



The Australian Newsline

Vol 9 Number 1

Talking Avocados



March 1998

 AVOMAN Help System 

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[Contents](#) [Search](#) [Back](#) [Print](#) [Exit Help](#)

How to Rate Rootrot Status of your trees



An avocado tree showing moderate rootrot symptoms

Leaves wilted most of the time
Much of the canopy yellow
Only 40-60% of the leaves still on the tree
Sections of branches visible through the canopy

Avoman Help System

- Endosulphan - An Uncertain Future
- Markets and Marketing
- Successful Marketing Project
- Avocado Quality Assurance

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Table of Contents

Researcher Joins Team	3
Changes At The AHC	3
Late Publication	3
From Your Federation	4-5
Shepards Flock In	5
World Avocado Congress IV	5
Endosulfan - An Uncertain Future	6-8
Letters to the Editor	8-9
Record Number Of Exhibitors At Expo 15	9
Australian Round-up	10-11
Conference Proceedings	10
Avocado Field Day In NSW	11
Features Of The 1997 AVOMAN Prototype Part III	12-13
AVOMAN TIPS	14
Research Report	
Effects Of Phosphonate Soil Drenching On Avocados	15
AHC	
Industry Manager's say	16-17
HRDC	
How Are Avocado Projects Selected?	18
Marketing	
Pressure Grows On Pallet Size	19
PLU Numbers And Bar Codes Becoming Obligatory	19
Innovation Leads Melbourne Markets Through Change	20
Price Reporting Service Makes Dollars And Sense!	21
The Markets Will Stay	21
Successful Marketing Project	22-23
Overseas Horticultural Markets Waiting To Be Tapped	23
Buy And Sell Fruits And Vegetables Online!	23
Quality	
Avocado Quality Assurance: Part 1	24-27

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Talking Avocados is the official magazine of the Australian Avocado Growers' Federation and in conjunction with the Australian Horticultural Corporation is published four times a year (March, June, September and December).

This publication is distributed upon the understanding that the publisher is not engaged in legal, cultural or other professional advice. The Editor, Directors and Executive Officers of the Australian Avocado Growers' Federation Inc (ACN Number IA 5122) do not accept any liability for and/or necessary enclose and/or concern and/or support any of the claims and/or statements made and/or views and/or opinions expressed anywhere in any edition of "Talking Avocados".

Calendar of Events 1998

April

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

May

- 5 **Avocado Growers Association of WA** - Annual General Meeting Conference Room, Market City commencing 5.30 p.m.
- 20 **Bundaberg & District Orchardists Association** - meeting Fruit & Vegetable Growers' Office, Barolin St. Bundaberg commencing 7.30 p.m.
- 21-22 Expo 15 - Horticultural Industry Exposition at Gatton University of Queensland College. Contact: Anne Story 07 4635 6845.
- 30 **NSW Field Day** - Top working Fuerte to another variety - Stuarts Point. Contact: Andrew Wright 02 6653 6087.

June

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

July

- 7 **Avocado Growers Association of WA** - meeting Conference Room, Market City commencing 5.30 p.m.

Late Publication

As editor and publisher of Talking Avocados, I wish to apologise for the late publication of the March issue.

Unfortunately due to illness I was unable to keep to the normal schedule of distributing the magazine in late February.

I am glad to say that I am well on the way to a full recovery.

Orf Bartrop
Editor

Researcher Joins Team



Andreas Neuhaus (28 years old) has recently commenced his PhD studies on water relations and irrigation of avocado. HRDC and the Australian Avocado Industry fund the research project, which commenced in February this year.

Andreas has an excellent background for the project with a masters degree in

agriculture (plant production) from the Humboldt University in Berlin. His master thesis researched soil water relations and during his studies he developed an interest in environmental stress on agricultural crops, which led him to the area of stress physiology of plants.

Andreas also has orchard experience from working in Tabulam (NSW) where he was involved with the production of kiwifruit, peaches and mandarins.

He said that he is very happy to have the opportunity to work on the avocado project with Dr David Turner in Western Australia and Dr Tony Whiley in Queensland.

While based at the University of Western Australia in Perth, Andreas will have some fieldwork running in Queensland over the duration of the project. Avocado is a rainforest tree but commercial production of this crop takes place under conditions far removed from its natural environment.

The main objective of this project is to improve the irrigation management in relation to yield and fruit quality of avocado. Irrigation of avocado trees is essential to maximise production and fruit quality and the research program will be targeted at providing the industry with information to assist in making decisions on the most effective use of water resources.

Changes At The AHC

Changes at board and senior management levels of the Australian Horticultural Corporation were announced today by AHC Chairman Arthur Charles.

Mr Charles has announced his resignation and that Deputy Chairman John Gibson will act as Chairman.

Mr Charles said it was unfortunate that circumstances had caused his resignation at a time of such difficulty for the Australian horticultural industry. However, he was confident in the ability of Mr Gibson, his board colleagues and the staff of the AHC, to meet the challenges that presently face the industry.

The Board has appointed Corporate and Industry Services Manager Mark Napper to act as Managing Director following the announcement last year by Managing Director John Baker of his intention to resign to pursue other interests in horticulture.

To ensure an orderly transition, Mr Napper will assume responsibility from February 20, with Mr Baker assisting in the hand-over until March 20.

ANVAS ACCREDITED NURSERIES

ANVAS accredited trees can be purchased from these nurseries:

Rainforest Nursery

Ron and Joan Knowlton
25 Reynolds Street
Mareeba Qld 07 4092 1018

Batson's Nursery

Merv and Pat Batson
Schulz Road
Woombye Qld 07 5442 1657

Anderson's Nursery

Graham and Vivienne Anderson
Duranbah Road
Duranbah NSW 02 6677 7229

Birdwood Nursery

Peter and Sandra Young
71-83 Blackall Range Road
Nambour Qld 07 5442 1611

Front Cover:

Shows a snapshot of the AVOMAN Help system on how to rate Rootrot Status of your avocado trees.

From Your Federation

By Astrid Kennedy, Executive Officer

Endosulfan Review

Since the last edition of TA your Federation Executive Committee has been highly focused on researching and preparing a submission to the National Registration Authority (NRA) for the continued use of the insecticide Endosulfan in avocado production.

The Executive quickly identified the issues in the report and their potential impact on production and formed a task force of researchers, consultants, academics and representatives from other affected commodities. The meeting brain stormed the issues and identified possible sources of case studies and other evidence that would serve the industries in its fight against this new threat.

The Executive then initiated a number of avenues of attack. Firstly, they formulated a brief summary of the most detrimental recommendations of the review and a list of problems that would be experienced by the industry should the recommendations be implemented. The summary was sent to all growers in New South Wales and Queensland with the recommendation that they use the information to write to their State and Federal members of parliament and to the NRA.

Secondly, a submission was prepared and hand delivered to the NRA by industry president, Mr Rod Dalton. During discussions, Mr Dalton had the opportunity to voice the industry's deep concern and urge that the review recommendations not be implemented in their current format. The outcome of our efforts will be known by the end of June.

A full report on the endosulfan review and your Federation's response is presented on page 6. A copy of the industry's submission can be obtained from your representative on the AAGF Board or by contacting the Federation Executive Officer direct.

Levy increase - 1 July 1998

The wheels are in motion and the industry's proposal to increase the R & D levy by 2 cents per tray and \$3.33 per tonne is being processed. Senator Judith Troeth, parliamentary secretary responsible for horticulture, has agreed to the increase. The proposal is now before the Prime Minister and the Treasurer seeking their agreement. If their agreement is received it is hoped that the levy increase can be implemented on 1 July 1998. The June edition of TA will provide more details.

Next Round of AAGF Meetings

Marketing Forum

The AAGF/AHC marketing forum was held on 17 February 1998. Forum members received the results of a consumer response survey and were pleased with the good results received in the public relations program—the program generated magazine features, TV spots and many local newspaper articles. New look promotional material and recipes were considered and approved. A more detailed report on the Forum can be found on Page 17.

Varieties Committee

At its February meeting, the Varieties Committee approved four nurseries for accreditation for the calendar year 1998—Anderson's Nursery, Batson's Nursery, Birdwood Nursery and Rainforest Nursery. It was agreed that annual accreditation was no longer appropriate and that a rolling accreditation program should be introduced. This will mean that the ANVANAS nurseries will be inspected and sampled every six months rather than once a year as is the current practice. The new procedure will benefit both industry and the nurseries because any pathological or hygienic problems will be detected and corrected in their early stages.

R, D & E Subcommittee

All components of the R, D & E program will be audited over two days early in March 1998. The audit will be facilitated and will:

- Consider whether or not the Subcommittee has been adhering to the industry's original brief—the R, D & E plan.
- Consider forthcoming issues and their likely effect on the industry from an R & D perspective.
- Redefine priorities and make recommendations to the Federation.
- Ensure that the administration and overall management of the program is working efficiently.

The results of the audit, together with the Subcommittee's recommendations, will be presented to the Federation Board at its end of March meeting. This procedure is a key measure in the Subcommittee's accountability to the AAGF Board.

Board Meeting

Directors of the AAGF will meet at the end of March 1998. In addition to a regular

board meeting, directors will participate in an audit of the industry's strategic plan.

Details for the audit are currently being worked out, however it is envisaged that:

1. the continuing relevance of the plan's goals and objectives will be considered and refocused if thought necessary; and
2. the effectiveness of the portfolio process will come under scrutiny.

