional trellis to lay on continuous paper trays. This method has had considerable uptake and is probably due to the ability to rapidly dry fruit without replanting. The damaged fruit and grit didn't seem to deter them.
- Open gable, intended to be based on bi- or quadrilateral cordon, with fruiting canes laid over the outside wires. This was designed to be mechanically cut, but hasn't been so far. There appeared to be difficulty with maintaining cordon viability due to shading, and some seem to have reverted to a crown. There also appeared to be a lot of crown bunches. Nevertheless, growers seemed happy with the result. Trellis investment costs were quoted as US\$2,500 per acre (US\$6,188/ hectare).
- Overhead horizontal or pergola trellis, cropped in alternate rows. This seemed the most productive system, but still had considerable manual input for shoot positioning and removal etc. Some impressive specialised machinery had been developed for harvest based on equipment used in the almond and prune industries. Trellis cost was quoted as \$10,000/acre (\$24,752/ ha). The resultant microclimate



*Fruit drying as naturals on an Open Gable trellis system at Kearney Agricultural Centre.*





*Fruit is harvested for ground drying using the continuous roll method. Fruit is laid onto continuous paper sheets 1 to 1½ berries deep and dries in seven to 10 days depending on weather/temperature conditions.*

showed considerable powdery mildew pressure, and would be difficult to manage without their very dry growing and harvest period.(ie in Sunraysia).

- Sunmaid south side system has had very little uptake due to no increased crop levels being observed.

The group were told that mechanisation was definitely on the increase, but this had been made more difficult by the wide range of growing systems in place and unique machinery required for each.

As a result they have adapted different levels of mechanisation for different operations. This has given them four distinct processes:

- Traditional hand picked and dried on trays
- Machine picked and dried on continuous trays
- Trellis dried on a wide 'V' trellis
- Trellis dried on the overhead pergola system

#### Pierce's disease

Pierce's disease is a major problem for the Californian viticultural industries. The bacterial disease is spread from vine to vine by insects known as Sharpshooters with the introduced species, Glassy-winged sharpshooters causing the most problems due to its ability to fly long distances. Affected vines die within three years of becoming infected.

There is no cure for Pierce's disease which only affects *Vinifera* species of vines. Native (non-vinifera) vines, some native trees as well as other crops such as citrus and lucerne and ornamentals such as oleanders provide an ongoing host source for the bacteria for the sap sucking insects to reinfect vines.

Researchers are working on resistant

vines to Pierce's disease using genetic modification (GM) technology; however this will take a number of generations to be accepted by consumers.

Pierce's disease is now centred in the Napa Valley, mainly due to the close proximity of the Napa river and other streams to vineyards providing a ready availability of host plants for the bacteria and access for the sharpshooters to infect vineyards.

A large area of vines around Anaheim was completely wiped out due to Pierce's disease.

There seems to be no Pierce's disease in the Fresno/Selma areas due mainly to the lack of host plants to harbour the bacteria.

"Australia is fortunate to be free from both the Pierce's disease bacterium

and the sharpshooter insects that spread the disease," Mr Hawtin said.

Mr Long added that it had always been suggested that the big risk was introducing the glassy-winged sharpshooter into Australia, but the real issue was introducing the devastating bacteria as Australia has insects that may be able to transmit the bacterium, should it be introduced here.

#### Water and environment

At present Californian growers have access to cheap reliable sources of water. Snow melt from the Sierra Nevada Mountains provides flood irrigation and replenishes the aquifer. Despite this, the water table is getting deeper beneath the soil, making it more difficult to pump for irrigation.

Mr Hawtin said during his informal discussions with growers they had revealed they were beginning to feel the influence of the environmental lobby and the US Government on water control and perhaps they would not be so fortunate in the future.

Another area of potential change could occupational health and safety. Mr Hammond said he saw little evidence of the simple things such as ear plugs/muffs, eye protection and dust masks when on the farm and there were no cab tractors or cabs on machinery.

