



It's official - Mareeba holds the record for the largest guacamole dip in the world. More than 5000 Shepard avocados formed part of this 1000 litre dip.

- Technology exchange within the industry
- Wanted - input from growers
- GMO - Facts and issues
- Some thoughts on eliminating Dimethoate

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Calendar of Events

March

- 15 **Bundaberg & District Orchardists Association** - meeting Fruit & Vegetable Growers' Office, Barolin St. Bundaberg commencing 7.30 p.m.

April

- 4 **Avocado Growers' Association of WA** - meeting Conference Room, Market City, commencing 5.30 p.m.
- 19 **Bundaberg & District Orchardists Association** - meeting Fruit & Vegetable Growers' Office, Barolin St. Bundaberg, commencing 7.30 p.m.

May

- 17 **Avocado Growers' Association of SA** - AGM and Seminar at the Waikerie Club commencing 9 a.m. Mr. Jan Toerien, a world leader in canopy management, will be the guest speaker.
- 17 **Bundaberg & District Orchardists Association** - meeting Fruit & Vegetable Growers' Office, Barolin St. Bundaberg, commencing 7.30 p.m.
- 31 **Tamborine Mountain Ag Show 2000** - commencing 8.30 a.m. (See box page 7).

June

- 6 **Avocado Growers' Association of WA** - meeting Conference Room, Market City, commencing 5.30 p.m.
- 21 **Bundaberg & District Orchardists Association** - meeting Fruit & Vegetable Growers' Office, Barolin St. Bundaberg, commencing 7.30 p.m.

Front Cover:

Suzanne Denyer (left) and Irene Kernot of DPI Mareeba Centre for Tropical Agriculture with their trophy—proof that the guacamole making effort they organised during Primary Industries Week last year produced the world's biggest avocado dip.

Back Cover:

Top - The largest guacamole dip in the world arriving at Mareeba Plaza, Mareeba.

Bottom - The department of Primary Industry team with their caldron of guacamole.

Editorial

— Orf Bartrop

It is not very often that I put pen to paper but on this occasion I feel a few words should be said. Some of the subjects mentioned below are dealt with in more detail in other parts of this magazine.

It is with deep regret that I heard of the passing of Ross Richards. Ross worked tirelessly for the industry and will be especially remembered for his efforts as an AAGF Delegate and with avocados at the Adelaide Royal Show. A great gentleman - thanks Ross.

I have heard several people say that with the beginning of a new decade, century, millennium, "It's a great opportunity to start out afresh". Avocado growers will be well aware that problems of the last decade, century, millennium have not disappeared just because three noughts appear in the date. They are all still there, all those pests, diseases and marketing blues have not gone away.

Some of the articles in the last issue caused some controversy. The letter on phosphorous acid had many growers on the phone trying to determine if their supplies were useable. Unfortunately, no one used the QDPI AUSSIE-AVO-NET Discussion Group to raise the subject and get the specialists to sort out the problem. Did you get the message that appeared on the Discussion Group net about NRA inspectors examining Queensland and NSW properties for breaches of regulations in the handling of endosulfan? Come on growers; embrace this new technology. Information that could be a life saver is available in hours instead of having to wait months to read it in this magazine. The greater the number of growers that use AUSSIE-AVO-NET the more benefit those growers will get from the discussion group.

Another article that raised the ire of several people was the report on the NSW field day address given by Graeme

Sait of Nutri-Tech. I must draw readers' attention to the fact that the article was a report of what was said at a field day and was not a scientific paper. Granted, growers at that field day had the opportunity to question the presenter, where readers of this magazine did not. However, one should assess the content and make up one's own mind.

Some criticism was aimed at the validity of what was printed. To them I say: Remember when scientists (dietitian) preached that avocados contained too much fat to be healthy. Remember when scientists said that applying phosphorous acid by spray was a waste of money. Remember when scientists said that alcohol was bad for you. Definitive knowledge only progresses because people put forward information to allow research to prove it right or wrong. What was right yesterday may well be wrong tomorrow. To that end, I would be interested in hearing from anyone who has tried the Nutri-Tech scheme.

Genetically modified organisms have been in the News of late. In this issue the subject has been addressed together with the "clean green" image. You be the judge—I think the jury is still out on this one.

Some growers have ventured into organic farming. Some have succeeded so far, other have given up. I am endeavouring to get information on organic avocados and if I am successful, you can look forward to an article or two in the future.

Last year, four enthusiastic avocado delegates went to the World Avocado Congress. They took the opportunity to visit other places and increase their knowledge of the industry. They have published a 170 page report of their trip, which is available from the HRDC. In this issue I have reproduced some of their findings, hopefully a few more will appear in future issues.

From Your Federation

By Astrid Kennedy, Executive Officer



TA Survey

Talking Avocados is your Federations primary communications vehicle and our aim is to provide growers with information and updates on matters that impact on the industry with emphasis on those areas funded by the National levy system.

The December issue included a reader survey designed to indicate whether or not the magazine is achieving its aim and I am pleased to report that the vast majority of respondents are satisfied with TA. Thank you to the growers and other readers who participated. Your feedback and comments are valuable to us particularly those relating to the types of articles and specific topics you want to see published in future editions.

A summary of the responses is listed below and your comments and suggestions will be forwarded to the editor, Mr Orf Bartrop, to use as a content list for future editions.

- 92% of respondents were growers.
- 54% read all the articles in detail.
- 35% read only a few articles and the remainder skim through.
- Approximately 36% of all respondents agreed and 54 % strongly agreed that TA is informative, interesting to read and relevant.
- 31% agreed and 52% strongly agreed that they like the layout of the magazine.

- A large number of respondents wanted to see more "on-farm" articles, for example pest control, pruning, nutrition and organic growing to name a few.
- A few respondents requested more marketing information and research data.

On behalf of the Federation I thank the survey participants for sparing the time to complete and return the survey.

Meetings

The next round of Federation meetings is scheduled for March and April. The R, D & E Subcommittee will meet on 20 March and the Conference Steering Committee the next day, 21 March. Both of these meetings are in Bundaberg. Your Federation has its next Board meeting on April 4 and 5 with an introduction for new Directors on Monday 3 March.

Conference 2001

The location is Bundaberg, the year is 2001, the time of year is early June and the Conference 2001 Steering Committee is meeting with their New Zealand counterparts in Bundaberg, in March, to start the planning process in earnest.

Horticultural Industry Alliance

Past editions of TA outlined the rationale, process and proposed structure for the new service provider for Horticulture.

Meetings around the country were held where growers were consulted and their feedback noted.

For those readers who have not followed the debate, the rationale behind the alliance is to get the business of horticulture service management away from Government and back in the hands of Industry. The AHC/HRDC amalgamation process to form a single service provider for horticulture is now underway.

- a. A submission has been prepared and went to Cabinet at the end of February,
- b. The implementation team is currently preparing:
 - (1) A Deed of Agreement between Government and the new Company (whilst the new company will not be a statutory authority like the AHC and HRDC it will still be responsible for government funds).
 - (2) A template Memo of Understanding between the new Company and each commodity.
- c. This process is expected to be completed by June/July and the new company should be launched in September/October.

Vale - Ross Richards

The Avocado industry lost one of its stalwarts with the passing of Ross Richards on 11th February 2000.

Following a successful career in the oil industry, Ross and his wife Shirley purchased a rundown citrus orchard near Renmark in the early 1980's. They then set about establishing a productive avocado and persimmon enterprise. Ross joined the AAGF Board as the South Australian representative in 1984 and held that position until his retirement in March 1999.

As a member of the Varieties Committee for some 14 years, Ross was a strong supporter of work to evaluate salt tolerant rootstocks and the Gwen variety. Ross's marketing experience and expertise, and his contacts in the scientific community, were greatly appreciated and utilised by

the AAGF, particularly prior to the involvement of the industry with the AHC and HRDC.

Ross was Vice-President of the AAGF for a number of terms. He served for a number of years on the Avocado World Council and was Australia's contact for the California Avocado Society in recent years.

Ross will be remembered as a strong supporter of the Avocado industry at both a local level in SA and at national level. His many friends around the International avocado industry will remember his sense of humour and his capacity to enjoy the social side of the industry.

Ross also made a large contribution to the development of the sweet persimmon industry. He was a foundation member of the Australian Persimmon Export



Company which successfully markets persimmons in Asia from throughout Australia.

His partner in all his endeavours, Shirley, and a family spread around Australia, survives Ross and the industry offers them our condolences and best wishes for the future.

An additional major step is yet to be completed by Industry and that is that industry leaders must meet soon to discuss and clearly outline what services are required and what are the expectations from horticulture's newest service provider.

Peak Industry Forum

There is strong support for the proposal to establish a Peak Industry Forum but as yet the necessary funds have not been forthcoming. This organization, when it get off the ground, will be Horticulture's voice to Government. It will deal with such issues as GST and how it affects horticulture, World Trade matters, agropolitical issues and the like and will include the views of all sectors of horticulture including retailers.

The implementation team was due to present its final report to industry at the end of February and as of 15 February financial commitment from a number of proposed members had been received; unfortunately however, not enough to establish the proposed organization. The implementation team is now investigating alternative funding options.

Statistics

Whilst preparing the Market Access submission "Avocados to the US" I used statistics from the major growing regions in Australia and reproduce them here as an item of interest. The statistics in table 1 (below) were compiled from the 1997/98 Australian Bureau of Statistics Commodity Survey.

Avocados to the US

Your Federation has identified a window of opportunity to export fresh avocado fruit to the United States of America during the months of July to December.

Traditionally, the California region has supplied the US with most of its fruit, however they are under threat from water restrictions and urban encroachment. Their production is expected to decrease from 214 million pounds to 128 million pounds over the next five years. The US will be forced to import a significant amount to meet its requirements.

Production in Australia is increasing steadily from 15,600 tonnes in 1995-96 to 25,000 tonnes in 1998-99 and a forecast of 28,000 in 1999-00. The bulk of the extra fruit is harvested in the July-December period. The AHC Market Access Committee meets at the end of February and will consider the industry's submission at that time.

Table 1. 1997/98 ABS Survey by Major growing region.

REGION (Major growing areas)	TREES		TOTAL
	Under 6 years old	Over 6 years old	
WA Perth Metropolitan	8,137	29,807	37,944
WA South West	12,298	17,768	30,066
Sunraysia	63,263	59,143	122,406
NSW Lower North Coast	40,760	19,819	60,579
NSW Central Coast	15,000	10,000	25,000
NSW Far North Coast	24,595	60,087	84,682
Mt. Tamborine	6,695	27,629	34,324
West Moreton	17,602	38,407	56,009
Qld, Near North Coast	50,810	80,961	131,771
Qld, Bundaberg	81,289	64,716	146,005

Table 2. Australian Tree Numbers & Production

Year	Trees Under 6 Years old	Trees Over 6 years old	Total	Production Kg
1994/5	200,000	400,000	600,000	16,539,384
1995/6	219,540	387,053	606,593	15,640,090
1996/7	301,973	440,324	742,297	20,072,277
1997/8	363,996	457,644	821,636	23,173,589
1998/9	Estimate	<i>(ABS data not yet available)</i>		25,000,000
1999/0	Forecast			27,750,000
2000/01	Forecast			30,000,000

Talking Avocados Policy

State Round-Up

The "State Round-Up" section of this magazine is designed to publish news and information pertinent to a region that may be of interest to growers elsewhere in Australia. Subjects suitable for inclusion are crop forecasts including conditions which may effect production, local events, successful field days, workshops, industry promotions, district or Branch activities, and items of interest relating to avocados or other crops.

The "State Round-Up" section is not the section for promoting individual businesses, nurseries, packhouses or airing gripes or grievances.

The accepted and polite procedure for gripes or grievances is to contact your representative to the AAGF, and/or write to the AAGF Executive Officer or AAGF President, or if there is no response after the next AAGF Board meeting, go public in the "Have Your Say" section of Talking Avocados.

Have Your Say

The "Have Your Say" section of Talking Avocados is for any item which you want to bring to the attention of your fellow growers or matters on which you want to generate general discussion. Names and addresses should be included as anonymous letters will not be printed.

Author's Name

Any article published that does not have the name of the author is either a media release, written by an AAGF Board member, the AAGF Executive Officer or by the editor of Talking Avocados. All other articles are required to show the name of the author or a nom de plume.

Advertisements

If you are an avocado grower and want to buy or sell an item, then you can place a free advertisement in this magazine.

Endosulfan Audits Commence In NSW And Queensland Coastal Areas

Sellers and users of the pesticide endosulfan in the coastal areas of northern NSW and southern Queensland are being audited as part of ongoing work to ensure compliance with tough new requirements introduced last year.

National Registration Authority for Agriculture and Veterinary Chemicals (NRA) inspectors and NSW and Queensland control-of-chemical-use officers began the audit on Monday 21 February to ensure compliance with the new legislative requirements that came into effect on 1 October last year. Endosulfan is mostly used on tropical fruit crops in these areas.

NRA inspectors will audit Endosulfan resellers on the coastal areas of northern NSW and southern Queensland. They also will work with officers from the Queensland Department of Primary Industries (QDPI) and the NSW Environment Protection Authority (EPA) to audit Endosulfan users and spray contractors.

"Monitoring and evaluating the effectiveness of the new requirements was one of the key outcomes of the NRA's review of Endosulfan last year," the NRA's Head of Surveillance and Enforcement, Mr Stephen McDonald, said.