The audit process is a key element of the Federation's accountability to you, the grower.

Changes at the AHC

Mr Arthur Charles, newly appointed Chairman of the AHC, has announced his resignation. Deputy Chairman, John Gibson will act as Chairman. Mr Charles said it was unfortunate that circumstances had caused his resignation at a time of such difficulty for the horticultural industry.

Mr John Baker, Managing Director of the AHC, resigned late last year to pursue other interests in horticulture. Mr Mark Napper, formerly Industry Services Manager, has been appointed acting Managing Director.

Your Federation is concerned about these developments and will participate in discussions on the future of the corporation with other AHC member commodities in mid-March.

Peak Industry Body for Horticulture

Representatives from industry bodies, the AHC, HRDC and DPIE, met in late November 1997 to determine a better and more efficient way of managing the national horticulture industry. As a result of the two-day workshop three working groups were formed to examine and report findings early in the New Year on the following topics:

- Industry representation;
- Marketing issues; and
- Production issues.

The production group has held its first meeting and is now actively seeking out areas of duplication or potential duplication across commodities. The marketing group identified a number of issues, some of which should be the responsibility of



the AHC. AAGF President, Rod Dalton, is a member of the marketing group. The industry representation group has yet to meet.

The first two meeting attempts were aborted because on both occasions only three of the five group members were available and it was felt that the foundation meeting should have input from as many sources as possible.

A third attempt was scheduled for 17 March 1998. AAGF Executive Officer, Astrid Kennedy, is a member of this group.

R & D Chairpersons Meet

Mr George Green, Federation director and chairman of the R, D & E Subcommittee, attended the annual meeting of R & D chairpersons at the end of February 1998. These meetings provide an invaluable opportunity for industries to discuss issues with other horticultural commodities and to catch up with the latest government policy regarding R & D.

In Brief

South African Research Symposium

An event of interest was the South African Avocado Growers Research Symposium in Nelspruit on 4 and 5 March 1998. E-mail:- Saaga@pixie.to.za

Quarantine Fines Now In Force

International travellers arriving in Australia without declaring items of quarantine concern now face on-the-spot fines of up to \$110. An AQIS survey has shown that up to 6% of passengers arriving at Australian international airports are failing to declare items that may need to be seized and destroyed. That translates to almost 180,000 potential quarantine breaches each year. The on-the-spot fines are designed to act as a deterrent by warning passengers about the penalties they face for failing to declare items that could pose a threat to Australia's environment or agricultural industries.

Choice of Superannuation Funds

Employers will be required to comply with the new choice of superannuation fund requirements as follows:

- from 1 July 1998 - for new employees who started after 1 July 1998;
- from 1 July 2000 - for all existing employees who started before 1 July 1998.

Essentially employers may offer employees a choice of a minimum of four funds or, offer a choice by either formal or informal workplace agreements or certified agreements or, must accept any complying fund nominated by the employee.

This is a complex matter and affected growers would be advised to seek professional advice.

World Avocado Congress IV

The International Avocado Society has issued the first announcement of the IV World Avocado Congress. The congress will be held in Morelia, the beautiful pink city, and capital of the state of Michoacan, Mexico—the world's avocado capital, in October 1999. The organisers advise that the program will include sessions on:

- Legislation.
- Production and quality.
- Commercialisation.
- Industrialisation.
- Cultural aspects of avocado producing countries.

The Congress will include debates, symposia, seminars, workshops, technical papers, posters and exhibits. They seek suggestions on additional topics and activities for the program. For input please E-mail details to: dteliz@colpos.colpos.mx

Shepards Flock In

From Market PLACE News, March 1998

SHEPARD Avocados—the first Australian avocado variety for 1998—are now being marketed throughout Australia by The Harvest Company.

It's an eight-week distribution program that began mid-February.

For six years, Shepard Australia, a cooperative of Shepard avocado growers on the Atherton Tableland and in the Bundaberg district, has teamed with the Harvest Company to market the fruit.

Harvest's project manager for Shepard Avocados, Robert Gray, says consistent quality has been the key to the success of Shepard in Australia.

This has been further refined following the Federal Government's Food Quality Program that established a network of communication from growers right through to retailers.

"Volume for the 1998 Shepard Avocado season will be on a par with last year, however fruit size is expected to be larger due to the heavy rains from the recent cyclone activity in North Queensland," Mr Gray said.

"Twenty-six growers supply The Harvest Company with Shepard Avocados during the two-month season."

Specifications

The Atherton Tableland is the main growing region but this year for the first time there is supply from the Bundaberg region.

Mr Gray said The Harvest Company, Shepard Avocado growers and retailers, worked closely together to set stringent product specifications on quality of produce.

"This has meant a higher quality and more consistent product for consumers over the last couple of years. There is a minimum standard for size, amount of blemishing (no fruit is perfect), ripening procedures and storage temperature.

"Assessment of the produce is done at the market and from there we provide feedback to growers on areas for improvement.

"The Food Quality Program opened up the lines of communication between ourselves, the growers, transporters and retailers with the outcome being a set of

guidelines and procedures at all levels to ensure quality is maintained."

Distribution

The Harvest Company supplies Shepard Avocados to all of Woolworths' stores throughout Australia, marketed under Woolworth's own Blue Mountain brand. Harvest Shepard Avocados are also distributed under the pink "Shepard Australia - Eat When Soft" labels on avocados in the fruit and vegetable sections of other supermarkets and independent retailers.

The Harvest Company's promotional campaign for Shepard Avocados incorporates cross promotions, in-store demonstrations, point of sale material and public relations activity.

The Harvest Company is a division of The Harvest Group. The Harvest Group market and distribute a wide range of fresh fruit and vegetables, and, more recently, with production facilities in Queensland and Victoria, manufacture, market and distribute value added FreshCuts salads and vegetable mixes nationally.

Endosulfan - An Uncertain Future

By Rod Dalton, President AAGF

The National Registration Authority for Agricultural and Veterinary Chemicals (NRA) review of Endosulfan is a major issue for the Australian Avocado industry and this article is published to update all growers as to the current situation. Information on the review process, the recommendations of the review and the actions of the AAGF and industry in attempting to ensure that the industry continues to have access to one of our critical 'tools of trade', are discussed.

Review Process

The NRA is an independent statutory authority with responsibility for the regulation of agricultural and veterinary chemicals.

The NRA, through the "existing Chemical Review Program" is systematically examining agricultural and veterinary chemicals registered in the past to determine whether they continue to meet current standards for registration. Chemicals for review are chosen according to predetermined, publicly available selection criteria. The NRA advises that public participation is a key aspect of the program.

In undertaking reviews, the NRA works in close cooperation with advisory agencies including the Department of Health and Family Services (Chemicals and Non-Prescription Drug Branch), Environment Australia (Risk Assessment and Policy Section), Worksafe Australia (Chemical Assessment Division) and State Departments of Agriculture.

The list of chemicals to be reviewed contains some 80 chemicals. Endosulfan was one of the first 5 to be listed for review when this process was begun in 1995. A second group of 7 chemicals are currently being reviewed and the review process has just been started for the next group that includes Paraquat, Diquat and Fenthion. Submissions from industry are currently being called for on these chemicals.

The AAGF provided a detailed submission to the NRA on endosulfan in mid 1995. The submission outlined use of endosulfan in the avocado industry and highlighted the chemical's importance in IPM, the level of usage, and the priority that industry was placing on FSB research in an effort to reduce endosulfan dependence. Environmental issues were also addressed.

However, the issues of worker exposure when spraying and working in the orchard were not addressed in detail as they had not been identified by the NRA or the industry as significant issues at that time.

Some two years later in September 1997 the NRA released a restricted draft response on endosulfan use to Departments of Agriculture and chemical companies only. A second draft was released to the public (and industry) on 22 December 1997. This draft report of some 500 pages was released on the Internet and had a closing date for responses of 27 February 1998.

AAGF Action

The AAGF became aware of the report in early January and immediately sought an extension of time to allow a reasonable time frame to study the 500-page report, consult with industry and prepare a detailed response. The request was denied and the AAGF was advised that the response time had already been extended from the normal 1 month to 2 months to allow for the fact that the report was released at the start of the Christmas break.

The AAGF then convened a workshop with researchers, consultants, academics, growers and other affected commodities, e.g. macadamias, to review the recommendations of the NRA draft report and discussed approaches which could be used in preparing a detailed response to the NRA. It was acknowledged that the response had to be based on sound science rather than emotional arguments.

A brief summary of the most detrimental recommendations of the review and their implications was prepared and sent to all avocado growers in Qld and NSW with the request that they prepare a submission to the NRA and contact their State and Federal members of Parliament.

A response to the draft review was prepared by the AAGF with the assistance of a number of non-industry personnel, which was greatly appreciated. The submission was lodged with the NRA in Canberra on 25 February.

Endosulfan - Why The Review

Endosulfan is an organochlorine insecticide that has been registered for use in Australia for more than 30 years. Unlike other organochlorines such as Dieldrin

and Chlordane, it does not persist for decades in the environment. It is fat-soluble however, and will produce residues in animal fat while ever animals continue to consume feed containing residues of endosulfan. When animals are taken off contaminated feed, residues drop below legal residue limits in about 6 weeks.