This is vastly different to Australia and Europe where there is much attention



*Growers on the study tour inspect dried grapes on continuous paper. The dried fruit is picked up by a specialised machine and is transferred into bins on a following trailer.*





*Stephen Bennett and Peter Hammond take a close look at the dried fruit after it has been mechanically picked up from the continuous roll system of drying.*

to protecting those that grow the crop as those that eat it.

### US advantages

One of the real advantages of growing dried fruit in California was the climate.

As Mr Hammond put it, stable dry weather during harvest is an asset we (Australians) can only aspire to.

This allows them to harvest and dry fruit on the ground. And in the event that rain does fall most farmers have US Government-backed rain insurance for harvested fruit drying on the ground; it does not cover fruit left on the vine to dry.

"But it is more than just a dry harvest period that makes dried fruit production in this area so attractive. The rainfall season is predictable, with x millimetres falling when, and both water quality and quantity are more reliable than in Australia," Mr Johnstone said.



*Fresh Fiesta grapes hanging on overhead pergola trellis system at Kearney Agricultural Centre.*

"They also have deep well drained soils giving the ability to grow vigorous vines on their own roots."

Mr Long said direct comparison between Californian and Australian dried fruit industries was difficult.

"The Americans have traditionally produced fruit in a manner that suits their environmental conditions and product characteristics and this is quite different to what we

do in Australia," Mr Long said.

"Talking to growers I gathered there was an acceptance of some fruit loss, either spilt on the ground or not harvested. The introduction of better trellising and management of the crop would reduce the losses as the industry moves further towards mechanisation."

### Costs and labour

Labour was nearly half the cost as in Australia, and was readily available. Mr Long thought that this readily available pool of cheap outside labour could have been one of the reasons that the larger growers had failed to perfect processes as they were adopted.

However, the use of Mexican labour is diminishing as the availability is decreasing and there is evidence that labour costs are increasing, up to US\$100 per person per day. Mr Johnstone said it was not all plain sailing for US raisin growers.



*Harvester for pergola trellis system loaded with empty bins for harvesting into.*

"They are not subsidised by the US Government and are paid are about US\$1,500/tonne. This is much lower after several deductions including contributions to the reserve pool which funds their export marketing. With yields generally low, the end result is fairly low returns to growers."

### Conclusion

Mr Swain said the tour was a great success. "While we are two very different industries growing distinct products, we also have areas of common ground," he said.

"The Californian industry is facing very similar issues as Australia, the timing may be different, but there are many similarities including: comparative high labour rates, availability of skilled labour, water availability and the influence of winery uptake on the dried fruit production."

DG10001 'Study tour to California and International Dried Grape Conference' has been facilitated by Horticulture Australia (HAL) in partnership with the ADFA. It has been funded by voluntary contributions from industry: The Australian Government provides matched funding for all HAL's R&D activities.



*Harvester operating in overhead pergola trellis system.*



# *Growing dried grapes in California*

## *Part 1. A land rich in natural resources*

*By Ashley Johnstone*



The Californian raisin and Australian dried grape industries have many similarities and we can learn a lot from one another.

Of most immediate concern to California is the decline in production, currently about 2,424 hectares (6,000 acres) is lost each year. Compounding this is uncertainty about future water supply with agriculture competing against a growing urban population for this scarce resource. Labour is also becoming shorter in supply and as a result is getting more expensive.

### **Resources**

The San Joaquin Valley in Central California is the major food production area supplying much of the West of the United States. The valley has deep fertile soils, a warm to hot climate and a vast water source formed from the snow which falls in the Sierra Nevada mountain ranges in the state's East. Labour for the crops grown in the valley has been sourced mainly from legal Mexican migrants who have up until recently worked at a cheap rate.

### **Soil and geology**

The San Joaquin Valley comprises the southernmost portion of the Great Valley Geomorphic Province of California. The Great Valley is a broad structural trough bounded by the tilted block of the Sierra Nevada on the East and the complexly folded and faulted Coast Ranges on the West. The Eastern San Joaquin Sub-basin has sedimentary deposits that are bounded

by the Mokelumne River on the North and Northwest.