The audits follow an intense round of reseller and user audits in the major cotton

growing areas of NSW and QLD earlier this summer.

Of particular interest to the inspectors will be that:

- Endosulfan has been supplied only to users with ChemCert (Farmcare) certification or a State authorised chemical applicator's licence;
- Sales records are correct, including verification that each purchaser holds acceptable accreditation and a certificate number;
- An Endosulfan user's notice is displayed at the point of sale; and
- All Endosulfan products carry the new label approved by the NRA.

"These requirements are just part of the new safeguards put in place to ensure Endosulfan doesn't adversely affect workers, the environment or Australia's trade," said Mr McDonald.

"Extensive audits have been conducted in the cotton growing areas but all users of Endosulfan products must follow the new label directions. Unless there is significant commitment to follow the new directions, further control measures on Endosulfan use will be needed."

For further information or to arrange an interview with Mr McDonald or an NRA inspector, please contact Joanne Branson at the NRA on 02 6272 3797.

Phosphorus Acid Update

Geoff Eldridge's letter to the editor in December TA raised the issue of the stability over time of phosphorus acid and caused considerable concern amongst growers. In an attempt to clarify the situation, at the end of February the situation is:

- Food and Agricultural Labs Australia have tested more than 10 samples from concerned growers and all have been found to be within the expected concentration range. One sample drawn from a half full 200 L drum that had been stored for 12 months tested above the label formulation of 40% a.i.
- The Queensland Horticulture Institute is conducting a stability test over time of full and partially full containers with regular monitoring of concentrations. To date no significant differences have been observed.
- A number of chemists were consulted as to the likelihood of a problem. All agreed that there should not be a problem of stability with phosphorous acid. However, that would obviously depend on the conditions under which the product was stored e.g. resealed container, out of direct sunlight.
- The NRA was asked to supply information on the product's stability, which is normally supplied at the time of registration. To date the information has not been received.

FarmBi\$ Scheme Boosted

Commercial growers of avocados may qualify for a 90% FarmBi\$ rebate on the \$250 price of the AVOMAN software if training is undertaken.

The Queensland Rural Adjustment Authority (QRAA) is offering a 90% rebate on the total price of eligible agricultural software till the end of June 2000 to a maximum of \$500.00 per applicant. After 30 June 2000 the rebate will be reduced to 75% of the cost of the software and training.

Significant enhancements to the FarmBi\$ program have increased access to training and business development funding including boosted FarmBi\$ grants to cover 90 per cent of the cost of learning activities and professional advice.

Building the business of farming is the focus of FarmBi\$, a scheme which offers

funding assistance to primary producers who seek to build on their financial management and business skills.

This assistance is only available to Queensland farmers and the applications can be downloaded from the web site.

For further information contact:

QRAA

Freecall: 1800 623 946,

Ph: 3370 0120

Fax: 3370 0180

E-mail: www.qraa.qld.gov.au

feedback@qraa.qld.gov.au

or

Simon Newett, DPI

Ph: 07 54 412211,

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Australian Round-up



Death of Ross Richards

A prominent grower and past President of SAAGA, Ross Richards, died on 11 February after a couple of years of poor health. He will be missed, not only as a generous person but also for his knowledge of avocados and the people involved in the industry. The thoughts of the growers go out to Shirley and the family at this time of loss.

Crop Forecast

As reported in the last TA we had a good set of all varieties this year after a good crop of Hass last season. February has been very hot with many days around 40°C with a few reaching as high as 45°C.

There has been a fair summer drop on all varieties but it still looks like an average to heavy crop for this season.

Coming Events

There will be an avocado stand at the Karoonda Sheep Days (7-8 April) with tastings and avocado sales as well as the delight of talking to the many interested people who attend.

Our AGM and Seminar will be held on 17 May at Waikerie starting at 9 a.m. at the Waikerie Club. The Guest Speaker, Jan Toerien, will talk on Total Canopy Management. After lunch it is into the field for a practical look at how trees should look and various ways to accomplish this. At the end of the day there will be a BBQ for those who wish to stay and talk before heading home.

For catering purposes, those attending please call Colin Fechner on 08 8541 2819 or Greg Liebig on 08 8541 2174.

Mount Tamborine

Most farms on Tamborine Mountain have achieved an above average fruit set this season and some growers have had to push their trees very hard to get sufficient leaf flush to cover their fruit.

With the exception of a few days, we have had a very cool moist summer that has greatly reduced sunburn pressure on exposed fruit.

New Technology

Some of our larger farmers have embraced new pruning techniques and the use of plant growth regulators to assist in fruit set. I expect that this will assist in the biennial bearing of some farms and increase the over all production by about 30%.

The down side to this is, that farms are locked into very strict time programs, and have to harvest by the calendar, and not to suit market conditions.

Farms have already booked large pruning machines to do their cutting, so fruit will be picked as soon as it is mature in June, July and August.

Even though our farmers are quick to embrace new technology, it is our industry that will ultimately control the future of our farmers. With the pressure of quality,

safety and environmental standards increasing, only the best managed industry and businesses will be able to survive.

Having said that, December's Talking Avocados shows up to 44% of the fruit that we are trying to sell on the supermarket shelf is of unacceptable quality and has been for at least the last 6 years. If we, as an industry, fail to get our act together very quickly, farming avocados

on Tamborine Mountain and other areas has a very short future.

West Moreton

The region has enjoyed a summer with moderate rainfall to date and with the exception of three days in late January, the temperatures have been mild and ideal for avocado fruit development. The heat wave in January caused significant losses through sunburn in some orchards and excessive fruit drop throughout the area. Given that most orchards have had a heavy fruit set the jury is still out on the final crop size. The moderate conditions and the lower fruit numbers should enhance fruit size.

Atherton Tablelands

Wetter than wet is the only way to describe the Tablelands at present. Walkamin Research Station has had in the vicinity of 850 mm during February, some areas a little more, some a little less.

The cold weather on the Tablelands during Shepard flowering resulted in a poor set on the upper Tablelands and a lighter set elsewhere, while the Hass seems to be a reasonable crop. The Shepard harvest was already being hampered with continuous showery weather before the arrival of cyclone Steve. To date there haven't been any reports of damage to orchards from the wind but there's no doubt the heavy rain will take its toll. The grubs are having a field day.

The township of Kuranda looks like a battlefield with branches down everywhere while several homes in Mareeba and along the Barron River were flooded. Reports of farmers losing farm machinery aren't uncommon. Many sugarcane crops are flat on the ground and pawpaw and banana have toppled over. To date the avocado industry seems to have fared well—time will tell.

Bundaberg

Bundaberg is anticipating a good crop again, although Shepard yield will be down on last season. The heat wave of late January didn't miss us, and was responsible for some late fruit drop and sunburnt fruit.

Apart from that one very hot spell the summer has been notably cool which should result in a good proportion of larger sized Hass.

As usual, we seem to be missing out on the abundant rains, our water storage is still languishing at just 14% of useable capacity.

TAMBORINE MOUNTAIN

AG SHOW 2000

OPEN TO THE PUBLIC
8:30 a.m. till 5:00 p.m. on
Wednesday 31st May 2000 at
The Tamborine Mountain
Showgrounds
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Wanted - Input From Growers

Most avocado growers will experience difficulties with their farms at some stage of avocado production. If you are one of these growers, how about you share your problems with other growers? And if you found a solution, how about you share that with other growers as well?

There are two ways you can do this, either write, fax or e-mail the editor of this magazine or post a question or statement on the AUSSIE-AVO-NET. So that everybody can benefit from your experience, why not use both options?

Contacting the Editor

You can contact the editor by post by addressing your letter to Talking Avocados, 28 Nicholls Street, Devonport, Tasmania 7310, or by faxing 03 6423 3917. Better still, use the Internet and E-mail: orf@southcom.com.au.

AUSSIE-AVO-NET

For those who are unfamiliar with the AUSSIE-AVO-NET, it is a free avocado growers discussion group on the Internet set up and hosted by the Queensland Department of Primary Industries. Subscribers can send an e-mail message to the discussion group host computer and automatically that e-mail will be sent to all other subscribers.

Subscribing

For those with access to the Internet, to subscribe all you have to do is to log on to the Internet and from your browser log on to: [Http://lists.dpi.qld.gov.au/AUSSIE-AVO-NET.html](http://lists.dpi.qld.gov.au/AUSSIE-AVO-NET.html)

To join the group as a full member click on "Join or leave Avocado growers discussion group". Fill in your e-mail address and name and select the type of subscription required (usually regular). In the "Mail header style" select "LISTSERV-style, with list name in subject" and for "Acknowledgement" select "Receive copy of own postings". Now click the "Join the list" button. The selections can be varied to suit individual needs but these settings are a good way to start if you are unfamiliar with what is required. You will receive an e-mail from the discussion group host computer asking you to confirm your subscription. Replying to this e-mail will finalise your subscription.

Once you are a subscriber, you can post questions or make statements that will be received automatically by all other subscribers to the discussion group. Messages from other subscribers will arrive in the form of an e-mail and can be handled the same way as any other e-mail.

If you are not a subscriber, you can access archived material that has already been posted to the group but you will not be able to post your own question, for that you must subscribe.

Automating Netscape

Receiving Messages

For those using Netscape Communicator as a web browser, you can set up the browser to automatically save discussion group messages in a separate folder. Here's how it is done:

1. Go to the "Netscape Folder" window.
2. In the "File" drop down menu click "New Folder".
3. Type in the name of the new folder, such as "Avocado Discussion". Make sure "Local Mail" is selected in the "Create as subfolder of" box. Click "OK".

A new folder will appear just under the "Trash" folder.

Next the browser has to be set up to automatically put incoming messages into this new folder. To automate this procedure:

1. Click the "Edit" drop down menu and click "Message Filters".
2. On the right hand side of the "Message Filter" window is a "New" button. Click this button.
3. The "Filter Rules" window will appear. Type in the name of the filter "Avocado Discussion".
4. Select "Match any of the following".
5. Change the word "subject" to "to".
6. At the right hand end of that line is an empty box. Click in this box and type "AUSSIE-AVO-NET@LISTS.DPI.QLD.GOV.AU", without the quotes.
7. In the next line, in the box that is after the words "move to folder", select the name of the new folder that you just created "Avocado Discussion" (by clicking the downward pointing arrow and highlighting the new folder).
8. Click "OK" twice and the windows will close. Now new discussion group messages will be automatically stored in the new folder. The folder will have its name displayed in bold print whenever there is a message to be read.

Viewing Messages

So that the new folder is not cluttered up with messages, it can be made to show only unread messages. To do this:

1. In the "Netscape Folder" window click on the "Avocado Discussion" folder and go to the "View" drop down menu.
2. Point to "Sort" and click on "by Thread".
3. Go to the "View" drop down menu again and point to "Messages" and click on "Threads with Unread".

Now only new messages and those dealing with the same subject will be displayed.

Sending Messages

Subscribers can send, or post, messages to AUSSIE-AVO-NET by e-mail. From your browser:

1. Click on the "New Msg" icon or "Reply" icon if replying to an e-mail.
2. In the "To" box type: AUSSIE-AVO-NET@lists.dpi.qld.gov.au (it is a good idea to save the address in your address book for future reference).
3. In the "Subject" box type the subject you wish to discuss (i.e. Fertiligation).
4. In the body of the e-mail type the question you would like answered.
5. Run the spell checker by clicking on the "Spelling" icon. Correct any problems.
6. Click the "Send" icon.

Your question will now be e-mailed to all other subscribers and hopefully someone will be able to supply a satisfactory answer. Avocado specialists monitor the discussion group so if all else fails, one of them should come to your rescue.

Internet Explorer

For those who use Internet Explorer as a browser, you will find it works in a similar manner to Netscape. All the features may not be there but from the forgoing you should be able to work out how to set up the discussion group and how to use it.

The Bottom Line

The success of AUSSIE-AVO-NET will depend on how many growers use the discussion group. With a large subscriber list comes a wealth of knowledge and an abundance of questions. Who knows, you may even learn something about avocados just from monitoring the discussion group!

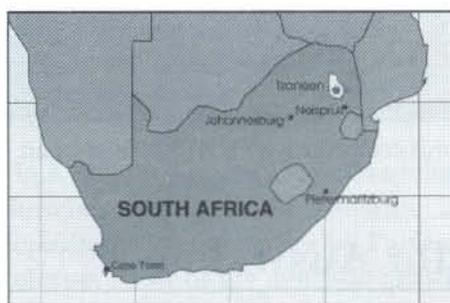
A warning of a forthcoming audit of some growers by the NRA for endosulfan storage and handling was posted on the discussion group. Were you forewarned and given an opportunity to ensure your farm was in order? Next time it might be the tax man!

Technology Exchange Within The Avocado Industry

By Simon Newett and Geoff Waite, QDPI Nambour, Chris Searle, QDPI Bundaberg, and Alan Blight, AAGF R&D Committee, Western Australia

The authors of this report attended the World Avocado Congress in Mexico last year as well as visiting two other countries. This article covers a few of the aspects of their report. However, to gain the most from their trip, their report should be read in its entirety.

South Africa



Simon Newett was invited by the South African Avocado Growers' Association (SAAGA) to visit that country to demonstrate the AVOMAN software program and train a number of their growers. SAAGA is currently evaluating the program for possible purchase by their industry. Whilst in South Africa Mr Newett took the opportunity to investigate their new canopy management system and their clonal propagation techniques.