Large quantities of endosulfan are used in Australia each year with some 70% being used in cotton followed by vegetables (20%).

Endosulfan use has been implicated in a number of environmental incidents, particularly related to fish kills in cotton growing areas, and has been found to result in isolated residue detection in beef. Endosulfan was also implicated in fish kills in the Maroochy River in SE Qld where, despite the best efforts of authorities, no prosecutions were achieved. Much of the concern regarding possible health and environmental effects of endosulfan spraying is associated with cotton growing.

The NRA draft report acknowledges that "Endosulfan is not expected to accumulate in humans". It also concludes, based on current restricted uses of endosulfan, there should be no harmful effects on public health from the continued use of endosulfan in Australia, and endosulfan residues are estimated to be very low in Australian diets.

Nevertheless, the draft review recommendations if implemented in their present form, will significantly reduce the use of endosulfan in some crops such as avocados with probably only minor reductions in cotton, which is by far the major user. Thus the overall aim to reduce endosulfan usage in Australia is unlikely to be achieved to any significant degree.

Review Recommendations

The draft review makes 26 recommendations with respect to the use of endosulfan. Only those recommendations that have a direct impact on avocado growers are discussed in this report.

Recommendation 1

All uses of endosulfan, except use on the following crops (list provided) in the nominated States, will be withdrawn from 30 June 1998.

ENDOSULFAN

Avocados in Qld and NSW are on the list and have been given essential usage status. This means that, for example, WA must use alternative registered chemicals (if available) to control thrips in avocados.

Recommendation 2

Occupational health and safety (OH&S) and environmental concerns raised as a result of the review necessitate that use of endosulfan on nominated crops can only continue under a temporary restricted use regime in which specified modifications to use patterns, labels, maximum residue limits and other limitations are in place.

The NRA has recommended Endosulfan be withdrawn on 30 June 2001 unless scientific data/argument supporting continued use is presented before 31 December 2000.

Although the avocado growers in NSW and Qld have been given essential user status, the industry will have to generate the scientific data/argument to support the continued use of endosulfan past 30 June 2001. The chemical companies will not be doing this work for a relatively small user of their product such as Avocados.

Recommendation 3

Very limited measured worker exposure data (three studies in orchards) were submitted for consideration during the review.

These studies, together with predictive exposure, indicated that in the situations encountered in Australian agriculture, exposure was high.

The OH&S risk assessment indicates that there is a need to reduce overall worker exposure to endosulfan and it is likely that this will be best achieved by restricting the number of crops to which endosulfan is applied and the number of sprays per season per crop. Although it is acknowledged that these restrictions do not in all cases correlate directly to reduced exposure levels for individual workers, they will nevertheless reduce overall worker exposure.

The draft NRA report recommended:

- Unless a commitment is given by the registrants and respective industry bodies to generate worker exposure data by 30 June 1999, use will be restricted to two sprays per crop per season where IPM or resistance management strategies are practised.
- If such a commitment is given, further sprays in the context of IPM or resistance management programs will be permitted, provided they are carried out by licensed spraying contractors, on the basis that these operators are

better prepared in terms of training, equipment and experience to avoid exposure to the chemical. The NRA, in conjunction with Worksafe, will use data generated to establish if possible, permanent acceptable use patterns for the respective industries.

This recommendation of 2 sprays per crop would have a major negative impact on the avocado industry in Qld and Northern NSW and has been addressed in detail in the AAGF's submission. The recommendation that licensed spraying contractors be used in some circumstances was also identified in the submission as an impractical recommendation for the avocado industry.

Recommendation 5

It is recommended that the current Minimum Residue Levels (MRL) will become temporary and will be withdrawn on 30 June 2000 unless data are submitted to support these MRLs.

The avocado industry will have to fund the MRL data collection, as again the chemical companies will not fund this activity.

Recommendation 10

The following label statement is required:

Re-entry period. Do not allow entry for 3 days after treatment. If prior entry is required, limit duration of entry and wear cotton overalls buttoned to the neck and wrist, and elbow length PVC gloves. Clothing must be laundered after each day's use.

Hand weeder. Do not allow entry into treated areas for 3 days after treatment. After this period, wear shoes or boots, socks, long trousers, long sleeved shirt, gloves and hat.

This recommendation was identified in the AAGF submission as being impractical for avocado producers who need to enter their orchards regularly to monitor pest levels and irrigation systems.

Recommendation 11

A statement promoting the preferred use of enclosed vehicle cabs for ground spraying equipment over reliance on personal protective equipment is to be included on the label below the Safety Directions.

This recommendation was identified as unsound and impractical as the emphasis should be on the use of appropriate protective equipment.

Recommendation 16

In order to limit supply and use to suitably trained persons, endosulfan will be included in the Agricultural and Veterinary Chemicals Code Regulations as a restricted chemical product, and labels will be altered accordingly by the inclusion of the following wording:

"RESTRICTED CHEMICAL PRODUCT - ONLY TO BE SUPPLIED TO OR USED BY AN AUTHORISED PERSON"

It is proposed that 'authorised persons' will be those who have obtained Farmsafe accreditation or who are licensed spraying contractors.

The AAGF submission supported the accreditation of growers and requested that an extension of the deadline to 30 June 1999 be granted to provide adequate opportunity for all growers to gain accreditation.

At a meeting in Canberra on 25 February, I together with two representatives from the Macadamia Nut industry met with the managers of the Review Program and the Endosulfan Review team. I left that meeting with a greater degree of confidence that the NRA had a much better appreciation of the impact the draft recommendations would have on the Avocado and Macadamia industries. I believe that they also understood that some of the recommendations, such as the use of spraying contractors in certain situations, are not an option in the avocado industry.

The meeting also highlighted the constraints that had been imposed on the review due to the lack of information and local data on issues such as worker exposure levels, proportion of growers who had undertaken chemical user accreditation courses and detailed crop usage by crop and by farm.

NRA staff who acknowledged that they had received a large number of submissions from the avocado industry will review all of those submissions. I must take this opportunity to thank all growers and local associations who made the effort to make a submission.

A final report and recommendations will be considered by the Board of the NRA at its meeting on 16 April. Once the Board accepts the final report it will be forwarded to the Minister for Primary Industries and Energy for final approval. Industry will not be consulted again; however there is an appeal process that can be activated if necessary.



TALKING AVOCADOS - HAVE YOUR SAY

Dear Sir,

I would like to respond to the comments regarding AVO-MAN in the December issue of Talking Avocados.

I can understand the AAGF feeling some frustration that the issue of the commercialisation has not yet been resolved. The Corporation shares that frustration, as no doubt do the researchers involved. We are actively pursuing the matter with all parties involved in an effort to resolve it.

It is important to correct the impression that there will be no benefits flowing to the avocado industry from the use or adaptation of AVOMAN components by other industries in Australia or overseas. First, any licencing fees from AVOMAN or similar products will be used to develop upgrades. Second, developments funded by other industries will be freely available for future versions of AVOMAN. Our first consideration in these matters is always to ensure that the Australian industry will benefit.

7

In order to ensure that directors of the NRA Board were fully aware of the concerns of the avocado industry with the draft recommendations, a copy of the AAGF submission has been forwarded to each NRA Board member. I am meeting Mr David Wolfenden, who is the National Farmers Federation representative on the Board, in mid-March to ensure he is fully briefed.

The Federal and State Ministers for Primary Industries have also been sent copies of the AAGF submission.

As part of the AAGF response to the endosulfan review, a recommendation will be put to the AAGF Board meeting in March 1998 that the AAGF facilitate, at regional level, the provision of chemical user accreditation courses, to enable all avocado growers to be accredited by December 1998.

A project to generate worker exposure data is currently being developed. Tree crop industries that use airblast and air-shear type spraying equipment will be approached for a contribution to this project so that costs to each industry are minimised and Worksafe Australia's requirements for data are met.

The June edition of TA will report on any further developments. In the meantime, be assured that the AAGF Executive are covering all bases to ensure that endosulfan remains available for industry use.

The issue is the mechanics of how this is to be managed. There is certainly no ruling that the "AVOMAN shell" cannot be sold. This may well be how overseas avocado industries access the product. My understanding is that there is, however, no "shell" that can be simply adapted to another horticultural crop. Depending on the needs of that industry, some components could be adapted just as some of the work for Pineman was developed into components of AVOMAN. Similar names, but entirely different products.

We are currently negotiating an arrangement that will cover this scenario without the need for constant renegotiation and dispute as to who invented which component. This will also ensure that the industry will always have access to the product and to future improvements.

As already indicated to AAGF, I agree that the efforts of all the growers who have helped to develop AVOMAN should be taken into account in some way. However, as the research agency and inventors of AVOMAN, the Queensland Horticulture Institute (QHI) are the legal owners of the product. Through our contract they have an obligation to consult with HRDC on intellectual property issues and the Corporation requires QHI to develop a commercialisation strategy. We then have an obligation to ensure that this will be workable and that benefits will flow to the industry.

The Corporation acted with diligence and concern for the best interests of the industry in seeking advice from experts in software legal issues to propose a workable approach.

There are some lessons for all parties in this. Despite this issue being recognised very early in the life of AVOMAN, it has not been addressed satisfactorily. Lack of resources in QDPI, HRDC and AAGF has caused delays; even suspending funding to the project failed to accelerate the process. In future, projects will simply not be approved until a framework for commercialisation is established and built into milestones. Some resourcing for commercialisation must be built into project budgets, just as other expert services such as biometry or taxonomy is built in, when needed.