Soils in the Central Valley range in thickness from a thin veneer on the East side of the basin to over 46 metres (150 feet) near the centre of the basin. The soil's age varies from recent to Late Pleistocene and consist of sand and gravel in the fan areas while clay, silt and sand are dominant in the interfan areas. The deep soil in the central part of the valley is where the raisin area is situated. There is great potential to produce vines of high vigour necessary for the cultivation of dried fruit.

### **Water**

Approximately 90% of the state's water is collected from the snow melt from the Sierra Nevada Mountain range in the East. The demand for water is mostly in the South of California in the Los Angeles area which houses a huge human population. The mountains shed water when the snow melts and this water drains naturally through a network of rivers and out through San Francisco. Various state and federal projects divert water around the state in large canals. Water is also pumped from underground aquifers in addition to surface water.

Between 16 and 20% of the state's power consumption is used to pump water to the regions which need it. The

dams built at the turn of the century in California were initially set up to generate power and prevent flooding and not for water storage. All of the water going South (to Los Angeles) has to be pumped over the greatest lift in California. Energy is recovered in hydro-electricity as it moves down.

Presently the draw down in the Hoover dam is so low that they are thinking about shutting the water off. If they stop the water flow they stop electricity generation which supplies power to one third of California and Las Vegas.

The large metropolitan base is placing huge pressure on diversion of the water resource. Agricultural users are paying about \$40 per megalitre (\$50/ acre foot) to use their water right. Metro authorities are purchasing this water for about \$810/ML (\$1,000/ acre foot).

Some irrigators are selling their licences and reaping the immediate benefits; however the land which is no longer irrigated is turning into a dust bowl. The metropolitan areas have responded to the chronic dust problems and are now saying that those dry areas need to be watered to cut the dust.

Irrigated crops typically consume between 8.9 and 11.9ML/ha (3.6-4.8ML/acre) per annum. The season



*The beginning of one of the many canals which move water around California.*



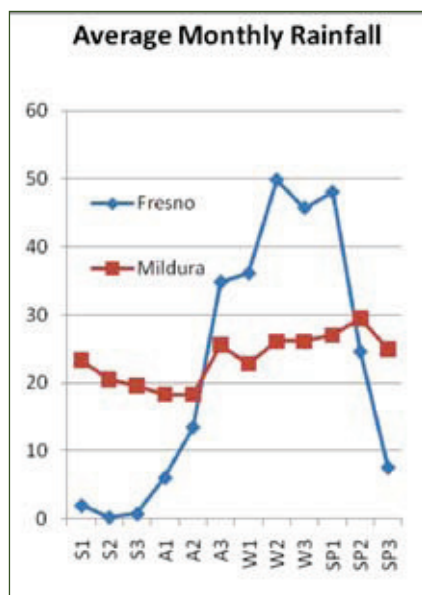


Figure 1: Comparison of average monthly rainfall in Fresno, California and Mildura, Victoria over the dried grape growing season.

can start as early as April but generally starts in early June and is completed at the end of August.

We observed vines mostly excessive in vigour and suspect over watering in most instances. A large proportion of the vines irrigated in the San Joaquin Valley were still flood irrigated. These vines generally were irrigated four to six times a year.

The sandy well drained soil lead to a high content of leaching through to replenish the water table, which in most part of the valley is a good source of water. Nitrogenous fertilisers have been discouraged by research scientists as the water in the aquifers contains plenty of nitrogen from previous N applications.

Salinity is generally not considered a problem through the valley. There is a 242,400ha (600,000 acre) patch of land on the Western side of the valley which has the high ground water table with a salinity of between 3,000 and 6,000ppm. The Americans have been investigating planting alternative crops tolerable of these high saline levels. Another strategy of handling this is to dilute the saline water with more fresh water and use as irrigation water.

The Californians are facing similar water issues to the irrigators in the Murray Darling Basin. Recent snow melts have not yielded the required water the state has been accustomed to and storages are deleting through over consumption. Great gains in water savings can be made through more efficient on-farm irrigation systems

and farmers changing their attitude towards implementing water savings.

Water is still cheap for them. Water trade has not yet needed to come about and the cost for irrigation is still only \$40/ML (\$50/ac ft). The heavy metropolitan demand is the greatest

challenge facing the Californians regarding pressure on this resource.