- Seven growers and two SAAGA staff were trained to use AVOMAN, their interest is keen and they continue to evaluate it on farm.
- Good communications have been established with SAAGA technical staff.
- A number of Westfalia and ZZ2 orchards were visited with leading horticulturists to investigate a canopy management system which is proving very successful in South Africa. The system is a total management concept that requires a high level of orchard management and involves pruning in winter and summer and the strategic use of growth regulants. Observations of the success of this system will create greater interest from Australian growers in the trial work currently being conducted in Australia by Dr Whaley and assist in the adoption of a similar system customised for our conditions.
- Time was spent at the Westfalia and Allesbeste nurseries investigating the

production of grafted trees on clonal rootstocks; use of these trees eliminates much of the variability in orchards and most of the South African industry is now based on these trees.

- Hans Merensky Technological Services (research arm of Westfalia Estates) was also visited.

Mexico

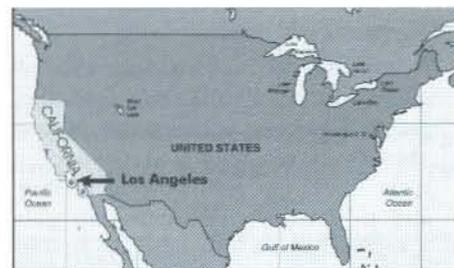


Alan Blight, Simon Newett, Chris Searle and Geoff Waite attended the 4th World Avocado Congress held at Uruapan, Michoacan Province, Mexico. Some of the pre congress workshops were also attended and the post congress tour was taken by some of these delegates.

- Between them the Australian delegates were able to attend most of the relevant papers presented at the four concurrent sessions of the congress. A great deal of technical information was gathered (including the proceedings, which has already been published). Many contacts were made and renewed with delegates from most of the 23 countries represented. Nine separate orchards and two research sites were visited which allowed much to be learnt about the local pests and diseases, growing environment and cultural techniques.
- The Australian delegates are now familiar with the wide range of pests and diseases of avocado in Mexico that could pose a threat to the Australian industry.

- Two papers were presented (one on spotting bug and the other on the AVOMAN and AVOINFO software), two posters displayed (one on AVOMAN, the other on AVOINFO) and brochures on AVOINFO were supplied to all 900 delegates.
- Between Mexico and California 24 copies of the AVOINFO software were sold raising AUD\$5500 for the AVOMAN/AVOINFO project.
- A workshop on canopy management was conducted at one of the pre-congress sessions and as a result good communication was established with Dr Daniel Teliz, the new president of the International Avocado Society.
- The International Avocado Society is considering funding the conversion of the AVOINFO reference database to an Internet version.
- For the next update of AVOINFO copyright release for abstracts of papers published in the workshop proceedings has been given verbally, written permission has been promised as has an electronic copy of the bibliographic details and abstracts.

California



Simon Newett was invited as a panellist to attend a week of workshops (Brainstorming '99) and field visits organised

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jointly by the California Avocado Commission and the University of California. These events were held the week after the World Congress.

There were a total of 50 panellists from 6 different countries and 8 separate topics were covered in the workshops, approximately 150 Californian growers attended.

A number of orchards, clonal propagation nurseries, packhouses and research sites were visited as far as Santa Barbara north of Los Angeles to Fallbrook south of Los Angeles.

- In California the use of trees on clonal rootstocks was given the same high priority as it was in South Africa.
- The disastrous consequences of the Mexican thrips arriving in California reinforces the importance of learning about other countries' pests and diseases, maintaining Australia's strict quarantine precautions, opposing trade which has the potential to allow the introduction of new pests and diseases and remaining vigilant.
- The AVOMAN software is also being evaluated for possible purchase by the California avocado industry so this was

a good opportunity to discuss the software with the evaluators and to demonstrate both the AVOMAN and AVOINFO software to delegates at the workshops. AVOINFO brochures were distributed and sales achieved.

- New concepts for very high-density plantings, canopy management, post-harvest management and evaporative cooling irrigation were learnt.
- A number of useful contacts were made and good technical information was gathered. Proceedings of the workshop are being compiled and will be available early in 2000.

How the Information Gathered will be Disseminated

Presentations have been made at field days and meetings in WA, Sunshine Coast

(2) and Bundaberg and more are planned. An order form has been enclosed with this

magazine for those wishing to buy a copy of this comprehensive and illustrated report.

Implications and Recommendations for Australian Horticulture

Implications and Recommendations for Australian Horticulture are:

- A new sustainable canopy management system that is showing good results in South Africa holds great promise for Australia.
- The Australian industry should closely examine the use of clonal rootstocks or at least be far more selective with rootstock seed in order to reduce variability in yield and fruit quality on orchards.
- Australia should continue to maintain strict quarantine measures, remain vigilant and not allow the importation of fruit from overseas producing countries that poses a threat of introducing foreign pests and diseases.
- Attendance at international avocado conferences and workshops by technical staff is essential in order to keep abreast of research and production techniques, tap into new technology and to establish and maintain good communications with other researchers and producers.

Mexico

Mexico is situated in Central America and covers a land area of 2 million square kilometres. While situated in the tropics a high chain of volcanic mountains that run down the centre of the country significantly modifies

the climate. It is in the cool montane cloud-forest areas at 1,600 to 3,000 m of this mountainous chain that the indigenous native avocado (*Persea americana*, race *mexicola*) was originally domesticated approximately 7-8,000 years ago.

There are approximately 124,823 hectares of commercial avocado in Mexico today producing 1,148,547 tonnes of fruit. Average yields range from 5 to 10.5 tonnes per hectare, though the better farmers average 15-20 tonnes per hectare per year. Hass is the main variety and constitutes over 90% of production.

The remaining production is composed of native or criollos (pronounced cre-o-yos) types. These are better types of the wild native avocado *P. americana* race *mexicola* that have been selected and cultivated by the native people.

There is also a small trade at local village level in related avocado species such as *Persea nubigena*, and *P. schiedeana*. Most of the commercial production is consumed within Mexico but there is a growing trade with other Central American countries, the United States and Europe.

As Mexico is a centre of origin for the evolution of avocado and has the longest history of cultivation, the opportunity to attend a World Avocado congress in this "home" of the avocado represented a unique opportunity for all those attending.

Mexico is the largest producer of avocados in the world. By their own figures, the Mexicans produce 53% of the world's avocados. The state of Michoacan represents 84% of the Mexican production with around 124,000 ha of avocados.

The 4th World Avocado Congress gave us the chance to see many examples of Mexican orchards and research projects. The climate was mild with modest evaporation rates (4-5 mm/day), high rainfall and good quality water supplies (Fig 1). The areas we saw were mostly blessed with rich, well-drained soils of volcanic origin (Fig 2). As expected of the evolutionary home of avocado there were plenty of pests and diseases, and some rather interesting approaches to controlling them.

Approximately 900 delegates attended the congress, 300 more than expected, so resources were stretched. However the friendly, helpful and enthusiastic attitude of the organisers and locals and their eagerness to show us their culture, ensured it was a successful and enjoyable event.

Some of the Mexican production techniques and research were outdated, although many interesting seminars were delivered.

The hospitality of our Mexican hosts was superb and appreciated. There is also a lot



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Fig 1. This scene in the Cupatitzio National Park Uruapan, Michoacam Province in Mexico reflects the abundance of water and excellent growing conditions for subtropical plants in the region.



Fig 2. Soil profile in a Mexican orchard showing the layer of volcanic ash deposited 57 years earlier by Paricutin volcano. Most of the avocado growing soils of Michoacan Province are volcanic in origin.



Fig 3. Most trees in Mexico are at wide spacings (16 m x 14 m) and are very large posing harvesting and spraying challenges.



to be said for having a beer company sponsor a conference.

The 4th World Avocado Congress varied from highly interesting to hugely frustrating, but rarely boring.

The following is an outline of what we learnt:

- Excellent growing conditions, especially the soils (Fig 2).
- Very large trees on wide spacings, overgrown in many instances (Fig 3).

- Greater incidence of trunk diseases, such as cankers, compared with Australia.
- A strongly growing and lucrative export market.
- The presence of USA packhouses (such as Mission and Calavo) and their growing influence on improving technical expertise.

In spite of all the potential shortcomings, average yields are around 15 t/ha from well-managed orchards, mainly as a result of more than one flowering per year, deep well-drained soils and a favourable climate.

South Africa

Simon Newett was invited to South Africa to demonstrate the AVOMAN software to that industry. Whilst there he took the opportunity to look at their canopy management work and the clonal propagation of nursery trees.

California

Simon Newett was invited as a panellist to attend the Brainstorming '99 event organised jointly by the University of California, Riverside and the California Avocado Commission. This event was held in the week following the World Congress and was conducted over 5 days with 3 days taken up visiting orchards, nurseries and packhouses north and south of Los Angeles. The other two days were used to conduct sessions of 1½ to 2½ hours on each of the following topics:

- More than one flowering per year.
- Relatively high yields.
- Relatively low levels of phytophthora damage when related to growing practices possibly related to the deep well-drained soils.
- Widespread zinc and boron deficiency (Fig 4).
- Their industry is based almost exclusively on Hass, the fruit has a less pebbly and more shiny appearance when grown at high altitude.
- Lack of mulch—possibly due to a combination of high skirts, warm temperatures, a moist environment and already high organic matter levels in the soil (up to 4 to 5%).
- Lack of sunburn damage possibly due to low light levels (cloudy conditions at high altitudes) and absence of high temperatures.
- Widespread and very noticeable brown mite infestation.
- Plant nutrition
- Plant breeding and genetics
- Disease management
- Salinity management
- Postharvest handling and quality control
- Pollination
- Insect pest management
- Canopy management.

Fig 4. Boron deficient fruit are not difficult to find in Mexico and are characterised by depressed corky areas and hooked shapes. Leaf boron levels were around 20 ppm.



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Genetic Material

CICTAMEX Station

The CICTAMEX station in Mexico was established to collect and hold plants from within the avocado species *Persea americana* and related species.

Many areas in which avocado are native to are being destroyed and an aim of the CICTAMEX station is to preserve trees with possibly useful characteristics.

The CICTAMEX germplasm bank contains many trees from the 3 horticultural races - Mexican, Guatemalan and West Indian. It also contains related species such as *P. schiedeana*, *P. indica*, *P. cinerascens*, *P. floccosa*, *P. stevermarkii*, *P. nubigena*, *P.*

gigantea, and related genus *Bedschmedia anay* and *Bedschmedia miersii*.

Characteristics of the plants within the collection have been recorded so that they may be used for plant breeding purposes.

Many of the plants within the collection have useful characteristics, such as dwarf growth habit and tolerance to various diseases. Two of the most promising varieties to arise out of the CICTAMEX station are Colin V33 and Fundacion II.

Colin V33

Colin V33 trees seen in the field were over 20 years old and around 3 m tall. Fruit were large and green-skinned. It is derived from Fuerte, but apparently has a thicker skin. Eating quality is apparently very good. At the CICTAMEX station in Mexico State, harvest is from November to January. Not many of these trees are grown in Mexico and those seen exhibited severe boron deficiency. Apparently in Mexico, Colin V33 functions effectively as a dwarfing interstock. Hass is supposed to be about 20% smaller with Colin V33 as an interstock. In South Africa, using Colin V33 as an interstock apparently makes no difference to size; therefore its dwarfing habit in Mexico could be related to boron deficiency.

Fundacion II

Fundacion II is a Hass seedling with fruit similar in colour to Hass although the flavour is different. Trees seen (Fig 5) were 6 years old and less than 1 m tall. They also displayed plenty of boron deficiency. These trees showed signs reminiscent of a Sharwil suffering from boron deficiency, but a bit more extreme. It is difficult to know how effective Fundacion II is at dwarfing avocado trees or whether it was the extensive boron deficiency responsible for tree size.

California Breeding Program

The breeding program in California is now based on two strategies. The first is to take seeds from the most promising varieties and grow them out, the second is to perform controlled crosses in isolation blocks. Selections are evaluated for harvest data, fruit quality and post harvest storage. Updates can be obtained on the university web site at www.ucavo.ucr.edu. Their current promising varieties include:

- Lamb Hass
- Sir Prize
- Gem
- Harvest
- BL516
- BL667

Some post harvest problems were being reported with Lamb Hass, namely shrivelling and stringiness.

Fig 5. This tree of the Mexican selection is 6 years old and claimed to be a dwarf type. However its small size may be another of the many boron deficiency symptoms it displayed.



Propagation

In South Africa and California most avocado trees sold from nurseries are now produced with clonal rootstocks. An outline of the principle steps in the production of grafted trees on clonal rootstocks is illustrated in Fig 6.

Nursery Propagation in South Africa

Approximately one third of the South African avocado industry is based on clonal rootstocks and in the last 10 years 80% of all trees sold have been on clonal rootstocks. Choice of rootstocks is regarded as just as important as selection of the scion variety. The emphasis on rootstock choice is for resistance to root rot, yield and orchard uniformity. Duke 7 is

commonly used as a rootstock but in recent times Westfalia Estates have selected two which they call Merensky 1 and 2. In South Africa clonal trees sell for R21.30 (AUD\$5.45), while trees grafted onto seedling rootstocks sell for R13.50 (AUD\$3.45). SAAGA has an Avocado Nursery Association (ANA) scheme which is similar to our ANVAS scheme, they audit their nurseries three times per year and give them "star" ratings.