We value our close partnership with the AAGF in working for the best interests of all in the avocado industry and look forward to addressing future challenges in a constructive and professional way.

Lindy Hyam
Executive Director HRDC

Dear Sir,

My belated congratulations to Graeme Thomas on his presentation to the Avocado Growers Conference under the heading "Rootstock Influence on Yield of Hass Avocados". It was a well-researched project into a problem that has been with us for many years.

The fact that Graeme has recorded yields of individual trees over a period of six years lends substance to an important aspect of production: cost per tray. The fruit on those low yielding trees are expensive.

The support of Dr. Tony Whiley, our senior research officer in Queensland Research Institute, is hopefully, an indication that some long-term research may be done at last. The industry desperately needs access to approved clonal rootstocks that have been grafted with scions of proven performance and quality.

The widespread flood rains in 1974 emphasised the necessity for research work on the control of phytophthora. Ken Pegg and Tony Whiley did research work that was recognised world wide on the control of this disease. The ANVAS scheme with its emphasis on plant hygiene helped to ensure that nurseries supplied disease free trees to the industry.

If you follow Graeme's lead and keep records of production from individual trees over a period of years, you will find that the strong healthy trees with stacks of good scion wood are often the trees which produce very little fruit. This natural selection has in many orchards, led to a predominance of trees which are free of disease and fruit!

The particular rootstock problem came to my notice in 1983. I had purchased several hundred Hass avocado trees which were "AAGF Virus Tested". The trees were quite sound when planted, records showed they were from several different scion trees worked on to Mexicala rootstock.

There was some variation in vigour that appeared to be related to the compatibility of different rootstock-scion combinations. The point was that for the most part the trees were nonproductive!

Soil tests prior to planting indicated the nutrients required and these were applied regularly. Leaf analyses at five and six year old indicated that, with the exception of boron, all major and minor elements were at optimum levels.

The boron level, 20 ppm, did not increase after three times the amount of boron recommended was applied. (60 ppm of boron in the leaves is supposed to be optimum.)

Subsequently, that particular rootstock was dropped from the ANVAS program. Apparently it was selected for areas in California where the irrigation water has a

high mineral content and has the capacity to screen out some elements.

An article by research scientists in Israel confirmed that three factors might limit production—rootstock, scion, and compatibility of the stock-scion combination.

Sometimes incompatibility is clearly shown by the rootstock developing to a larger diameter than the scion at the point of grafting. It is probable that less obvious symptoms may still be responsible for restricted movements of nutrients to the upper part of the avocado trees.

Some of the early growers may recall that the rootstock problem was brought up at the Atherton conference in 1994. (In spite of a dispute with the chairman of the day!)

It is not my intention to be critical, sufficient to say that the majority of the delegates at that conference had an interest in nurseries, there was a very substantial demand for trees. The industry was expanding rapidly at this time but there were few funds available for long term research.

The industry definitely has a long term problem to select rootstock and scions of known performance which are both highly productive and compatible. Avocado rootstocks are not easy to propagate in quantity. The system developed by Henry Brokaw in California, which made use of "nurse seedlings" to propagate clonal rootstocks, has been tried and discarded. This system may have to be resurrected until some better method evolves to increase clonal material.

May we live to see the day when we can buy with confidence, trees on approved clonal rootstocks worked with compatible scions taken from trees of known performance.

*E.F Tree
Horticultural Consultant
Flaxton Qld*

Dear Sir,

The method of deciding which research projects are given priority for funding is a mystery to me. For example, in relation to the AVOMAN project:

1. Why were funds given for record keeping when record keeping has never been identified as a problem for growers?
2. Why was the development of software given priority when a print version of AVOMAN would have been cheaper and accessible to more growers?

An article explaining the guidelines used to allocate research funds and how they led to the above two decisions would be very worthwhile.

*Philip Diemar
Bobs Farm, NSW*

Record Number Of Exhibitors At Expo 15

Expo 15 will be held at the University of Queensland Gatton College on Thursday 21 and Friday 22 May, 1998.

Visitors to Expo 15 will find they need every minute of the two-day event to thoroughly cover what is on offer to the horticulture industry. Expo 15 will present a record number of exhibitors dedicated to displaying horticultural products, services and technology from all over Australia.

To date, 132 sites are secured with many of the site categories being fully booked. Strong interest is still being shown by other businesses, as Expo 15 continues to build on its industry standing as Australia's premier horticultural field day event.

Expo Coordinator, Mrs Anne Story, said, "It is particularly pleasing to see the number of interstate exhibitors who will be involved this time. This will inject new products, services and technologies into Expo and visitors will find every aspect of horticulture covered."

"The in-ground varietal trials are developing well and the feature block of indeterminate tomato varieties has already generated a lot of industry interest. I am aware of groups travelling in

from New Zealand and Western Australia, as well as other eastern States."

This Expo will see two specialised seminars presented—one on each day during the lunchtime period. Hosted by Good Fruit & Vegetables, two prominent speakers will address the issues of food safety and minor use registrations for chemicals. Both these issues impact directly on producers and everyone else in the distribution chain.

Support for Expo 15 has been very strong with many commercial companies providing sponsorship of the event. The major sponsor, Good Fruit and Vegetables, will preview the event as well as providing the industry with full details on participating exhibitors in their Official Program.

A one-day ticket will cost \$5.00 per person, but visitors can purchase a two-day ticket to Expo 15 for just \$8.00. Tickets are available prior to the event from the Expo Office, or at the gate.

For further Information contact:

Anne Story
Expo 15 Coordinator
PO Box 7667
Toowoomba Mail Centre Qld. 4352
Tel: 07 4635 6845 Fax: 07 4635 9422

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Australian Round-up



Now that our orchards have completed their 'fruit drop' cycle, orchardists are able to assess and forecast this year's crop.

Early indications are that this year's crop of Hass is approximately 30% down on average and higher in some areas. However, reports indicate that green skins have cropped particularly well.

The NSW Avocado Association's AGM was held at the Summerland House With No Steps on 26 March. Guest speakers were Wayne Prowse (AHC) who discussed the 1998 marketing and promotion program and Bob Brinsmead (Tropical Fruit World) who talked about value adding of fruit produce.

The Association has had a change of secretary. Phil Connor has replaced Veronica Guy who previously held the position. We thank Veronica for her efforts and professionalism during her period of office.

Reshape Your Orchard for Bigger Yields

On the day of our Annual General Meeting, we imported a Guru from Palmwoods, Mr Peter Young. With a rented crowd of 50+ growers from the Riverland and Sunraysia, we visited Kevin Heritage's property, where there were many trees in various stages of reshaping.

Having started with our AGM and appropriated guest speakers we retired to Ross Richards' place to see some Gwen avocados and have lunch. After lunch an inspection of Yandilla Park's avocados followed by practical examples of Peter Young's morning talk at Kevin Heritage's property. The show continued until bad light prevented play. Everybody learned something but not necessarily the same thing, which shows how well Peter can stimulate ideas.

Support for Climate Research

1996 was a bumper year in these parts but 1997 was a disaster (we have noted one grower with 22% yield compared with 1996). We should support the research by Dr Robert Munro (Bureau of Resource Sciences).

Gwen Avocados

Gwen avocados crop early and prolifically. Unfortunately, some fruit drop off, particularly big fruit that drops just before maturity. We are in the process of measuring the percentage of the dropped and non-dropped fruit by isozyme analyses (courtesy of the University of Adelaide) and relating this qualitatively to the proximity of "B" type trees (Bacon, Ryan and Ettinger). Some Hass have been included. We hope to have a preliminary report on the results by mid '98.

In a presentation to a group of media, well-respected Western Australian sports dietitian and nutrition consultant, Glen Cardwell, put a very strong case for avocados as a nutritious fruit for all ages. Excerpts from his presentation follow.

"The avocado has been unfairly accused as a co-conspirator in heart disease. The fat in the avocado is mono-unsaturated, the kind of fat that has become the darling of the health fraternity. It doesn't increase and indeed it may well decrease your risk of heart disease, with its abundance of vitamin E, vitamin C and beta-carotene.

"The vitamin folate is now portrayed mainly as a woman's vitamin as folate may reduce the risk of birth defects such as spina bifida. But folate also reduces the risk of heart disease in both males and females.

"There is universal scientific agreement that all fruit, including avocados, have heart disease and cancer preventing properties. Avocados may even reduce the risk of osteoarthritis. Any charge suggesting avocados as a cause of disease can be safely dismissed.

"But let us not over-medicalise the avocado. It should be enjoyed for its great flavour and texture. Of course it is good for you, as nature would never offer a great-tasting food that would cause harm.

"We can safely drop the charge that avocado is fattening. Body fat is the creation of society, not the integrity of the fruit. There is not a single medical condition in which the avocado should be a food of concern. Its character is flawless and enjoys enhancing and nurturing many a life.

"In this feel-good era, and for that extra marketing edge you may wish to describe avocados as 'no added sugar, salt-free and

dolphin safe'! Let the avocado bring healthful pleasures to the taste buds and physiology of all humans."