### Climate

An average of 279 millimetres (11 inches) of rain falls in the Central Valley. Rainfall is confined to the Winter, Spring and Autumn months (Figure 1). Very little rain falls during the Summer and early Autumn period. This is a huge advantage for drying fruit. As a consequence their drying method is to place the fruit on paper trays on the ground adjacent to the vine as there is little risk of it getting damaged.

Late Spring and Summer temperatures are also hotter in the Central Valley than Sunraysia (Figure 2). This would enable earlier ripening and a more rapid rate of drying fruit than what occurs here.

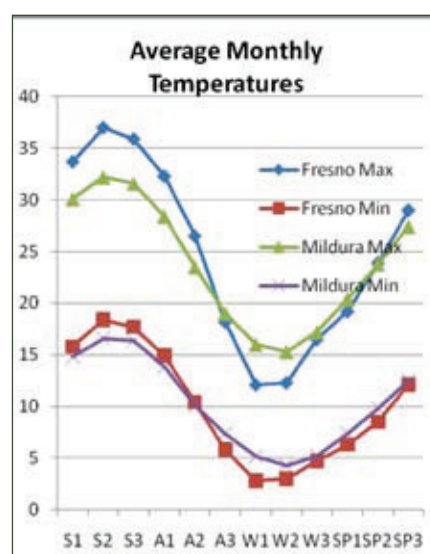


Figure 2: Comparison of average monthly temperature in Fresno, California and Mildura, Victoria over the dried grape growing season.



Cut Swingarm trellis at the Kearny Research Centre displaying the excessive vigour typically seen in drying vines.

### Labour

Most horticultural labour is sourced from Mexico. The labourers are generally legal migrants; however there is still an influx of illegal labourers during peak labour requirements. In recent times border security has tightened and this has stopped the flow of transient illegals who are afraid they might not be able to return to Mexico.

Agriculture competes for labour with the construction industry. Since the global financial crisis construction has slowed and made labour more available to the agricultural sector but this is soon to change with construction beginning to pick up again.

Workers are paid a minimum wage of \$8.52/hour. Piecework is used for many tasks in the dried fruit harvest. Typically each tray of grapes costs between \$0.25-\$0.30 to pick. Workers generally aim to earn \$100/day.

Illegal workers obtain work by getting illegal social security cards at the local flea market. They purchase these cards for \$25 each. Occasionally there are raids on illegal workers. If one is found the employer needs to terminate employment, however the illegal will show up the following day with a new name and social security card.

On the surface California seems an ideal location for dried grape production, but like so many horticultural areas, a number of external factors are impacting on the productive capacity of the land. In part 2 I will look more specifically at dried raisin production in California and marketing of that fruit.

Ashley Johnstone was the recipient of an Australian Dried Fruits Association (ADFA) scholarship for a young grower member to participate in a study tour of the Californian dried fruit industry.

# Growing dried grapes in California

## Part 2. The raisin industry

By Ashley Johnstone

California's raisin industry is made up of about 3,000 growers covering 84,840 hectares (210,000 acres) of vines. The crop usually yields 300,000 tonnes each year, of which two thirds is consumed domestically and a third exported.

In the last ten years vineyard area has declined by more than 20% as vines are removed to plant other crops, mainly almonds. However total crop size is unchanged over that period due to productivity increases by the remaining raisin growers.

### Traditional harvesting methods

Traditionally raisins are hand picked and the fruit spread on a paper sheet laid on the midrow to dry and this remains the main method of harvesting (55%) in California.

To maximise drying the midrow has been cultivated and the soil graded with a slope facing the sun.

The fruit usually takes 10-20 days to dry and is then rolled into a small parcel and left in the sun for a further three days to even up the moisture content between the grapes and complete drying. The fruit is then picked up, emptied into a bin and sent to a packer.

Traditional harvesting methods are very labour intensive. Picking costs range from \$0.25 to \$0.30 per tray, with

workers aiming to pick 300 trays for the day.