Advances in Clonal Propagation System

Allesbeste Nursery in South Africa has developed a modification of the double grafting technique to produce clonal rootstocks at a lower cost and in less time.

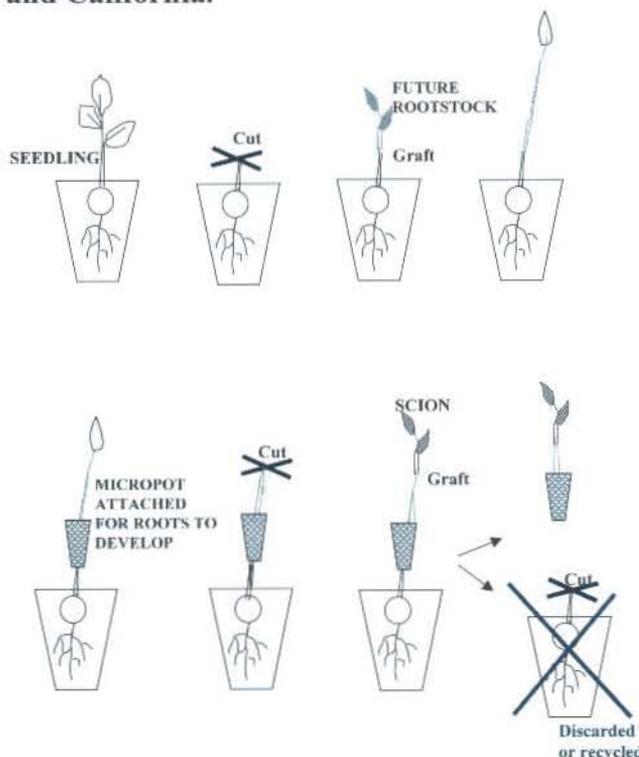
The double grafting technique with supporting nurse seed, as modified by Brokaw, has been used with great success in the past but was felt to be too expensive. The modification basically involves getting more than one plant from each nurse seed. Instead of encouraging one etiolated shoot to come up from the grafted rootstock, 2-3 shoots are encouraged.

The biggest advantage to this technique is the decreased production costs and time to produce trees with clonal rootstocks. The nurse-seed/rootstock combination can produce two or even three cycles each



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Fig 6. Principle steps in the production of grafted trees on clonal rootstocks. Clonal rootstocks are used extensively in South Africa and California.



generating 2-3 plants. These trees cost around AUD\$5.45 per tree.

Rootstock seed used is Zutano (ready in April) or Edranol (ready in July). It is picked as soon as mature and planted in 30 cm long narrow 1 L nursery bags. At about 6 mm diameter it is grafted with Duke 7 clonal material as close to ground level as possible. For Edranol they were being grafted in October. Each bag is labelled with the origin of the seed and another label with the origin of the Duke 7 clonal material.

The nursery manages its own scion and clonal material mother trees. The material usually comes from the summer flush that has hardened about June. Scion material is grafted within one day of collecting, leaves are removed when material is collected. A side graft is used. From here the plants go into a warm (25°C), humid (65 to 75% RH) hot house until a bud starts to grow. This usually takes about 4-6 weeks.

As soon as the bud starts to grow the plant is placed in a totally dark, warm and humid etiolation room. About a month later when the bud has grown one or more 30-40 cm shoots the plant is removed from the etiolation chamber. With a sharp blade a slight vertical cut is made on each of the etiolated stems in the area where roots will develop and a drop of 0.4 to 0.7% IBA rooting

hormone (the carrier is methylated spirits) is applied to the cut using a pipette.

For each shoot a wire supports is inserted in the bag and a small container (micropot) is threaded down the etiolated stem so that it covers the cut spot and is held by the wire support (Fig 7). The micropot is filled with a light potting mix (mostly composted pinebark) and the grafted nurse seed with its 2-3 micropots are then moved into a shade house.

About one month later the final graft takes place using the scion for fruit production. A colour-coded label is inserted in the bag to identify the variety.

As soon as the graft has a healthy bunch of leaves (Fig 8) and a well-developed root system in the

little "air-layer" pot (about 6 weeks after the second grafting process) the plant is separated from its nurse seed plant by being cut off at the base of the pot. The grafted nurse seeds in the 1 litre bags can then be returned (recycled) to the etiolation chamber for further production of clonal rootstock shoots. They can be used for two or even three cycles each generating up to 2 or 3 plants, cutting production time and costs.

The clonal trees are either transplanted into a standard 8 L bag to grow out for another 3-6 months (the transplanting process allows inspection of the clonal root system and culling out of those with sub-standard systems) or sold as they are in the micropots. The micropots are very useful if trees need to be transported large distances since 4000 to 9000 can be transported in a standard utility. The small plants from the micropots are sometimes planted directly into the field as long as they can be given the extra care required for their small size.

A further advantage of the technique is the presence of a buffer zone between the developing clonal root system and the seedling roots in case of disease. A possible disadvantage is that trees produced with this technique do not have a nurse seed to help in the establishment phase of the tree.

Fertigation commences one week after separation from the nurse seed. The conductivity of the leachate is not allowed to exceed 200 mS.m⁻¹. The growth rate can be manipulated by changing the conductivity. Increasing the conductivity up to about 180 mS.m⁻¹ speeds the growth whilst dropping it to about 100 mS.m⁻¹ slows it down. The process takes from about 8 to 11 months for trees in micropots to 14 months for larger trees grown out in 8 L bags.

Westfalia Nursery

Westfalia nursery does not use the new modifications developed by Allesbeste Nursery. Instead of the small "air-layer" micropot, a rigid tube is used for the nurse seed and an extra long narrow bag is folded in half over this. Later when the stage for forming roots on the etiolated stem is reached, the folded half of the black poly bag is pulled up like a sock around the future root area and the bag topped up with potting mix. A small metal ring or washer is used on the stem just above the graft of the clonal rootstock and in time this automatically severs the nurse seedling from the clonal tree. This nursery uses wedge grafts.

Westfalia exports trees overseas to other countries in Africa and overseas (including to California) in a soil-less mix. They claim it takes 18 months to produce a clonal rootstock tree and 12 months for a tree on seedling rootstock.

Westfalia is screening its own rootstock material, searching for those that are more resistant to root rot. They have a 5 ha trial site for field testing selections against their standards, which are Duke 7 and Edranol. They are using two of their own selections, Merensky 1 and 2, and a paper was presented in Mexico about the performance of these two. They have tested our popular rootstock Velvick and found it not to be more resistant to root rot as such, but generally to be able to outgrow root rot due to its very vigorous root system.

Nursery Propagation in California

The Brokaw nursery in the Ventura area of California was visited. In the 1970's this nursery was producing up to 400,000 trees per year but now they sell about 100,000 trees annually. 96% of their avocado trees are produced on clonal rootstocks. Their irrigation is a microtube system to each bag

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and trees receive pulse irrigation all day. They achieve greater than 90% success rates with their grafting.

The Hofshi nursery in the Fallbrook area was also visited. Clonal propagation was used there also (Fig 9).

Nursery Propagation in Mexico

Tree production in Mexico was primitive by our standards and most tree bags were on the ground, which gave them a good chance of being infected by *Phytophthora*

cinnamomi (Fig 10). Seed from criollo types are used for rootstocks.

Summary

Australia lags behind the world in its use of clonal rootstocks. This is possibly due to the lack of information suggesting clonal rootstocks outperform seedling rootstocks, the high cost of clonal rootstocks and the difficulty in cloning Velvick rootstock.

Hopefully trials underway will illustrate the most effective rootstocks in different areas and whether clonal rootstocks are superior to seedlings. Even in California where clonal

propagation is widely used, Velvick has been found to be difficult to root.

Given its popularity within Australia, the inability to easily clone Velvick is a major limitation to our industry; however steps to use Velvick seed with a greater chance of uniformity (e.g. by using seed from a single mother tree per batch of trees) should be tried.



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Fig 7. Allesbeste Nursery, South Africa; plants have just been removed from the etiolation chamber and micropots threaded down the stems of the future rootstock and filled with potting mix for root development. Note in some (eg. extreme left and right) the presence of more than one shoot from the nurse seedling, each with its own micropot.

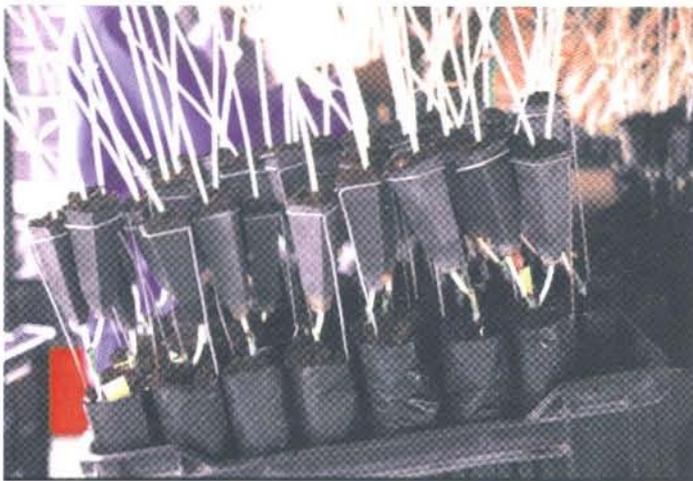


Fig 9. In California, as in South Africa, most trees planted today are produced on clonal rootstocks. This photo was taken at an orchard nursery near Fallbrook.



Fig 8: Avocados on seedling rootstocks are rarely planted in South Africa today. Here at Allesbeste Nursery, South Africa, grafted trees on clonal rootstocks are ready to be separated from their nurse seedlings and either planted out or potted into bigger bags.



Fig 10.: A typical nursery in Mexico. Unfortunately, having the pots on the ground leads to widespread infection of the plants by *Phytophthora* root rot.



Biotechnology

Some advances have been made with tissue culture, but the process is still very slow and does not yet appear to have commercial viability.

Most of the research into tissue culture has been conducted in Spain and Mexico. Even with advances in technology it still takes over a year to get a small plant produced in-vitro and survival rates through acclimatisation are only 40-50%.

Dr Richard Litz from the University of Florida has been working on somatic hybridisation; however he has found that this reintroduces juvenility into a plant. He is looking at identifying and introducing disease resistant genes into varieties and has also recently started a postgraduate student on researching the genes responsible for the control of ripening in avocado.

To clone adult material it is necessary to try to return it to a juvenile phase. Severe pruning of the mother plants and the collection of new shoots are a prerequisite for establishment of adult tissues in-vitro.

Micro grafting of the shoot material in-vitro also helps to return it to a more juvenile phase. Shoot formation in-vitro does not seem difficult.

Research indicated a combination of liquid media, then a double phased medium with cytokinin added was best for encouraging shoot formation (Benzyladenine at 4.44 μM). MS salts media at 20% or 100% concentration was found to be effective.

Rooting of juvenile explants could be achieved by transfer to a liquid medium with IBA present (4.92 μM) for 3 days, then transfer to a solid medium with

activated charcoal added (1g.L⁻¹). Shoots of adult origin had low capacity to form roots.

The use of severe pruning of mother plants and Micro grafting in-vitro to induce a return to juvenility, plus the use of IBA in a liquid medium could induce rooting percentages similar to that of juvenile material (80-90%). Where problems occurred with browning of the explants, an ascorbic acid bath for the explants was effective.

Dr Litz has been successful in producing Hass, Lamb Hass and Fuerte through a tissue-like process called somatic hybridisation.

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Irrigation

Traditional irrigation in Mexico involves filling individually created bays around each tree from a water cart several times during the winter dry season. More recently, standard under tree mini-sprinklers have been introduced. Irrigation water quality and supply in Mexico is generally very good.

Hoffman and du Plessis from South Africa presented a study on the seasonal water requirements of avocados in their subtropical conditions and are shown in the first Table. Six to seven year old Fuerte and Hass trees on Duke 7 rootstock had three irrigation treatments applied. Continuous dry, continuous wet or a treatment that started wet after harvest then dried out through flowering and fruit set, but was wet through fruit growth and harvest.

Treatment	Phase		
	I (rest till flowering)	II (flowering to fruit set)	III (fruit growth to maturity)
1	Wet	Wet	Wet
2	Wet	Dry	Wet
3	Dry	Dry	Dry

Wet = Irrigate when tensiometers reach 30 centibars (50% of moisture extracted under trial conditions).

Dry = Irrigate when tensiometers reach 60 centibars (80% of moisture extracted under trial conditions).

Effect of irrigation treatments upon yield are shown in this next Table.

Treatment	Fuerte (k/tree)	Hass (kg/tree)
1 (continuous wet)	25.3	26.9
2 (wet, dry, wet)	32.3	32.5
3 (continuous dry)	27.9	19.2

Although none of the yield differences were statistically significant, there did appear to be greater productivity on trees with a dry treatment imposed at flowering and fruit set than on trees that were continuously wet or dry. The results represent only one year, as hail destroyed the crop on the planned second year of recording yield.

In southern California, frequent water stress is seen as one of main factors

Month (N hemisphere)	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Pan factor	0.3	0.35	0.5	0.6	0.7	0.75	0.75	0.75

contributing towards low yields. Preset regulators on lateral lines and pressure compensating emitters are very useful in maintaining proper flow to all trees. It is recommended in California and Mexico to keep water applications away from tree trunks to avoid trunk canker.