South East Queensland

Sunshine Coast Avocado Growers Association (SCAGA) members have become accustomed to seeing Dr Clive Kaiser on their properties, and to discussing the problems they encounter in producing the crop. Clive is a visiting researcher from the Republic of South Africa based at Maroochy Horticultural Research Station, and is completing the first of his three year secondment. His presence here is financed to a degree by AAGF from the R&D levies which we all pay.

We all know what a nightmare is. The need to inject trees with acid to stay the ravages of root rot is a nightmare in any grower's book. What is the opposite of a nightmare—a fantasy? In one of his grower discussions, Clive was told that tree injection was the most hated time consuming (and therefore expensive) and frustrating task confronting the avocado grower. So Clive has spent a couple of months looking at the problem, and a possible solution by phosphonate foliar spraying. The current wisdom has been that foliar absorption of acid is not a viable solution. Clive's proposed method of making it a viable solution is so simple that an initial reaction is that it is too good to be true. SCAGA is sufficiently encouraged

Conference Proceedings

Conference proceedings are now available from the AAGF Executive Officer, P.O. Box 19, Brisbane Markets, Qld. 4106.

The purchase price is:

Australia \$45 + \$5 postage
Overseas \$65 + \$10 postage

All prices quoted are in Australian dollars.

by progress to date that we believe the fantasy might become a very agreeable reality. So far, there are no significant bad side effects. There is even a potential beneficial side effect—the technique might help the fight against anthracnose.

These are very early days. There is still much work to be done and tree injection will not be abolished overnight. There is also a major snag. The work has not been budgeted in AAGF's R&D program so there is no easy money available to continue the good work. To overcome this problem, SCAGA was prepared to tap its hollow log and produce something like \$5000 to keep the project going, and to ask AAGF to canvas all other LPAs to kick into the kitty. If this does not produce enough, we believe some individual growers feel so strongly about it that they would also contribute. At the time of writing, we have been told that the Establishment may be in a position to provide finance at least in the short term (due to buoyant levy income) so passing the hat round may not yet be necessary.

We believe that the project is sufficiently prospective (as the gold miners would say) that it should go to the top of AAGF's priority list. The savings to growers will not be peanuts—they will be megabucks.

If funding does become a problem, SCAGA will push hard for a radical funding solution that will allow the hypothesis to be proved one way or the other.

We applaud Dr Kaiser for the initiative he has shown if our fantasy does indeed become a reality, we hope all the credit will go to him.

Avocado Field Day In NSW

The Coffs Harbour Branch of the NSW Avocado Association will be holding a Field Day at Stuarts Point on the 30 May 1998.

The main speaker will be Peter Young of Birdwood Nursery talking about "top working Fuerte to another variety". There will be a morning seminar followed by a practical demonstration in the afternoon. The day will start at 9:00 a.m. and finish at around 4:00 p.m. The cost will be \$10 for Association Members, \$20 for others and a \$5 surcharge for late bookings or at the door.

To book please write to:

Coffs Field Day
C/- Andrew Wright
P.O. Box 406
COFFS HARBOUR NSW 2450

Please RSVP by the 15 May. Include your name, address, phone number, number attending and a cheque to NSW Avocado Association. You will then be sent a receipt, timetable and map.

Phone enquires to Andrew Wright at 02 6653 6087.

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Features Of The 1997 AVOMAN Prototype

Part III

The Planner

The AVOMAN '97 prototype includes a new look planner that has been updated to complement the new Operations section of the program.

The Planner in the 1997 prototype provides a visual overview of all jobs recorded within the Operations section. It includes both those that have been set as reminders and those that have been done. The user has two viewing options, either a whole year on the screen split into fortnights or four weeks split into individual days.

Each job recorded in the Operations section automatically appears as a coloured cell on the planner. These jobs are arranged into their respective categories on the Planner (e.g. fertiliser, fungicide, irrigation) and each category is colour coded. A coloured cell with no lines through it means that the job (or jobs) have not been done and remain as reminders. A single diagonal line means that one or more, but not all, of the jobs scheduled for that time have been done. Two diagonal lines making a cross through the cell means that all the jobs scheduled for that time have been done.

Users can find their way around the Planner by a number of means which include the scroll arrows and selecting date columns on the Planner itself or by using any of the scrolling and date finding features on the main tool bar.

Since all recommendations and records are now handled within the Operations section of AVOMAN '97, the Planner is a visual summary of the jobs and unlike last year's Planner is not the place where they are recorded.

The Spray Diary

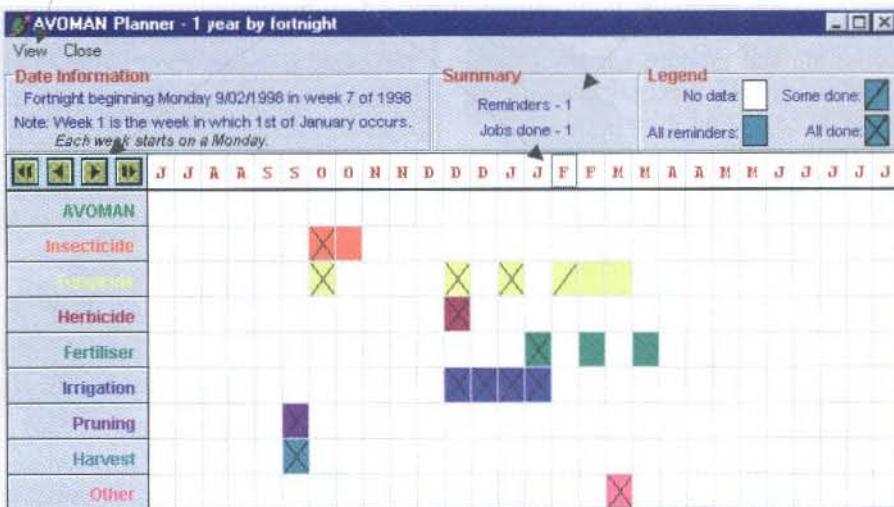
The spray diary report has been added to AVOMAN in response to grower requests. This report is being developed so that it satisfies the needs of most quality system requirements. As quality assurance becomes more of an issue such reports will become an important part of the AVOMAN software.

You can choose the amount of detail that appears in this report and specify the date range to be covered. The simplest version will show the name of the block, dates, chemicals, rates and a place for the

Alter viewing options here

Move around the planner using the navigation keys, selecting the fortnight or using the date facility on the main toolbar.

Number of reminders set and jobs done the fortnight selected



The planner provides a visual overview of the reminders set and the jobs done

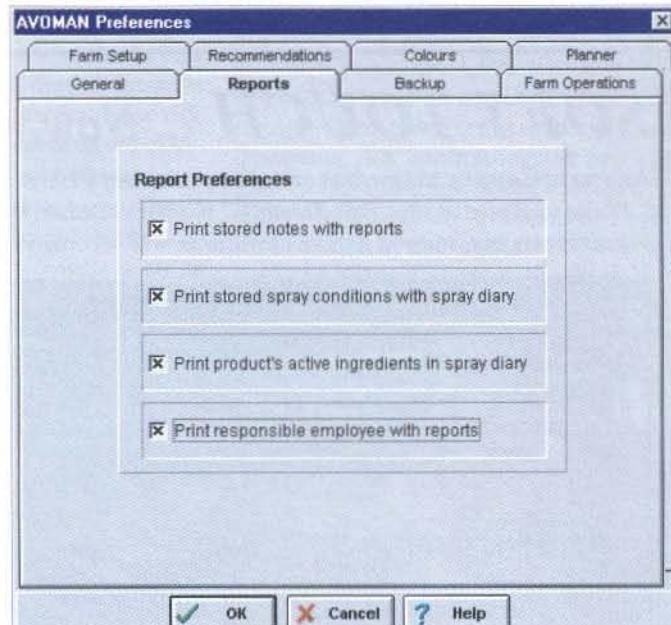
operator's signature. Optional details that are also available include the name of operator, time of spray start and finish, wind speed and direction at start and finish of spraying, name of the active ingredient, amount of chemical and active ingredient per block, per tree and per cubic metre of canopy area and any notes recorded at the time. All these options can be selected in the Options/Preferences section in the menu of the main tool bar.

The AVOMAN Help System

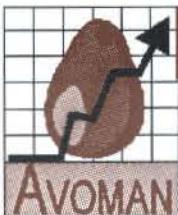
Those who used the 1996 AVOMAN prototype may have noticed that the manual accompanying the current version of AVOMAN is somewhat thinner than last year's. The reason is that most of the agro-economic information has been removed from this year's manual, but it hasn't disappeared from AVOMAN completely. Most of the

horticultural information from last year's manual has been updated and incorporated into the AVOMAN program itself.

The AVOMAN help system contains over 200 pages of information on a range of topics including nutrition and most of the major pests, diseases and disorders affecting avocado. It also contains a few sample pictures to help you identify root rot symptoms.



The screen in the Options/Preferences section where you can choose the detail required for your printed reports



AVOMAN

The help system can be opened by selecting "AVOMAN Help" from the "Help" menu on the AVOMAN tool bar. When opening the help system in this way, the help contents page is displayed which contains a number of underlined topics or links to other pages in the help system. To view other topics you simply click one of the underlined topics. By following the links it is possible to navigate through the whole help system (Figure 1).

Many of the topics in the help system are linked to sections of the AVOMAN program so that they can be easily viewed from within AVOMAN just by pressing the standard help key on your keyboard (the F1 key). For example, when entering block observations, if you would like more information about how to determine the root rot status of your trees, select any of the root rot symptom options with your mouse, then press the F1 key on your keyboard. The help screen should look like the one shown on the front cover of this magazine.