While this style may have been successful in the past, labour is becoming a real issue. Picking costs are high, equating to about \$1270/ha (\$500/acre) and the labour pool is less reliable as authorities crackdown on border control and Mexican migrants (legal and illegal) alternate between construction and horticulture industries.

As a result growers are investigating other forms of harvesting and about half the region is making some attempt at mechanisation.

### Continuous tray system

About 30-35% of the industry has adopted the continuous tray system. The system was developed to reduce harvesting cost and uses a mechanical harvester to pick and then disperse fresh fruit onto paper in the midrow to dry.



*The crown of the vine trained to pergola trellis showing summer-pruned fruiting canes on the right and replacement canes growing on the left.*

To assist the harvest, canes are cut two to three days before picking. This allows the rachis to dry, which makes it fragile and easier to harvest.

The harvester travels at speeds of four kilometres per hour (2.5 miles per hour) and is joined by a towed hopper in the adjacent row. The harvested fruit is discharged from a chute into the hopper which lays it evenly on paper in the adjacent row. The thickness of fruit on the paper is thinner than the traditional method, so it dries quicker. The fruit is picked up by another tractor-towed implement which shreds the paper as it passes.

### Trellis drying systems

Only 10-15% of growers have adopted trellis drying systems where the fruit is dried on the vine. Two main systems are in place – the pergola system and an open gable system.

**Pergola system.** The trellis for this system consists of wires suspended 1.8 – 2.0 m above ground spaced 500mm apart in both directions (running with the row and across the row) The canopy grows on the wires to form a full cover. Equipment needs to travel under the trellis. In winter the cropping canes are grown on one side of the vine and the vacant side is left for renewal canes. Cropping alternates from side to side between seasons.

Most of the pergola trellises we saw were head and not cordon trained.

Well set up properties were achieving high yields of around 4 t/acre.



*Tour members inspect the pergola trellis.*





*Dried Selma Pete on pergola trellis picked with a specialised harvester.*

Disease would be a problem in the Sunraysia climate as the microclimate under the pergola does not allow good air circulation.

Open gable system. Vines trained to the open gable system have quadrilateral cordons on a narrow T configuration. Fruiting canes are taken from these cordons and are arched over foliage wires held on V-shaped trellis heads.

The open gable has been designed to enable mechanical cutting of the canes; however few growers have actually mechanised this process.

### **New drying varieties**

The raisin industry has been based predominantly on Thompson Seedless, but new varieties are being developed to address some of the disadvantages of Thompson Seedless.

Breeders are now selecting for high yielding vines that ripen earlier and dry darker. Other desirable characteristics are powdery mildew resistance, spur fruitfulness, loose bunch structure and a natural ability to dry on the vine.

Recent outcomes of the breeding programs are Selma Pete and Fiesta, and these are now planted commercially.

Selma Pete is compatible with mechanical harvesting, matures to 22-24% sugar, has a finer wrinkle, ripens approximately three week earlier and crops heavier than Thompson Seedless. It seems to be the favoured variety now for new dried fruit plantings.

### **Pierce's disease**

Pierce's disease is a deadly disease of grapevines. It is caused by the bacterium *Xylella fastidiosa*, which blocks the xylem, the vessel that conducts water around the plant. As a result symptoms include chlorosis and scorching of leaves; entire vines will die

after one to five years.

The bacteria are spread to other vines by xylem-feeding leafhoppers known as sharpshooters.

Pierce's disease is known to occur across the US, from Florida to California, and can also be found in Central and South America. It is less prevalent where winter temperatures are cold, such as more northern areas, high altitudes and inland areas.

***“Only 10-15% of growers have adopted trellis drying systems where the fruit is dried on the vine.”***

Management and control. Once the grapevine is infected with the pathogen there is no known cure for the disease.

The disease is not thought to be spread through grapevine propagation. If an infected scion bud was grafted onto a rootstock, the bud would die.

Management has focused on control of

the vector through removal of their over-wintering habitat.

Riparian zones along the banks of rivers and creeks are important for soil stabilisation and habitat diversity, but they also contain plants such as wild grapevine (non-Vinifera type) and blackberries which host sharpshooters. Environmental considerations prevent clearing of some riparian zones, and where permitted, can be a costly exercise. As a consequence viticulture has been abandoned on land alongside riparian zones simply because control of the sharpshooter, and hence Pierce's disease is too difficult.