At the Congress, Ben Faber gave a review of irrigation in California. His research indicates that increasing water applications up to 111% replacement of pan evaporation grows larger trees but not necessarily larger crops. Faber believed a replacement of pan evaporation of 70% gave the greatest yields. Californian growers however seemed eager to apply more water than was available.

Other studies showed that well-watered Hass trees (20 centibars) had twice the

yield of drier trees (40 to 70 centibars). In California the CIMIS weather stations give growers information on the evaporative losses in their area.

Tensiometers are also popular in California, including solid state tensiometers filled with a gel matrix. These need less maintenance than standard tensiometers

but are 34 times the price. Neutron probes are not widely used. There was a lot of interest in the Enviroscan units developed in Australia.

Other equipment used in California included:

Dendrometers - Measure trunk expansion, highly variable results from tree-to-tree, mostly used by scientists.

Sap Flow metres e.g. Greenspan - results are erratic, mostly for scientific use.

Infra-Red thermometers - Measure plant stress through lack of transpiration, work well for field crops, not so well for tree crops. The device needs to be pointed down onto the crop to avoid being affected by direct solar radiation. These thermometers are expensive.

Porometer - Measure conductance of gases through stomata, good information, but expensive.

Emission Uniformity

Ben Faber emphasised the importance of uniformity of sprinkler output across a block of trees. This is measured by Emission Uniformity (EU). EU = 100% if each tree receives the same amount of water. Trees in a block with a bad EU can be out by a factor of four. Often this is due to pressure differences across the block and pressure compensators are recommended where necessary.

Pan Factor in Israel

Whereas Ben Faber suggests a pan factor for California of 0.7 throughout the season, Udi Gafni of Israel presented a pan factor in Israel that varies according to the season, as shown in the Table at the bottom of the page.

It should be remembered that Israel receives no rain during summer and irrigation volumes for the season vary from 7.5-8.5 ML/ha on the coast to 10-13 ML/ha inland. Fruit development occurs in May and June in Israel. Irrigation intervals vary from every second day to pulse irrigations four times per day. It has been found that the more intensive the management practices the more sensitive the trees are to adverse conditions or changes to management.

Pulse Irrigation

Pulse irrigation was trialed about four years ago. It appears to now be accepted practice in Israel. The concept is to keep the shallow feeder root zone of the avocado constantly moist by means of a number of short irrigations each day. These short irrigations also generally contain nutrients.



The article on this page is sponsored by HRDC and the avocado industry.

**New Irrigation Scheduling Device
"Water Guard" - Israel/California**

Ben Zur of the Technion in Haifa, Israel, is developing a new irrigation scheduling device provisionally named "Water Guard" (Fig 11). It is designed to track the moisture front in the soil following an irrigation and can also give an indication of changes in soil salinity.

The idea behind it is not to measure the amount of water as such, but to control the depth to which the soil profile is wetted. In this way under-watering is prevented and so is over irrigation with accompanying leaching of nutrients from the root zone.

The desired depth of the wetted front can be entered in the software and the software will switch the irrigation off at the estimated time to achieve this depth of wetted front. By measuring the depth reached by the wetted front after each irrigation, the software will fine-tune the shut-off time and get closer to the desired wetted depth.

The device consists of a robust fibreglass rod 25 mm in diameter that includes a number of stainless steel electrodes at various depths. These electrodes are connected to wires embedded within the fibreglass rod during manufacture. A 23 mm hole is augured into the soil at the installation site and the 25 mm rod is hammered into the ground. Information can be linked direct to a computer via cable or via a radio transmitter with the help of a solar panel. The cost per site is estimated to be around AUD\$380.

Evaporative Cooling Irrigation - California

Apple trees in California lose approximately 90 days of photosynthesis per year due to excessively hot days. The number of days lost by avocados has not been quantified but preliminary photosynthesis monitoring work using a Li-Cor 6200 has demonstrated that the avocado "shuts down" (closes its stomata) ceasing carbohydrate production when the temperature reaches about 30°C on a typically low relative humidity day, thus reducing yield potential. This research is attempting to relate canopy temperature to the rate of photosynthesis.

A system is being devised to apply overhead irrigation to the avocado orchard to achieve evaporative cooling of the canopy to keep photosynthesis going on these hot days. Early results have shown that their system will reduce the canopy temperature by 10°C from just five minutes of overhead irrigation.

The overhead irrigation system is separate from the undertree system and applies water in fine droplets via minisprinklers atop poly risers through the canopy (Fig 12). Minisprinklers have been specially chosen to deliver an even distribution pattern. The system delivers 650 L per hectare per minute (about 2 L/tree/minute on average tree spacing) and it is anticipated that during hot days the system will sprinkle each block of trees for about five minutes in every 30.

The system has cost AUD\$1140 per hectare, which will require the production of only an extra 500 kg of fruit/ha to recover that cost. It can be automatically switched on by an infra red sensor positioned to read the temperature of the tree canopy.

Other

Several presentations were given on irrigation from Mexico and Spain but there wasn't anything new from current knowledge in irrigated areas of Australia.

Jose Farre presented a half-day workshop on

irrigation management in Spain that largely consisted of how to install and use homemade tensiometers. In Spain, irrigation was scheduled to replace 40-60% of pan evaporation. In their summer period they could have days up to 8-9 mm of evaporation. In Mexico there were still a lot of orchards using flood irrigation. Transmission of *Phytophthora cinnamomi* was widespread.

The article on this page is sponsored by HRDC and the avocado industry.

Fig 11. A new irrigation scheduling device being developed in Israel that detects the position of the wetted front in the soil.

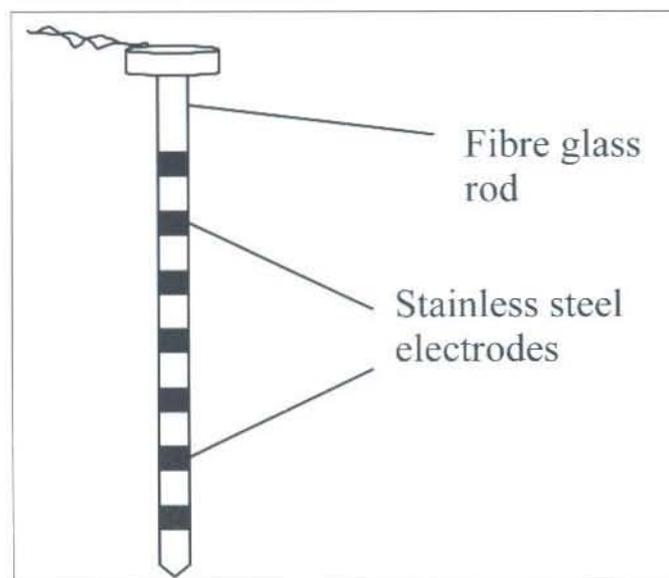


Fig 12. An experimental evaporative cooling irrigation system in California intended to prolong photosynthesis on very hot days.





Industry Manager's say

By Wayne Prowse



Last year we had a late wave of aged avocados from across the Tasman, which swamped our market as the new season greenskins were getting underway. Now this year Cyclone Steve has blown in from the Tasman and

swamped North Queensland and played havoc with the harvest. It demonstrates how unpredictable planning and forecasting can be in horticulture!

On the bright side we can be encouraged by the apparent increasing demand for avocados as this industry continues to produce and sell up to 8% more avocados each year. Our market research tracking is assisting us to measure the increasing market penetration of avocados. Even though less than 20% of consumers bought avocados on a monthly basis, 46% of households bought avocados at least once during the year. By targeting these 46% of households to use avocados more often, we are confident that demand can be substantially raised to absorb the increasing crop.

'Ave an Avo Today

The marketing forum has reviewed the current "avocados really make a meal" campaign that we have used for the past 3 years with a view to seeking a new direction relevant for the industry in 2000. Late last year following a grower workshop on the Sunshine Coast and input from the marketing forum we issued a new brief to QFVG to consider a new advertising program that would take into account the focussed nutrition benefits and encourage consumers to use more avocados in every day situations. This was a move away from the luxury image.

Their response, using the services of Oddfellows Advertising (of Banana and Mandarin campaign fame), was an impactful campaign with the tag line "Ave an Avo Today". The nutrition message will focus on the benefits of avocados being able to help reduce cholesterol (and thereby contribute to longer life) whilst the usage message will encourage consumers

to spread an avocado like butter on all types of everyday food. In other words bring avocados into a usage situations as common as butter.

The campaign will commence in June with new Point of Sale recipe leaflets and Posters, a series of half page magazine advertisements and over 100 outdoor advertising sites in June and July, and again at appropriate times according to state needs. Complementing the advertising will be a strategic PR campaign that follows some of the key messages of the advertising.

In the next issue of TA I will be able to show you how the campaign will look.

In Store Demonstrations Continue

As we prepare for the new campaign rest assured that the current program is continuing. Over the next three months we will manage almost 250 in-store demonstrations and make available the acclaimed "blue" series recipe leaflets.

The public relations activity is also continuing with appropriate press releases each 6 weeks. The food media have been most supportive of avocados and I am pleased to advise that the media value generated to February exceeded \$400,000 which is some 25% more than last season for a similar investment. Admittedly the media tour in August combined with the Macadamia Industry generated some excellent coverage and is ongoing.

Focus on Quality - Keeping Young

I have mentioned many times that the promotion program without good quality produce has limited effectiveness. Working with the R&D team I am pleased to report that an integrated program to assess and address in-store quality of avocados is underway. Peter Hofman (QDPI) is managing this project. From a marketing perspective we are most interested to ensure that this project is successful as it will help all members of the value chain from growers to retailers to monitor the critical points that can cause deterioration in avocados.

We have certainly been addressing bruising and the need to handle avocados with care. Growers have long been encouraged to address anthracnose problems and then there has been the cool chain management to control chilling injury. One area that we have had difficulty in measuring is aged stock as was the case with the New Zealand stock this time last year and our own stock at various high production times each year. This study will monitor this and more.

Complementing the R&D project will be the regular merchandising activity in March and September where our merchandising team will visit 600 stores nationally and present tips to help produce managers handle avocados correctly.

TV Consideration - Just a Thought at this Stage

The thought of a TV promotion for avocados is often raised by growers and dismissed when the campaign costs are assessed.

Whilst we are not in the league for considering a long term TV campaign, there is the possibility of using a strategically targeted TV activity to help move the high volumes of stock when necessary. Two distinct periods are in March with the onset of the greenskin season and August as Hass reaches a peak and traditional warmer weather demand has not kicked in.

With a professionally created campaign with strong impact, strategically targeted bursts of TV can really help sales with an immediate response. POS, Magazines and PR, whilst having their place, all take longer to generate sales action.

One downside is that it will take a large chunk of year round levy funding and levy payers in say October will be sceptical of seeing benefits of an August TV campaign flowing through to them. There is of course some flexibility to move the timing by state so that WA gets the campaign in say November rather than August; however to "drip feed" a campaign over a full year at low cost per month would be less effective overall.

Cost is always a major issue. A national campaign as described in two 6 week bursts would mean a minimum \$660,000 investment (with GST) which is double the

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Export Markets And Australian Horticulture

Australia exports 80 per cent of all rural produce—five times more food than we import. As export markets expand through globalisation, there is also greater pressure on Australia to further open its markets.

A quarter of Australian horticultural produce is sold to international markets and is steadily growing. Despite the Asian financial crisis, fresh horticultural exports have continued an upward trend with a 32 per cent increase over the past five years.

The prosperity of Australian rural industries, including horticulture, remains highly dependent on our ability to increase export markets. To impose protectionist trade measures on a rural industry that is well advanced down the path of

trade liberalisation would do considerable long-term damage.

Senator Judith Troeth, Parliamentary Secretary for Agriculture, Fisheries and Forestry, in her opening address to the horticulture session on exports, at the ABARE Outlook 2000 Commodity Conference in Canberra, said that international trade is a two-way relationship and Australia must recognise that if we want to export our produce, we also have to accept our domestic market will be open to competitive imports under the same World Trade Organisation (WTO) rules-based system.

"Recent industry comments surrounding the importation of Canadian salmon, durians from Thailand and grapes from California have highlighted this point," she said.

"With a perception widely touted that Australia is being flooded by imports that

directly threaten Australian produce, it is interesting to note that only 13 out of 167 protocol assessments undertaken by the Australian Quarantine and Inspection Service (AQIS) since 1993 fall into this category.

"Australia's quarantine policy is one of the most conservative of our trading partners, yet Japan—considered even more conservative—allows New Zealand apple imports.

"Australian horticulture needs to focus its attention on creating new market opportunities in order to continue the unprecedented growth it has been experiencing.

"Japan, one of the toughest export markets, has now granted access for Australian Fuji apples, easy peel citrus and four mango varieties, whilst new markets have also opened in India for Australian citrus and apples," Senator Troeth said.

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current levy income. The benefits however could be measured in millions of dollars for the industry particularly as volumes grow and place downward pressure on prices.

I would be interested to hear from growers of views for and against the TV idea and thoughts on how it could be funded. Contact Wayne Prowse:

E-mail: wayne@hort-corp.com

Fax: 02 8267 4199.

Avocado Exports

At the recent marketing forum we dedicated an afternoon session to export discussion. The industry view has been to monitor export opportunities rather than aggressively seek them which has brought some opposing views.