Another way to locate specific topics in the help system is to use the search facility. Simply open the help system (either through the help menu or by pressing the F1 key on your keyboard), then press the "Search" button at the top of the help system's screen. Within the search section, you will see a list of key phrases that you can select, or you can simply type the topic you are looking for. As you start to type your topic, you will notice that the system searches the list of key phrases for the phrase you are typing. (see Figure 2)

Once you have typed enough of your key phrase to see what you are looking for in the phrase list, simply select the phrase you are looking for from the list and select "Display" if you're using Windows '95 or "Show Topics" and "Go to" if you're using an earlier version of Windows. This is a very effective way of quickly locating specific information. Once located, help topics can of course be printed.

The AVOMAN help system is a comprehensive reference which, when used in conjunction with the AVOMAN software, can help you to effectively manage your farm. The project team plans to further expand the help system in the lead up to the final release so if you have any suggestions for improvement, please ensure that you have your say by either contacting the development team directly or by completing and returning the AVOMAN 1997 prototype survey.



All AVOMAN and other technical articles and reports published in this magazine are sponsored by the HRDC and the avocado industry.

Target Pest/Disease			Rate Applied	mL or g per Block
Date 19/01/1998	Employee Fred Smith		Signature.....	
<u>Product Information</u>	Anthrax/Stem end rot	<u>Product</u> Blue Barrier WP (Craig Mostyn)	2 g / litre	5400
<u>Actives</u>		<u>Active Ingredient</u> Copper hydroxide		2700
<u>Spray Information</u>	Start Time 10:00:00 End Time 20:30:00	Wind Speed 3 Wind Speed 3	Wind Direction E Wind Direction SE	
Date 19/01/1998	Employee Jim Wright		Signature.....	
<u>Product Information</u>	Spotting Bug	<u>Product</u> Endosulfan 350 EC (Nutarm)	1.5 mls / litre	4050
<u>Actives</u>		<u>Active Ingredient</u> Endosulfan		1417.5
Notes: Sprayer started to play up halfway through job - get Tim to look at it				
<u>Spray Information</u>	Start Time 6:00:00 End Time 9:00:00	Wind Speed 2 Wind Speed 2	Wind Direction SE Wind Direction SE	
Date 26/01/1998	Employee Jo Bloggs		Signature.....	
<u>Product Information</u>	Anthrax/Stem end rot	<u>Product</u> Blue Barrier WP (Craig Mostyn)	2 g / litre	5400
<u>Actives</u>		<u>Active Ingredient</u> Copper hydroxide		2700
<u>Spray Information</u>	Start Time 7:00:00 End Time 9:00:00	Wind Speed 2 Wind Speed 2	Wind Direction N Wind Direction N	

A Section of a spray diary showing the level of detail available

The screenshot shows the AVOMAN Help System window. At the top, there is a menu bar with File, Edit, Bookmark, Options, and Help. Below the menu is a toolbar with buttons for Contents, Search, Back, Print, and Exit Help. The main area is titled "Contents" and lists several underlined links: Introduction, Support and Feedback, Acknowledgements, and Conditions of Use. Below these links is a section titled "Farm Management Information" with a small icon of a farm. At the bottom of the window, there is a copyright notice: "Copyright © 1995-97, Department of Primary Industries, Queensland All Rights Reserved." and a warning: "Unauthorised duplication strictly prohibited."

Figure 1.

The screenshot shows the AVOMAN Help Topics window. At the top, there is a title bar with "Help Topics: AVOMAN" and a close button. Below the title bar is a toolbar with Index and Find buttons. The main area has two numbered steps: 1. Type the first few letters of the word you're looking for. A text input field contains the text "boron". 2. Click the index entry you want, and then click Display. A scrollable list box displays a list of topics starting with "Boron Deficiency". At the bottom of the window are buttons for Display, Print, and Cancel.

Figure 2.



AVOMAN TIPS

The Block Summary

The block summary feature is found within the operations section and it summarises the existing status and conditions affecting that block for the selected week. For example, it lists the variety, tree size, root rot and leaching status, crop load, current leaf and soil analysis levels etc. The purpose of the block summary is to serve as a quick reference to the measurements and observations that are considered in the calculation of the recommendations for that week.

If you need to make changes to any of the block details, these should be made in the block information or block analysis sections of AVOMAN, as the block summary is just a visual summary of the information from these sections of the program.

The Block Summary is a handy reference to check if an apparently unexpected recommendation is given by AVOMAN. It will show the conditions existing for the week selected (Figure 1.).

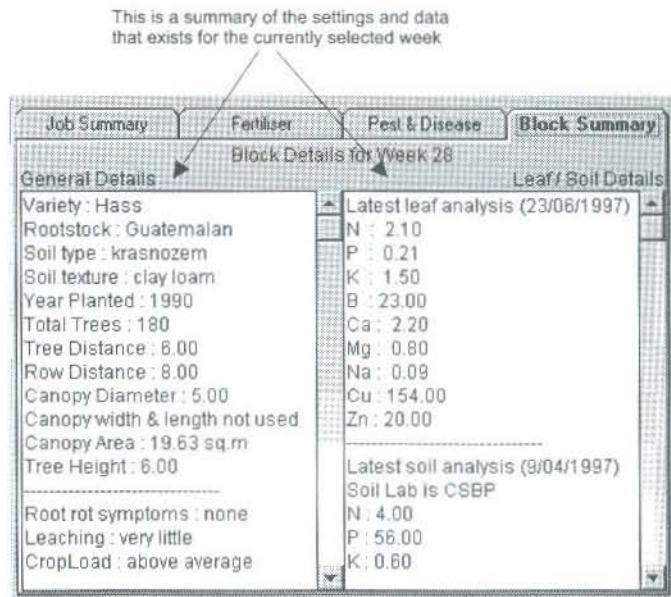
Backup Reminders

Most people understand the importance of making regular backup copies of the data you store on your home computer, however the hassle of backing up often leads to no backups at all. The new AVOMAN backup program is so quick and easy to use that there is now no excuse for not backing up your important information. To make life even easier, you can set a reminder in AVOMAN so that you are prompted to backup your data after a certain number of times that the program has run.

To set backup reminders, go to the "Options" menu on the AVOMAN tool bar and select "Preferences", then select the backup page on the preferences screen. To set a backup reminder, check the "Remind me to backup my files" option and enter the number of times you want AVOMAN to run before reminding you to backup your files (Figure 2).

The number of program runs to set depends on how often you run AVOMAN and how much new information you enter each time you run the program. With this preference set, after the designated number of program runs AVOMAN will display a backup reminder. From the reminder screen you can choose to either backup now or ignore the reminder. If you choose to backup now, the backup program will automatically be opened for you (Figure 3.).

Figure 1.



The block summary provides a handy reference to the information for the week currently selected in the operations section

Figure 2.

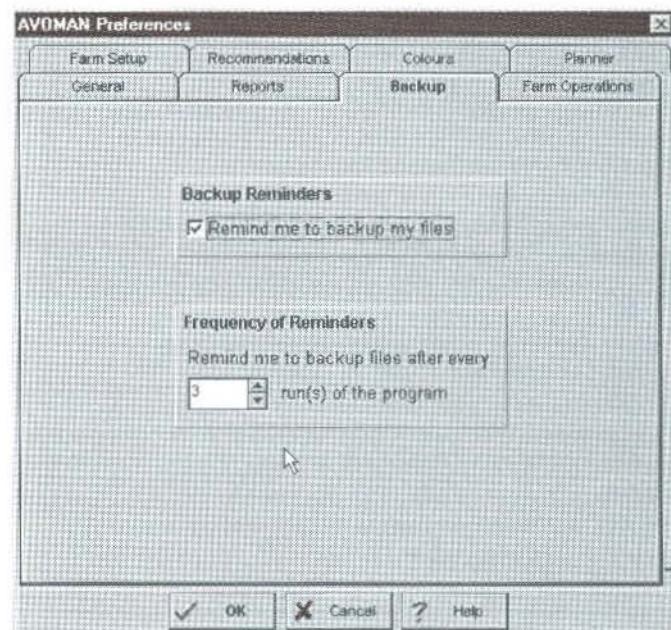
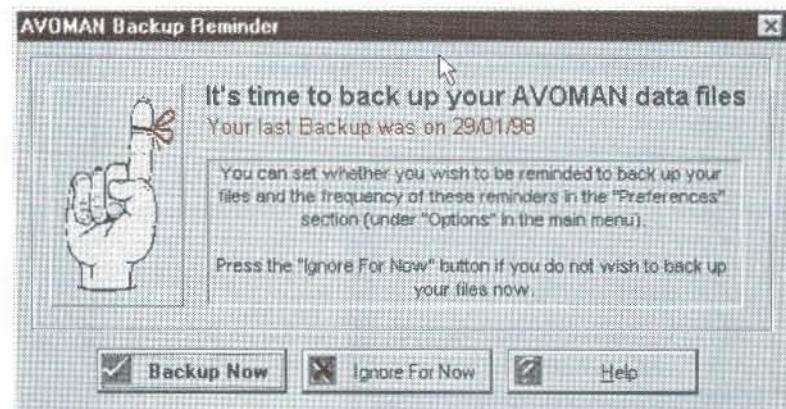


Figure 3.