The best way of controlling the disease is through developing resistance in the vines. Genetic modification (GM) provides the best result in resistance breeding, however the technology is not accepted by all segments of the community and growers may run the risk of growing fruit they are unable to sell.

Traditional plant breeding has resulted in strains that are 94% resistant to Pierce's disease. Small commercial plantings of these varieties have been planted, but these new resistant varieties do not carry all the quality traits of traditional varieties and as a result there has been a reluctance to adopt the new resistant vines.

Californian Raisin Marketing Board

The Californian Raisin Marketing Board (CRMB) has been set up to support and promote the increased use of raisins grown in California.

■ continued on page 38 ■



*Fresh fruit is harvested from summer-pruned vines and fed via a hopper onto continuous paper in the adjacent row for drying.*

■ continued from page 37 ■

The CRMB is an elected committee consisting of 35 growers, 10 handlers, 1 Raisin Bargaining Association (RBA) member and 1 public member. Ten of the growers also pack their own fruit. Members serve on the committee for a two year term.

As the country's leading authority on raisins and an advocate for its members, the board is responsible for disseminating information, promoting Californian-grown raisins to all relevant customers and recommending programs for research by the US Department of Food and Agriculture (USDA).

To fund its operation the CRMB collects a levy which was increased to \$15 per tonne in September 2010. This raises about \$4 million annually.

In the past the board has maintained a two-price system for export markets. The purpose has been to stimulate world sales of Californian raisins and has always been 100% funded by California raisin growers. It has been very successful, with export sales up nearly 50% in four years. This, combined with a decline in the RAC inventories of natural seedless raisins led the CRMB to discontinue the program and as a result levies have doubled.

### Fruit prices

The diversion of fruit to the wine industry seriously competes with the raisin industry. This is the biggest variable in production. This season the price paid for raisins should mean they are profitable. This will slow the grubbing of vines in favour of other crops.

The 2010 raisin price negotiated by the Raisin Bargaining Association (RBA) is forecast to be \$1,500 per short tonne (approx 900 kilograms). This price



*Allan Long and Ivan Shaw inspect dried fruit on continuous paper as the machine approaches to pick it up.*

comprises a Base price of \$1376, plus a moisture bonus (if fruit is 10% dry) of \$40; a maturity bonus of \$40; and rebates for container rental (\$21), transportation (\$10) and inspection (\$13).

***“The diversion of fruit to the wine industry seriously competes with the raisin industry. This is the biggest variable in production.”***

The forecast 2010 price of \$1,500 is an increase of \$177 or 13.4% on 2009. It is a far cry from the 2002 season where growers received only \$745/short tonne, the lowest price for many seasons. Packers make an initial payment of 70% of the RBA price for all deliveries within 15 days of a grower's final delivery. The final payment is paid before 28 February.

### Conclusions

The Californian raisin and

Australian dried fruit industries faces similar problems.

Uncertainty about future water supplies and a labour pool that is costly and becoming shorter in supply have seen many growers leave the industry. The CRMB estimates about 2424ha (6,000 acres) of raisins are converted to other crops each year.

Remaining growers have been able to maintain the region's total yield by productivity gains. This has been largely through significant advances in mechanisation, with further innovation and adoption the way of the future. Selection of new varieties with desirable traits will help growers achieve productivity and profitability goals.

The market expects a Californian raisin to be a naturally dried Sultana type. The industry produces 5,000t of a 'Golden' raisin which has been sulphured to give it that light colour.

Californian growers are capable of producing a light Sultana type that the Australian industry strives to achieve, but they're markets are not suited to this product.

Australia should not feel threatened by the Californian industry as the two counties produce very different products. Instead we should use our contacts and learn from one another.

*Ashley Johnstone was the recipient of an Australian Dried Fruits Association (ADFA) scholarship for a young grower member to participate in a study tour of the Californian dried fruit industry.*



*A typical paper tray of fruit drying to produce Thompson Seedless Raisins for the Californian market.*