Reviewing data obtained from world production, exports and imports of avocados only confirmed our knowledge that Australian avocados are a minute player on the world scene with less than 1%. Nonetheless there are some niche opportunities such as:

- Counter season supply to some northern hemisphere markets.
- In partnership with a northern hemisphere supplier, fulfil a gap in year round supply to a major retail account..

The marketing forum has recommended that desk research be conducted to assess the windows of opportunity for Australian suppliers with the resources to supply avocados that meet the stringent customer requirements for quality and time frames.

Illegal Immigrants Not The Answer For Horticulture

With horticultural industries expected to continue expanding, producers need to look strategically for a long-term answer to the acute labour shortages they are experiencing now.

Federal Parliamentary Secretary for Agriculture, Fisheries and Forestry, Senator Judith Troeth, said: "This is not a new problem, but one that is continuing to grow as the industry grows. Over the last five years, fresh horticultural exports have increased by 32 per cent to \$698 million, with growth mainly in fresh fruit.

"Given that labour is one of the biggest inputs and costs in the industry, a long-term solution needs to be found if that expansion is to continue.

"The current debate about using illegal immigrants as a cheap and immediate solution to the problem, only serves to highlight what is a strategic, long-term issue that the industry must face rather than respond to on a year-to-year basis.

"Our horticultural industries have enormous potential to grow and expand into export markets. Our produce is of high quality and competitive in world markets but importers want assurance of a

consistent supply, and periodic labour shortages only serve to undermine that assurance.

"I believe the industry needs to look at some other options in terms of organising their labour requirements and making the industry attractive as an employment option."

The Government has implemented changes to the Working Holiday Maker Scheme to increase the number of overseas backpackers available for work and is increasing the awareness of the variety and location of work available through its Harvest Trail initiative.

Senator Troeth said that these measures, however, are only part of the answer. As with any industry, the labour market is competitive and employers need to think about the options they are offering and how to attract the available labour.

"In the regular discussions I have with industry leaders, I shall be encouraging them to think about this issue as a long-term factor that has the potential to undermine the future growth of the industry," Senator Troeth said.

GMOs Facts And Issues For Horticulture

By Fiona Douglas B. Agr. Sc (Hons) Editor, National Marketplace News

GENETIC engineering is moving swiftly into the food industry, with Australian scientists at this moment transferring genes into apples, potatoes, vegetables and other crops. I believe this is the most important issue facing the Australian horticulture industry today and I present my understanding and concerns here.

What is genetic engineering?

Genetic engineering involves taking some genetic material (called genes) from one organism and inserting them into another organism when it is only a few cells old (embryonic). The gene is made up of DNA that can combine itself with the DNA of the embryo. As the embryo divides and grows this new DNA goes with it, so every cell of the maturing organism now contains this new genetic information. The end result is the organism has been given a characteristic it did not have before.

It is the universally compatible nature of DNA that allows this technology to happen. Scientists can physically extract DNA from one organism and mix it with the DNA of another, be it animal with vegetable, human with microbe, and so on.

What are GMOs?

GMO stands for 'genetically modified organism'. It can be any plant, animal, bacterium, fungus, virus etc. that has had its genetic makeup altered by the process of genetic engineering. Another name commonly used is 'transgenic'.

In the case of foods, it refers to food (fruit, vegetable, livestock, cereal etc.) that has had its genetic makeup altered via genetic engineering processes as opposed to conventional selective breeding.

How does genetic engineering work?

Scientists locate genes of interest to them through a process of called gene mapping. They use tools such as special enzymes that are known to cut the DNA strands at certain points in its code.

When they have the length of the DNA that contains the gene(s) of interest, they must then physically insert them into the organism they are hoping to modify while it is just a few cells old.

There are a few methods for doing this but a common one is the use of a vector called *Agrobacterium tumefaciens*. This bacterium normally causes the disease crown gall

tumours in some plants and it is good at combining its DNA with other organisms. The scientists make use of this feature and simply remove the disease genes of the bacterium and insert the new gene(s) of interest. They then allow *A. tumefaciens* to 'do its stuff' and hopefully a successful transfer of genetic material will take place.

Identifying the GMO - antibiotic and herbicide resistance

One problem confronting scientists making GMOs is identifying whether or not they have been successful. That is, not all the gene transfers will succeed, so the scientists need a way of telling which of the organisms before them are in fact GMOs.

They do this by attaching antibiotic resistant marker genes or, in some cases, herbicide resistant marker genes. That is, they attach the resistant DNA to the new genes, which means either antibiotic resistance or herbicide resistance will be transferred at the same time as the gene of interest.

Scientists can now identify the GMOs by a simple process of exposing all the embryonic organisms to either antibiotics or herbicide. Only the ones that survive will be the successfully transformed GMOs. This means that most GMOs have either antibiotic resistance genes or herbicide resistant genes as part of their genetic makeup.

Is genetic engineering any different from conventional selective breeding?

Genetic engineering is fundamentally different from conventional breeding.

With conventional plant and animal breeding, organisms are selected for their desirable genetic traits and then crossed to achieve the more desirable offspring. Here the scientist is merely coordinating in the laboratory a cross that could have occurred in nature.

Under genetic engineering, 'crosses' are taking place that cannot occur in nature.

A law of nature is that only organisms from the same species can reproduce to yield fertile offspring. Species from the same family can cross in nature, but they yield sterile offspring. This is nature's protection against the blending of different species. So for some reason that scientists do not know, nature does not allow the genetics of different families of organisms to mix.

Under genetic engineering, however, not only is the DNA from different species

mixed but also the DNA from different kingdoms—animal, plant or microbe.

Does use of antibiotics in genetic engineering pose any risks?

Yes. Antibiotic resistance is commonly found in GMOs because this is part of the process of genetic engineering. Namely, scientists deliberately make GMOs resistant to antibiotics so they can identify them from non-transgenics—only GMOs survive exposure to antibiotics.

Deliberately conferring antibiotic resistance to organisms is irresponsible because it increases the amount of resistant DNA in the environment. It is well known that DNA with antibiotic resistance can be passed among organisms, for example from livestock to humans via R-plasmids.

There are only a handful of classes of antibiotics and resistance to these is building daily. In the case of some pathogens there is only one antibiotic left (vancomycin) that still has full efficacy.

It is a fact that in Australia we have had approved for release at least one GMO that has antibiotic resistance to five different antibiotics. Multiple antibiotic resistance is being deliberately engineered into organisms and released into the environment by the biotechnology sector.

As long as biotechnology continues to use antibiotic resistance for identifying its GMOs there is an unknown cost to society.

How does herbicide resistance come into things?

The issue of herbicide resistance arises in genetic engineering in two different ways.

One way involves the practice of inserting herbicide resistant genes into crop species to allow for easy control of weeds in the crop. This means farmers can control all the weeds by spraying a non-selective herbicide without risk of damaging the crop.

The problem with this is the risk that the GMO crop species will cross with weed species and pass on the herbicide resistant traits. In this case the herbicide would have lost its effectiveness to kill such resistant weeds and a weed management tool will have been lost to society.

The other way herbicide resistance is involved with genetic engineering is similar to the use of antibiotic markers mentioned earlier. That is, herbicide resistant genes are used as markers for scientists to identify

which organisms have been successfully modified. The herbicide resistant genes are attached to the genes of interest and only transgenic organisms (GMOs) will survive exposure to the herbicide.

Again, the problem with this is the risk of this herbicide resistant genetic material being passed on to problem weeds.

Some Issues...

Who wants GMO food?

Worldwide consumers are telling the marketplace they do not want GMO foods. Many food industry players are now responding, particularly in Japan and the United Kingdom.

The rejection of GMO food is such that there are distinct markets emerging for foods that can claim to be GMO free.

Never lose sight of the fact that no matter how wonderful a product may look and taste, if the consumer does not want it, there is no market.

Is GMO food safe?

How do the scientists know the food is safe? Science is about the laws of nature. Scientific models arise based on these laws. Because genetic engineering side steps the laws of nature, the question arises as to what tools the scientists have to measure safety? What rules apply when you leave nature and enter an unknown realm?

What if GMO food isn't safe?

A characteristic of new technology is its rapid drop in price and rise in output once the technology is perfected—computers are a good example.

GMO food has already entered the human food chain. GMO food could be a part of everyday life for people in the not too distant future. Should the food supply not be safe, the ramifications are obvious.

Feeding the world's billions

The argument that the world's growing population can be better fed through genetic engineering is simply a distraction from the real issues at hand; namely food safety, the right for the public to know, antibiotic resistance and so on.

In fact the argument is precisely the same one that ushered in the agrochemicals of the 1950s and 1960s, many of which have since been removed from the marketplace because of their cancer causing properties and/or other detrimental environmental effects.

Reducing chemical usage (but what about IPM?)

Another common argument put forward by GMO proponents is that food will be a lot 'cleaner' because less chemicals will be needed. This argument is spurious because already agriculture (and particularly horticulture) has undergone a massive shift in its attitudes to chemical usage and pest and disease management.

What this industry has achieved in regard to food safety and 'clean green' food production has been staggering. Growers have embraced integrated pest management (IPM)—they are monitoring crops, using softer chemicals, following recommended spray programs, keeping spray records, becoming accredited for using farm chemicals, undergoing QA and so on.

Paralleling this has been a response by the agrochemical sector to develop softer chemicals and biological answers for pest and disease control. We have seen the emergence of Bt., pheromone traps, isomates, biological control predators, crop monitoring services and so on.

IPM has spelt success for the industry; the production of clean green produce and world markets are rewarding us.

The GMO 'reduced chemical' argument ignores the fact that IPM exists and thrives. It ignores the massive efforts of the entire horticulture industry to bring consumers the safest food in history—the very type of food the world's consumers are saying they want.

Goodbye clean and green

There would be few that would dispute the importance of Australia's 'clean and green' image in our newly found success in export markets. It has underpinned the extraordinary rise in food exports—in Victoria alone food exports have risen from \$1 billion in 1993 to \$4.5 billion today. Based on current trends they are forecast to reach \$10 billion by 2010.

Our major trading partners do not perceive GMO food as 'clean and green'. GMO food is seen as contaminated.

If we remain unclear about our production of GMO food we run the risk of alienating hard earned markets.

As a hypothetical example, it may take just one GMO variety to turn consumers in the UK or Japan off an entire line of produce—and this is not improbable if we continue to be vague in our guidelines on GMO cultivation, labelling and separation in the marketing chain. In this scenario, years of research and effort by the industry concerned to develop markets, produce safe food and sustainable systems would

be wasted and the industry crippled—and all for what?

What if in 50 years time it proves to be 'no big deal'?

Perhaps time will show that GMO foods had little detrimental impact on society. This would not, however, justify the flawed process by which this new technology has crept into society.

To date, consumers have been unaware that the food they are consuming is genetically modified. There has been no clear labelling and there has been resistance in the biotechnology sector to have such labelling.

To date, there has been little requirement for GMO foods to prove they are safe prior to finding a spot on the retail shelf.

Even if time shows this technology to have been safe, there is a chance that the insidious way it has entered society will stand as a model for other new technologies to be introduced in the future—technologies that may not be harmless.

Is there a place for biotechnology and genetic engineering in our society?

Most definitely there is a place for biotechnology and as a society we need to direct the scientific community on how we want the new technology used.

So just because scientists can tamper with the food supply doesn't mean we should let them. Consumers throughout the world are sending this very message to the marketplace.

Biotechnology is indeed exciting technology and has the potential to contribute greatly to medical science. Our biotech scientists could serve society better by searching for cancer genes, insulin genes and so on and leave food production to those who are already doing an excellent job.

Who is addressing GMOs in your industry sector?

Does your industry have a plan concerning GMOs? Has it investigated the possible consequences of producing GMO crops? Is it spending research dollars on developing GMOs and if so, for what purpose?

Who are the watch dogs?

It is my understanding that those charged with overseeing the introduction of the technology have been, by and large, the same people seeking to commercialise the technology; that is, the biotech sector has been watching itself. Are we asking the fox to mind the chickens?

Is This The Way Of Future Marketing?

The British supermarket chain, Tesco, could be seen as introducing a new way of marketing. Tesco recently opened another 22 stores, taking their total to 170 shops. All their stores are open 24 hours a day.

Tesco have developed a code of practice to ensure the quality of produce sold and to protect their customers and the environment.

Their change to mostly organically grown produce has sparked a move to firstly have the whole of Britain sell only organically grown products and secondly, to have Europe do likewise.

Tesco Nature's Choice

All Tesco produce must be attractive to look at and good to eat. So freshness, taste, appearance, performance and value are key criteria for which standards are set for suppliers and no product that falls below these very high quality standards is allowed for sale. However, Tesco are determined that this is achieved by adopting production and produce handling practices which are sustainable and protect and where possible enhance the well being and biodiversity of the environment. It is for this reason that Tesco have developed Nature's Choice, which is implemented through a Code of Practice.

This Code identifies key principles and practices which when complied with by Tesco's Producers and Suppliers of fresh fruit, vegetables, flowers and other ornamental plants, will ensure that their production and produce handling systems are sustainable and environmentally sound and responsible. Tesco aim to have all their Producers and Suppliers of UK grown produce meeting the requirements laid down in the Code of Practice.