Effects Of Phosphonate Soil Drenching On Avocados

C. Kaiser and A.W. Whiley, Maroochy Research Station, Queensland Horticulture Institute, Department of Primary Industries, Nambour

Introduction

Phytophthora cinnamomi is one of the most debilitating diseases in avocados and has been responsible for widespread destruction of orchards throughout the world. Today, in most cases, the soil-borne fungus is held in check by an integrated approach incorporating both chemical and cultural practices where the latter promotes a suppressive environment.

Chemical control relies heavily on the use of phosphonate fungicides that are usually applied as either one or two annual trunk injections. However, the question has been asked as to whether a soil drench of phosphonate will be effective in controlling the disease as well as being cost effective.

In this study, healthy, previously untreated trees were drenched with different concentrations of phosphonic acid (previously known as phosphorous acid). Both root and soil phosphonic acid concentrations were then monitored on a weekly basis.

Procedure

The study was conducted at Childers, a warm subtropical climate in SE Queensland, with 900 mm mean annual rainfall.

Two-year-old, *Phytophthora*-free 'Hass' trees on seedling Guatemalan rootstocks, growing in a deep, well-drained krasnozem soil were chosen for the study. Trees were soil-drenched over a 4 m² canopy area with 22.5 litres of phosphonic acid at concentrations of 5, 10, 20, 40 and 100 g/l in autumn (27/03/97).

On a weekly basis, root and soil samples were taken from depths of 0 to 10 cm and from 10 to 20 cm until 01/05/97 and analysed for phosphonate residues.

Results

Soil phosphonic acid concentrations declined steadily in the top 10 centimetres of soil over the six-week period of the trial. Immediately after the application of 5 g/l,

soil concentrations were 54 mg/kg. This declined to 34 mg/kg after six weeks. A soil drench of 100 g/l gave a reading of 785 mg/kg immediately after application, which decreased to 170 mg/kg six weeks later.

Initially, concentrations in the 10 to 20 cm zone of the soil profile were relatively low. For the 5 g/l drench, the immediate reading was 4.5 mg/kg. This figure increased to 21 mg/kg after six weeks. In the 100 g/l treatment, the immediate reading was about 128 mg/kg, which increased to about 253 mg/kg after six weeks. These figures suggest leaching in the soil profile.

For protection against conventional strains of *Phytophthora cinnamomi*, a minimum concentration of 20 mg/kg is required in the roots.

In all instances, phosphonic acid concentration in the roots increased after soil drenching but subsequently decreased. For the 5, 10 and 20 g/l treatments, root sample readings were only more than the required 20 mg/kg for a maximum period of two weeks. Furthermore, there was a lag phase before concentrations increased.

Roots from the 40 g/l treatment had concentrations greater than 50 mg/kg one week after treatment and these remained at this level for four weeks after application.

Phosphorous acid concentrations in roots from the 100 g/l treatment peaked at about 287 mg/kg three weeks after application but declined to about 50 mg/kg six weeks after application. Consequently, if root drenching were to be considered, a minimum of 40 g/l would be required to increase root concentrations above the critical level of 20 mg/kg for a four-week period. However, since concentrations had declined six weeks after application, additional phosphonic acid would have to be applied on a monthly basis.

Conclusions

Soil drenching of healthy, two-year-old 'Hass' avocado trees resulted in an initial increase in soil phosphonate concentrations but these declined over six weeks in the top 10 cm of the soil profile.

Concentrations remained low in the 10 to 20 cm zone of the soil profile but increased six weeks after application, which suggests normal leaching in the soil profile.

The degradation of phosphonate to phosphate (a plant nutrient) which is known to occur when phosphonate enters the soil was not measured.

Root phosphonic acid concentrations increased after soil drenching but subsequently declined suggesting applications of 40 g/l every four weeks would be required for adequate protection. Based on this concentration, it is estimated that when applied as a soil drench to protect avocado trees against *Phytophthora* root rot, 220 g of phosphonic acid per m² of canopy area would have to be applied every four weeks.

When compared to trunk injections which equates to 1.25 g/m² per annum of canopy surface area, soil drenching at the above rate would require 2640 g/m² per annum of canopy surface area to provide effective protection (assuming that leaching was relatively constant under irrigated avocado trees).

The costs involved equate to approximately \$54.00 (exclusive of labour) for soil drenching and \$2.00 for trunk injection. Consequently, soil drenching is not considered cost effective.

Furthermore, studies have shown that in some situations strains of *Phytophthora* root rot less sensitive to phosphonic acid have developed. It is believed that soil drenching with phosphonic acid will increase the potential for selection of phosphonic acid resistant *Phytophthora cinnamomi* strains.

Note: This experiment was only carried out on avocado trees growing in red krasnozem soils that have high clay content. Different results are likely to occur on other soil types. However, the dangers of selection of phosphonic acid resistant *Phytophthora cinnamomi* strains remains high with soil drenches.



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

Industry Manager's say....

By Wayne Prowse



Growers have sometimes commented about the "luck" we have that avocados often get a mention in newspapers and on TV programs without realising that it is all part of a public relations campaign funded by levies.

So far this year we have achieved an excellent response to the campaign with a higher level of "good quality" articles. Take for instance the 5-minute segment on Burke's Backyard last September when Rosemary Stanton talked beautifully about the nutritional benefits of avocados. Then there was the October segment on Australian Good Taste TV featuring John and Jay Dorrian's avocado plantation near Childers. It is impossible to estimate the value these features generate for the industry; however, it would be more than we spent on the annual PR program.

In January we conducted some consumer research to test the consumer perceptions to avocados following a two-year break in obtaining such data. The results were encouraging. **28% of the total population claim to regularly eat avocados.** This is a rise of 7% since 1995. Consumer resistance to the price of avocados is down from 43% to 29% in the same period and is more encouraging when you realise the study was done when avocado prices were high.

Much of the research confirmed our current positioning of avocados and that our messages are getting through. Cholesterol and fat are not major issues anymore and the older population groups understand the nutritional benefits of avocados more, which is where these messages are targeted. Young people were more aware of the benefits of avocados as a first food for infants.

What is emerging as a key issue from research is the strong association of avocados with salads and therefore summer. This is not unexpected; however, with increasing volumes coming onto the market in winter we are planning to focus more on making avocados part of a winter food whilst maintaining the underlying message of eating avocados for good health

and nutrition. In order of preference avocados consumers eat avocado:

- a. **with salad,**
- b. **on their own**
- c. **spread on a sandwich.**

We have prepared a new series of advertisements aimed at young people to help bring avocados into their healthy lifestyle. These will be one-third page ads that will be seen in magazines such as *Cosmopolitan*, *New Woman*, *Who Weekly* and *Better Homes and Gardens* (see opposite). Now these may not be on your average avocado grower magazines list of must reads; however, it's what the people we want to purchase more avocados read.

Overall I am very pleased with the way the programs are working for you and look forward to seeing results of the increasing impact the promotions are having in the market.

Your Levy at Work January - March 1998

Recipe Leaflets

- Distribution gained in Coles Supermarkets NSW for existing leaflets.
- Work to start on a new leaflet and poster in March for 1998 season.

In Store Demonstrations

- Avocado Industry in-store demonstrations will start in mid March.
- Other groups such as Team NZ and Shepard/Harvest are funding their own programs.

Special Events

- No Special Events in this period; however, participation in "Heart Week" activities in May is planned. More details next issue.

Public Relations

- Good media response to Reed and Hass releases.
- Press release - focus on Shepard - February.
- Press release - focus on **Healthy Eating** with avocados for health media.
- Press release - focus on **Fuerte** - April.
- Better Homes & Gardens filmed TV footage at Mt Tambourine in preparation for a later feature on their program.

- What's Cooking, Healthy Wealthy and Wise, and Australian Good Taste have all included avocados in TV segments filmed during February.

Advertisorials

- *Bounty Magazines* - to Maternity Hospitals - on going
- *HeartHealth Magazine* - to HeartHealth Australia cholesterol testing clinics - ongoing

Advertising

- Photography and finished art for 2 x one third page ads for magazines. Space booked for:
 - (1) *Cosmopolitan* - March and April issues.
 - (2) *New Woman* - March Issue.
 - (3) *Who Weekly* - 15 March and 5 April.
- A 3rd advertisement with a distinct winter theme will be prepared in March.

Research

- Quantitative study on consumer buying habits and perceptions of avocados.

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Manufacturers of:- SELF ADHESIVE FRUIT & POLYSTYRENE LABELS, GUMMED BACK, NON-TEARABLE & PLAIN TICKETS OR TAGS ON ROLLS OR SHEETS.