There is increasing concern about the need to protect our environment and the health of

the population. All food production causes some disruption to the natural environment, but Nature's Choice is about identifying and adopting sustainable farming systems and practices which will lessen this effect. It means devising and implementing ways of reducing the use of materials and energy, minimising waste and adopting the principle of recycling wherever it is practicable and environmentally beneficial to do so.

The Code sets demanding but achievable standards of production within an Integrated Management Plan, incorporating the need for environmental protection and enhancement and the development and sustaining of biodiversity. A key element in this is the formulating of a wildlife and landscape conservation and enhancement policy, linked to an action plan for its implementation.

Once Nature's Choice challenging requirements have been met they need to be maintained and wherever possible improved upon. Whenever significant changes in the business are being contemplated or planned, ensuring that Nature's Choice requirements will continue to be met will be a prime consideration.

The challenge of meeting and then maintaining Nature's Choice requirements invariably involves personnel at all levels in a business. It is therefore essential that all staff have an adequate understanding of what Nature's Choice is about.

Each business needing to meet Nature's Choice requirements is expected to keep a Nature's Choice file that will contain all the key verification documents. This will include a written statement of commitment to Nature's Choice produced by the owner or chief executive of the business and an indication of how compliance with the Code will be achieved and maintained. The file will also contain a site map or farm map as appropriate.

Nature's Choice is about sustainable production systems and therefore, adherence to Good Farming Practice is just as important for the growing of those crops in the rotation, which are not destined for Tesco.

By a structured, sustainable and scientific approach to food production, this Code offers suppliers the opportunity of a long-term profitable future with Tesco.

The code covers the following:

- Rational use of Pesticide
- Rational use of Fertilisers and Manures
- Pollution Prevention

- Protection of Human Health
- Efficient use of Energy, Water and Other Natural Resources
- Recycling and Re-use of Materials
- Wildlife and Landscape Conservation and Enhancement.

They require all their suppliers to meet all legal requirements relating to the use of these chemicals. Furthermore, they have developed an assurance scheme called Nature's Choice which applies to the restrictions on the use and application of pesticides. Growers are only allowed to use chemicals from a restricted list based on strict criteria. Chemicals are only permitted where no other, non-chemical, control measures are available and the grower can demonstrate a need to use the chemical selected.

In order to ensure suppliers throughout the world comply with all the legal and Nature's Choice requirements, their technologists carry out regular audits of suppliers to ensure that the requirements are being adhered to. Growers are required to provide complete pesticide records including results of residue testing. They also carry out their own planned program of testing and spot checks to ensure compliance with all legal requirements.

Marketing

Tesco is a supermarket that is leading the way in marketing. Not only do they sell food products but all sorts of consumer items. Besides selling goods through their 170 stores, Tesco have turned to electronic marketing.

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Tesco Opens 170th 24 Hour Shop

As Tesco opens another 22 stores through the night, the company is warning staff to be aware of sleepwalkers.

Customers have been found in the aisles in their pyjamas and slippers pushing trolleys and doing shopping. One customer at Pitsea in Essex had to be woken up and sent home at 4.00 a.m. so she could go to work.

Premium Prices for Compliant Produce

Late last year, a Tesco buyer travelled to Tasmania to inspect onion growing and packing facilities. Finding that the production of this vegetable met their stringent Code of Practice, contracts were signed for the supply of onions to Tesco stores in the UK.

Growers and packers signed an undertaking to abide by the Code of Practice and in return receive a premium price for produce, which makes exporting to the UK very profitable for all concerned.

Some Thoughts On Eliminating Dimethoate

Keith Johnson, Past Chairman, The Avocado Marketing Co Pty Ltd, Alstonville

Present Situation

At present NSW and Qld avocados consigned to Vic, SA, WA and Tas have to be dipped in a dimethoate mixture prior to packing and dispatch. The detailed requirements are set out in an Interstate Certification Assurance Arrangement (ICAA).

There are a number of reasons why this practice is considered sub-optimal, briefly and specifically:

- Exposure within packing sheds by workers to dimethoate, though small, is highly repetitive, and brings with it some risk of accumulating a toxic dose of this organo-phosphate.
- It is out of step with public, and political, demand for "clean green" product.
- It is a practice that would not be understood nor accepted by consumers and their representatives.
- It is a stand-alone process that adds to packing costs.
- It is probably an "overkill" solution.
- It is a practice that, in the hands of radical media, could generate a PR disaster for the products involved, like avocados, and lead to an Australian version

of the ALAR debacle in the USA, with great economic harm resulting.

Other Possibilities

Over the period the current ICAA has operated, approx 3-4 years, there has been a dramatic change to the Quality Assurance programs applying in the avocado industry. There has also been a marked shift in retailer profiles.

Today, any avocado operation of any consequence has a QA System complying with SQF 2000 or ISO 9002 in place and has undertaken detailed HACCP analysis. As well, and complementing the producer QA systems, large retailers, Woolworths, Coles, Franklins have an inwards receipt quality verification process and these retailers are now accounting for 60-70% of avocados sold at retail level.

Thus producers, knowing the level of detail their fruit will be inspected to, and knowing the penalties that apply when a large retailer rejects their consignment, are ensuring high levels of quality. Given this new and improved emphasis it ought to be possible to develop an ICAA that exploits the capabilities of the QA Systems and does away with the undesirable dimethoate dipping.

its life cycle in green avocados but can do so in ripe soft fruit. Since avocados are picked hard green the damage caused by egg laying is only of cosmetic concern. Also avocado does not appear to be a favoured host. However egg laying in avocado fruit may cause considerable fruit quality losses, particularly in north Qld. The most susceptible period, for thin skinned cultivars only, occurs from December through May. [Italics added for clarity].

There is other information and pictures in this booklet. The most relevant other fact is that a QFF strike on avocado is visible to the naked eye and resembles the damage caused by Fruit Spotting Bug.

Past experience of QFF survival

Victorian advice is that viable QFF have been found in avocado received into Victoria via the market system. It is believed that the occurrences would have been in soft fruit in the period Nov-Dec-Jan and came about because of a combination of circumstances. High prices, low quality growers and no QA led to fruit that was soft and probably picked off the ground being consigned to market.

Avocados can go soft on the tree BUT ONLY when very mature and in the presence of a fungus like anthracnose. Such fruit would not normally be taken by reputable growers to the shed for packing, and if taken to the shed, would be removed as part of the grading process. In sheds operating approved QA systems, the likelihood of an infested fruit surviving is very low but more on this later.

Avocado Marketing Company

The AMC is a Pty Ltd company operating on a non profit basis to market fruit from its shareholders, some 25 in number. All fruit is packed in 2 contract packing sheds, operating with AMC endorsement, and packed in accordance with a detailed Specification issued by AMC. One shed is SQF/ISO approved the other is in the process of obtaining approval.

Woolworths is AMC's biggest customer and all fruit is packed to meet their requirements. AMC sells between 100,000 and 200,000 cartons per year to clients in all states of Australia.

All AMC growers have done the Approved Supplier Program course and in 2000 will all be operating standardised

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What is the Tesco Internet Superstore?

Tesco's Internet Superstore is an online supermarket that provides customers with a wide selection of products available in any Tesco store. This service has been developed over three years and its development will be continuous.

As soon as customers register they can enjoy the comfort and flexibility of shopping online whether at home or at work. Required items will be handpicked by a Tesco Expert Shopper and delivered to the customer's home at a convenient time. Customers can access Tesco's online store via the Internet or by using their Home Shopper CD (sent free once a customer has registered) or by calling Customer Services.

Tesco's produce is grown to exacting specifications to ensure the highest quality and safety standards are met. In order to deliver high quality produce all the year round it is necessary from time to time to use pesticides.

What We Have To Do

With the foregoing in mind it is the purpose of this article to:

- Pull together relevant facts relating to Qld Fruit Fly (QFF) and avocados.
- Explain the operation of The Avocado Marketing Co Pty Ltd (AMC) with emphasis on that company's ability to apply and control QA and other QFF related processes.
- Propose a concept as the basis for an ICAA that meets the goal of QFF elimination from Vic, SA, WA, and Tas without the use of dimethoate dipping.

Relevant Considerations

QFF

Probably the best summary of the QFF's behaviour relative to avocados is found in the booklet: "Avocado Pests and Disorders. Qld DPI Information Series Q190013, 1991".

This authoritative source states:

"The QFF occurs throughout eastern Australia causing extensive losses to many fruit crops especially stonefruit and mangoes. It is *unable to complete*

documentation and standards. All have spray diaries and at all times comply with withholding periods set for agricultural chemicals. AMC has the means in-house to audit physical compliance with any requirements it may set as well as review documentation. AMC is compiling a fruit picking specification that will be used by all growers.

It is well within AMC capabilities to set up a QFF baiting regime for use during warm months on thin-skinned varieties that will have to be complied with by 100% of AMC growers.

Proposed Concept

Concept outline

On the basis of the considerations set out above, an ICAA with the following features would appear feasible:

- The ICAA applies to AMC produced fruit, packed by sheds meeting AMC quality specification requirements and subject to AMC internal audit.
- The sheds in question hold an approved QA System certification.
- The AMC specification details QFF signature features and requires rejection of all thin skinned fruit cultivars with such signature during the months of Oct-May.
- AMC institutes a QFF baiting program on all its growers' farms harvesting fruit during Oct-Apr.
- AMC internally audits for compliance with all the foregoing on a no notice spot check basis during the warm month's window.

Additionally, AMC would be prepared to undertake studies via trapping QFF to ascertain the extent of QFF presence and pressure throughout the year to verify the warm month's window, subject to a reasonable cost for such studies.

AAGF Action

The AAGF Board is aware of and concerned about the fruit fly ICAA issue.

We are at the concept development proposal stage of working on a research project to develop a "hard" avocado protocol as an alternative to dimethoate dipping. The premise is, as Keith suggests, that "hard" (unsprung) avocado will not carry QFF larvae.

Western Australia have already developed a similar ICAA protocol for Mediterranean Fruit Fly, which has been accepted by the Eastern States.

Supporting argument

Firstly one can have a high confidence that this concept will ensure the probability of a viable QFF entry to a southern state will be low. What is that probability? I do not know.

However for the system to fail there must be multiple failures in series with each having a low failure rate.

The concept continues to use QFF destroying chemicals but targeted in a way that ensures maximum effect and zero public exposure to those chemicals. The best aspect of the proposed concept is the elimination of dimethoate dipping from packing sheds. But it is by no means the only benefit. The integration of existing QA and internal audit procedures into an ICAA has the benefit of making the QA System more meaningful—some aspects

of the QA System are very paper oriented. This concept is focusing on the physical.

This concept also shows that we are genuinely working to produce ever higher levels of safety with our food products. Whilst ever we just accept dimethoate, without aggressively seeking safer methods, there is a risk of a public perception that the industry is not really committed to food safety. I know we are committed, you know we are committed, but getting that message across can often be difficult in the presence of an unscientific and exploitive media.

Given the success of similar ICAA in places like the Central Burnett on mandarins we are not faced with trail blazing requirements. We can build on the knowledge gained so far.



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A Look At Avocado Oil

By John Dirou, NSW Agriculture, Alstonville

As an adjunct to an avocado fruit nutrient study that required the removal of oil from the fruit tissue prior to it being dried and analysed, an opportunity arose to profile the fatty acid content of the extracted oil from locally grown fruit. Hass fruit were taken in 1998 and 1999 from the same orchard at Alstonville in northern NSW. These data are compared with overseas published data.

Introduction

The oil content in avocado fruit increases during the season as oil cells release oil more readily while the moisture content decreases as fruit matures. In South Africa, Fuerte and Edranol were tested from February to September, the weekly increase in oil content was 0.68% and 0.43% respectively. The high oil content gives avocado a high nutritional value—it is a high-energy food.

Avocado oil is similar in its fatty acid makeup to that of olive oil as shown in Tables 1 and 2. Avocado oil is used as a salad dressing and in the manufacture of many cosmetic and pharmaceutical products due to its skin penetrating and non-rancidifying properties.

Results

Oil yield

In Hawaii, the oil content of fully ripe avocado fruit from 37 varieties/selections ranged from 7.8 to 40.7%. The time of fruit harvest affected oil content. Hass picked in April had an average oil content of 27%, while May harvested fruit averaged 30%.

Hass is the most suitable cultivar for commercial oil extraction as it has the highest percentage of pulp at 74.9%.

Fruit in the Alstonville study were harvested late in the season (16 Oct 98 and 6 Oct 99) and yielded 13.8% and 20.4% oil using the Soxhlet extraction method—a method that reportedly gives a high extracted oil yield. The oil content was measured on mature unripe fruit.

Whether avocados are mature unripe or fully ripe when tested will influence the percentage of oil recovered. Unripe New Zealand Zutano and Fuerte fruits had 8.7% and 7.6% oil, when ripe, fruit had 14.9% and 16.2% oil respectively. An oil content of 12.9% is acceptable under New Zealand growing conditions.

Low oil readings are not atypical. For example in a Florida study on 11 varieties oil

ranged from 3-16%, while Puerto Rico reports a 5 to 30% oil range, and in California an 8 to 30% oil range was recorded. Australian research on 7 varieties grown at Mildura suggests a minimum oil content of 8% based on the crude fat extract method.

Recent research in South Africa has shown that fruit tend to produce oil at an increased rate after a period of excessive rain. For the period February 1999 until harvest 2249 mm of rain was recorded at Alstonville, double the amount of 1113 mm for the same period in 1998. This higher rainfall may account for the one-third extra oil recovered from fruit grown in 1999 season.

Oil profile

The therapeutic value of avocado oil is related to its fatty acid composition.

Fatty acids consist of long chains of carbon atoms with hydrogen atoms attached. Avocado oil has a predominance of fatty acids with 16 and 18 carbon atoms. The Alstonville sample was analysed with 28.8% and 26% 16 carbon atoms and 70.9% and 73.8% 18 carbon atoms for 1998 and 1999 respectively.

of carbon atoms joined by a double bond eg. 18.1 Oleic acid. A fatty acid that has more than one double bond is called polyunsaturated, e.g. 18.2 Linoleic acid and 18.3 Linolenic acid.

Table 2 shows the percentage relationship between mono, poly unsaturated and saturated fatty acids.

Summary

Hass fruit harvested in October 1998 and 1999 at Alstonville yielded a solvent extractable oil content of 13.8% and 20.4% respectively for mature unripened fruit, much lower than Hawaiian and South African figures of 25 to 30%. The fatty acid profile was however quite similar for the Alstonville and Hawaiian samples, although the latter study did not record Myristic, Stearic and Linolenic acids, while the South African analysis showed a 10% higher level of Oleic acid.

The predominance of mono and polyunsaturated fatty acids 80-83% for Hass fruit as shown in Table 2 is very similar to olive oil, which is highly desirable in the human diet.

Table 1. Chemical characteristics (% fatty acid) of avocado oil for Hass cultivar, with a comparison to olive oil.

Fatty acid % methyl esters		Alstonville		South Africa	Hawaii	Virgin Olive oil*
		1998	1999			
C14:0	Myristic	0.05	0.04			0-0.1
C16:0	Palmitic	19.06	16.72	11.85	20.7	7.5-20
C16:1	Palmitoleic	9.71	9.30	3.98	9.7	0.3-3.5
C17:0	Heptadecanoic	0.01	0.01			0-0.5
C17:1	Heptadecenoic	0.00	0.10			0-0.6
C18:0	Stearic	0.41	0.40	0.87		0.5-5
C18:1	Oleic	54.84	59.45	70.54	60.2	55-83
C18:2	Linoleic	14.78	13.26	9.45	9.4	3.5-21
C18:3	Linolenic	0.86	0.71	0.87		0-0.9
C20:0	Arachidic	0.10	0.11	0.50		0-0.7
C20:1	Eicosenoic	0.07	0.22	0.39		0-0.5
C22:0	Behenic	0.02	0.04	0.61		0-0.3
C24:0	Lignoceric	0.02	0.01	0.34		0-0.5
C24:1	Nervonic	0.02	0.07			0

* Oily juice of the olive fruit

When carbon atoms are joined by a single bond they are called saturated fatty acids e.g. 18.0 Stearic acid. Mono unsaturated fatty acids have at least one pair

Table 2. Analysis of avocado oil, Hass cultivar, growing at Alstonville showing fatty acid % for unsaturated and saturated oil types with a comparison with olive oil.

Fatty acids	1998	1999	Olive Oil
Mono unsaturated	64.6	69.1	55.3 - 87.6
Poly unsaturated	15.6	14.0	3.5 - 21.9
Saturated	19.7	17.3	8 - 27.1

Description Of Fruitspotting Bug Habitat

By Geoff Waite, Queensland Horticulture Institute

The description of common fruitspotting bug habitat on the Sunshine Coast, in terms of the tree species composition, has been carried out by identifying all of the different species in areas of forest adjacent to severely infested orchards.

Over the last ten years and throughout the life of this project, records have been made of every plant species on which fruitspotting bugs have been seen. These records include whether it was *Amblypelta nitida* or *A. lutescens* that were collected, which developmental stage was present, whether the host plant was just a feeding host or was utilised for breeding, and which part of the plant was damaged. A paper has been published with most of this data being discussed but since then, a number of new hosts have been recorded. These will be added to the list and published in the Final Report.

The survey of habitats has revealed that the areas close to most orchards contain many different known hosts of fruitspotting bugs. In addition, there are a number of plant species that are common to all areas but which have so far not been implicated as fruitspotting bug hosts. The main reason for this is that many of them are very tall eg. *Eucalyptus* spp. and it is impossible to sample the tops of these trees to see if there are bugs present.

The role that windbreaks play in determining the within-orchard distribution of

fruitspotting bugs remains unclear. Assessment of damage in orchards that have purpose-planted windbreaks of species such as *Eucalyptus dunii*, *E. torelliana*, *Pinus* spp. and Bana grass indicated that there was no significant difference in the amount of damage present in trees adjacent to such windbreaks over the rest of the orchard, excluding hotspots associated with edges or native scrub. Certainly, where such areas of native scrub are relied upon as windbreaks, then there is an association with higher fruitspotting bug damage. Surveys of growers confirmed this, with generally minor fruitspotting bug associations being attributed to planted windbreaks.

Chemical Studies

In order to apply for registration of Bulldock for avocados, Bayer has determined that it requires more efficacy data against fruitspotting bugs in avocados. To this end, they have commissioned a private consultant to conduct the required trial during the current season. With the data from this trial to be added to that obtained from project work last season, it is anticipated that the chemical will be available for use next season. In the meantime, further laboratory studies have been carried out with combinations of pyrethrum and vegetable oil and fipronil (Regent®). These are also being tested in the field under extreme fruitspotting bug pressure.

In the laboratory, the pyrethrum/oil treatment (beans dipped in the mixture and placed in a cage with the bugs) has given 100% mortality of both adults and nymphs for at least one week. Data beyond this time is not available due to the shrivelling and rotting of the test beans. Treated fresh beans cannot be added after this time because the chemical residue would not have 'weathered' and reserve beans kept aside would also be shrivelled by then.

The fipronil treatment has proved to be somewhat of a mystery. Despite advice from Rhone Poulenc who market fipronil, and early bioassay results that indicated fipronil was quite toxic to the bugs,

experiments conducted in parallel to the pyrethrum tests with treated beans described above, resulted in no mortality at all. When these experiments were repeated, the same results were obtained.

Observations on avocado trees treated with fipronil in the field at this stage indicate that it is performing quite well. It may be that direct contact by the spray at application will kill them, but the residue acts as a repellent, rather than killing them. The value of fipronil as a bug control will be assessed later when the trial is harvested.

You may be wondering why we are interested in pyrethrum as a fruitspotting bug control. Our attention was drawn to it because a number of organic growers have used it and we observed that it was very toxic to fruitspotting bugs. As a result, we thought that we should investigate it more closely to see if it could in fact, be a useful bug control.

Pyrethrum is an excellent killer of bugs and many other insects as well, including most beneficials. Since we also discovered that endosulfan kills a wider range of insects than we had previously thought, it seemed that perhaps pyrethrum could be just as useful, given that both have a limited residual life in the field.

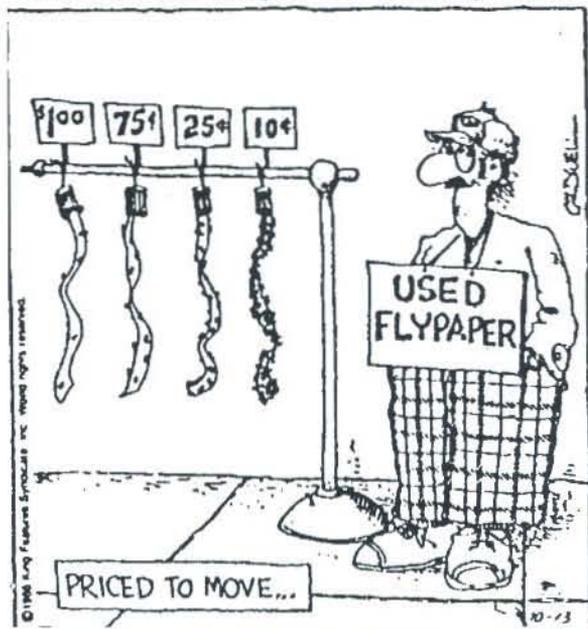
As reported above, pyrethrum indoors and not exposed to the sun's rays, will kill bugs for at least a week. The use of vegetable oils as a synergist (ie. an activator/enhancer of the activity of pyrethrum) has enabled a reduction in the rate applied and hence the cost. The reduced rate may also reduce its effect on the beneficials, but we have no evidence of this yet. One problem with pyrethrum is that it is quite expensive and at present, is in short supply.

End of Project

In the remaining four months of this project I will be finishing off the macadamia experiment, assessing the avocado trial, conducting endosulfan residue trials for the custard apple industry, conducting experiments on the effect of alternative chemicals on beneficials and compiling the Final Report. Consequently, this will be the last of the update reports for the project.

The article on this page is sponsored by HRDC and the avocado industry.

If all else fails maybe we could try these!



Project Entomologist Departs

By Geoff Waite, Queensland Horticulture Institute

After two years working on the fruitspotting bug project, Shaun Hood has resigned and taken up a permanent position with the chemical company, Bayer Australia. Shaun will be involved in Research and Development of a range of agricultural chemicals and will be responsible for an area in the southwest corner of Western Australia, centred on Manjimup. This area grows amongst other things, potatoes and vines, so we are expecting an annual sampling of Margaret River reds! Shaun and Lisa will be living on the coast at Busselton.

I would like to express my appreciation to Shaun for the work he carried out in the project. The research subject is a very difficult and challenging one and we have by no means solved the fruitspotting bug problem. However, we do know a lot more about the pests and Shaun has made a great contribution to that end. I wish him well in his new endeavour.

At the end of February, Russell Parker will also move out of entomology and into Information Technology here at Maroochy. He will be working with the MACMAN/AVOMAN Team, developing computerised information aids. Russell too has contributed significantly to the bug project, especially in keeping the laboratory

cultures going and with putting together the project reports and maintaining the Fruitspotting Bug Website. My best wishes also go to Russell in his new endeavours.

Many of you will be dismayed that such moves have occurred. This is a result of current policy on the part of Government, aided and abetted by funding bodies, to employ scientists as temporary staff.

Permanent staff will soon be very rare, as we are about to witness with the imminent retirement of many of the DPI's senior scientists. The next five years will see a huge black hole appear in the knowledge bank and experience of the DPI. Instead of appointing sufficient young graduates to work alongside those with experience to eventually follow in their role, we see these young graduates moving through a variety of temporary jobs, facing uncertain futures and distracted from that job as they continually look for permanent positions.

While the policy gurus will try to convince you otherwise, it is a highly inefficient system, as you can expect at most, about 1.5 to 2 years of a 3-year appointment to be effective. The rest of the time the new appointee is coming to terms with the job and in the last year is distracted looking for another job. If that job happens to pop up before the project is finished, then that adds another dimension to the inefficiency—and growers are paying the price!

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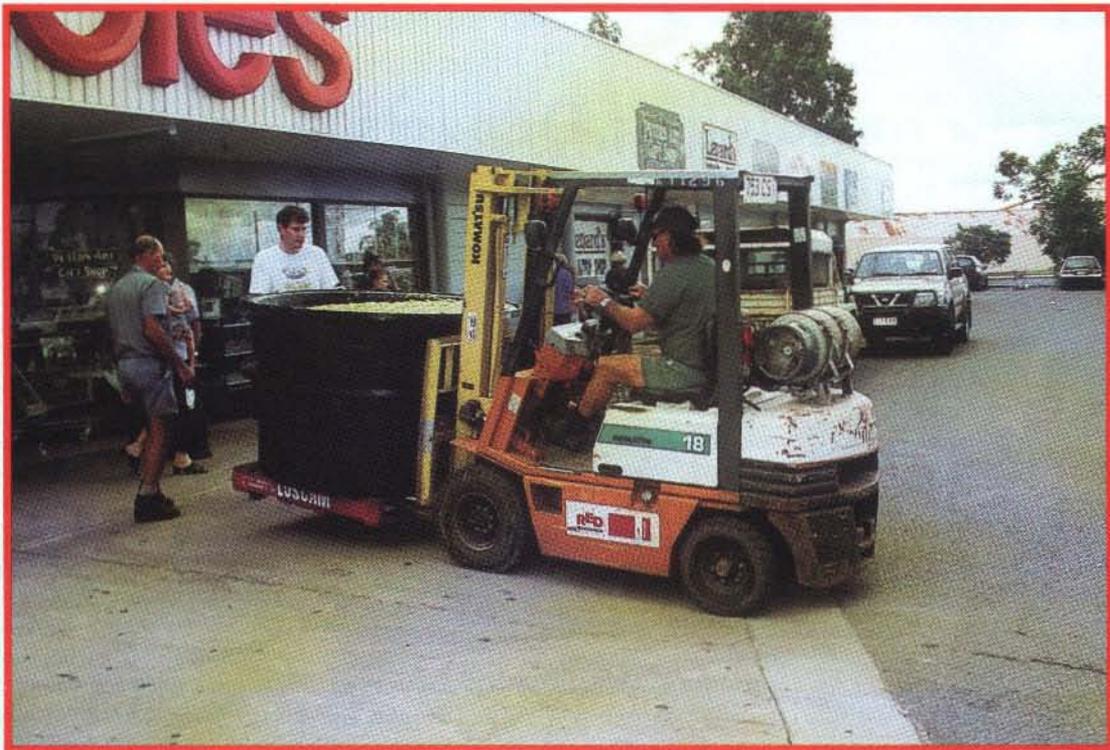
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