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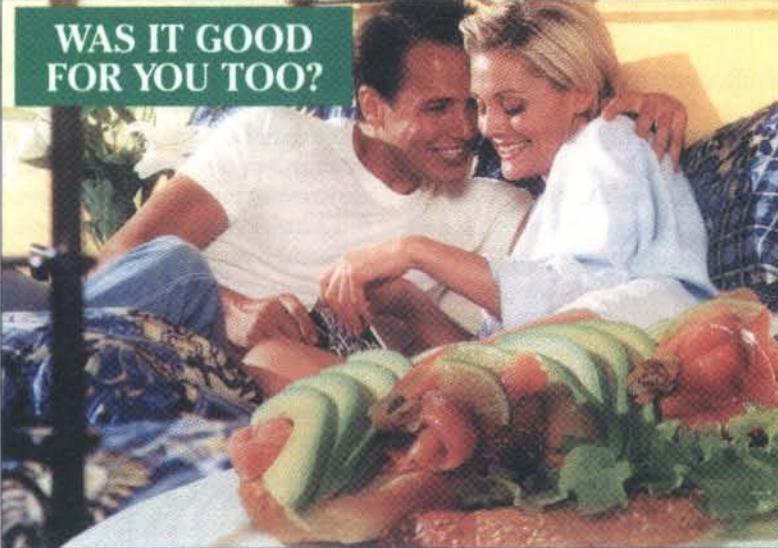
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WAS IT GOOD FOR YOU TOO?



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AUSTRALIAN AVOCADOS
DELICIOUS ON ANY OCCASION

HEART FOUNDATION APPROVED

Marketing Forum Review

The avocado industry marketing forum met on 17 February to review the current programs and to recommend programs for 1998.

All members contributed to the discussion by outlining their perspectives for 1998. All agreed that we are looking toward a large production year and needed every piece of our marketing program to work well for us.

Wholesale agents attending commented that quality was improving over past years. They did express concern that many growers were switching to agents with less experience in handling avocados and that this was having a negative impact on prices.

We reviewed the quantitative research and were pleased with the outcome.

In brief, more people (28%) are eating avocados, cholesterol and fat issues are now less of a deterrent for purchasing avocados, 91% of avocado eaters said they eat avocados because they like the taste and only 29% of people restrict their purchases because of the price. Ripeness and bruising was also less of a deterrent to purchasing than the 1995 research showed. Consumption was higher for older groups highlighting the need to increase sales to the younger age groups.

The presentation by Abi Ulgiati of QFVG was well received as she outlined the success of the PR program conducted by The Corporate Advantage. Excellent

TV, magazine and newspaper coverage had been generated to the value of \$205,000 as of January. This is the best result we have seen in several years.

Dominic Walsh from advertising agency JFM presented the magazine advertising concepts and artwork. We all agreed that we need to increase the frequency of magazine placements and the schedule for the full year would be reviewed. We agreed with the young lifestyle concepts and requested a creative execution that was more clearly relevant to a winter meal.

The discussion continued as we worked through the draft marketing plan that was finalised for the AAGF meeting on 23 March.

Trial by Weight

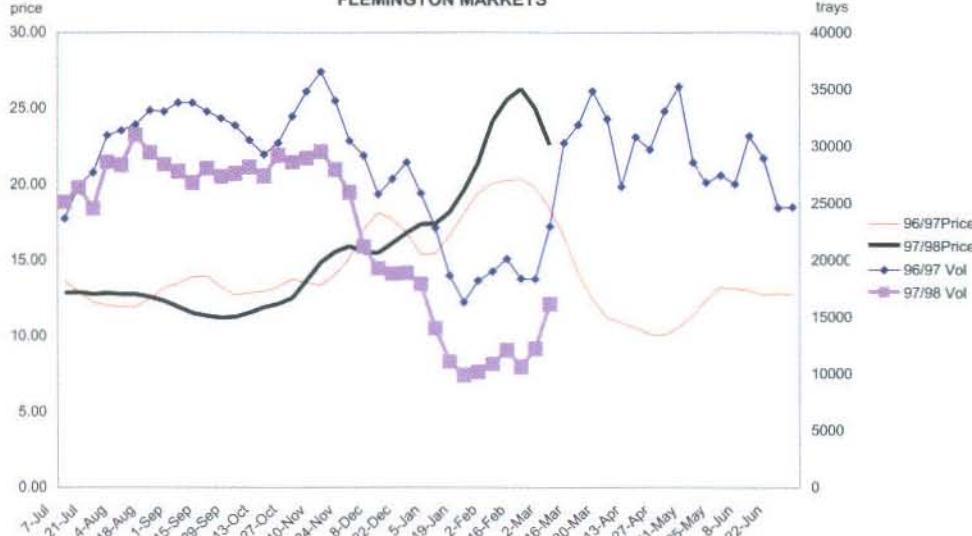
Many growers are aware of our effort to conduct a statistically valid trial by weight for the selling of avocados in retail outlets. The trial was conducted across 4 major retail outlets in Queensland during September/October.

The trial was to be conducted with 4 trial stores and 4 control stores following the measurement of 4 weeks sales prior to the trial in the 8 stores. Whilst the data for the trial was obtained, for various reasons the data for the pre-trial was not statistically valid and this has naturally made the results inconclusive.

The trial will be conducted again following the Shepard season. I regret the inconvenience to growers who were expecting results in this issue of TA.

AVOCADOS

4 WEEK MOVING AVERAGE PRICE AND VOLUME COMPARISONS TO LAST YEAR THROUGH FLEMINGTON MARKETS



source: Flemington Market Reporting Service, AHC analysis



How Are Avocado Projects Selected?

By Gerard McEvilly, Avocado Program Manager, HRDC

How many in the industry really understand how avocado R&D projects are selected? This article provides an outline of the process.

The process is now less based on selection and more to do with development of projects. Input from industry before a project is hatched is crucial to minimising the risks inherent in any R&D activity. This begins with an overall plan—the original R&D plan from 1991 was revised in 1996 and provides a broad framework of the needs of the industry. The R, D & E subcommittee of the AAGF Board has operated since 1996 with a brief to implement this plan.

The subcommittee comprises growers with technical and business management expertise and is chaired by George Green. The members of the subcommittee provide the next stage of industry input, working with HRDC and research agencies to develop proposals addressing the needs highlighted in the plan. Usually researchers are invited to submit expressions of interest to carry out particular projects.

Currently, a project to develop improved methods for clonal propagation of avocado rootstocks is being commissioned. The requirement was advertised nationally in January after the development of a detailed project brief. Submissions are

now undergoing analysis by HRDC and the R, D & E subcommittee.

As outlined in the last issue of Talking Avocados, this proactive approach has resulted in a well-integrated R&D program addressing many of the major concerns of the industry. However, there are many gaps in knowledge, which threaten profitability and require action. With the current program absorbing all available funds, the AAGF has increased the levy in order to address these gaps.

An R&D audit to be carried out in March will assess progress in carrying out the current R&D plan and provide priorities to be advertised in June for the 1999-2000 round of funding. Applicants will have to submit two-page concept development proposals by the end of August 1998 and, if any are suitable, they will be invited to develop a full proposal by the end of December.

Full R&D proposals are normally considered in March and recommendations go to the AAGF Board who in turn recommend the research program to the HRDC Board. If any priority areas do not attract proposals, funding may be allocated for commissioned work on these topics.

Apart from the management of the project, commissioning and application process, development of budgets and

technical analysis of projects by the program management team, the HRDC also undertakes ongoing management of the program. This includes a milestone management system, with ongoing project payments linked to the delivery of satisfactory outcomes and reports.

For efficiency, the Corporation develops systems that are uniform across its many horticultural industry and research agency partners, but allow some flexibility to meet industry needs. This involves regular consultation both with the individual industries and at forums such as the annual R&D Committee meeting in February and meetings of levy paying industry presidents. HRDC also communicates regularly with all peak industry bodies through its HRDC Update newsletter, launched in 1997.

The Corporation has commissioned reviews of a number of aspects of R&D management, including the role, function and resourcing of R&D committees and industry development officers. These reviews are designed to determine the better practices employed and ensure the most effective use of valuable resources, both time and money.

Industry and government both have a right to expect good governance and efficiency and the Corporation recently reported on its management systems to an audit team from the Australian National Audit Office, receiving a very favourable report.

The diversity of horticultural crops and industry structures allows plenty of opportunity for sharing new ideas. Often, as with clonal propagation, a problem may have been addressed by another industry and the concept can perhaps be adapted for avocados. Sometimes a problem needs cross-industry collaboration to fund a solution, as with Fruit Spotting Bug. Both HRDC and the R, D & E subcommittee are keen to see this extended to opportunities for overseas collaboration. Hopefully, discussions started at the New Zealand Conference will bear fruit.

For further information, please contact members of the avocado R, D & E subcommittee, the AAGF Board or the HRDC Program Manager, Gerard McEvilly Ph: 02 9418 2200.



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

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Pressure Grows On Pallet Size

By Rob Suggett, National Marketplace News, February 1998

THE AUF Packaging and Handling Group has agreed to support and recommend to industry a widespread move to introduce the international pallet size, 1200 mm x 1000 mm as another Australian Standard.

The proposal by a variety of Australian organisations is that the international size might eventually replace the most commonly used Australian standard 1165 mm x 1165 mm square pallet.

But the AUF group is wary of the costs involved and the timing of any transition from current sizes. Various Australian authorities have quoted periods ranging from two to five years of transition.

A high level group formed by grocery industry peak bodies, the Grocery Manufacturers' Association and the Australian Supermarket Institute—the Grocery Industry Supply Chain Committee—is expected to report next month on the cost/benefits of the adoption of the 1200 x 1000 mm pallet.

The committee has not yet made any recommendations on pallet standardisation.

Incompatibility

The AUF group met in December following an earlier briefing by representatives of the Department of Transport and Regional Development on the proposal to

introduce the international size as an Australian standard.

The Prime Minister's Supermarket to Asia Council is also keen to see a change, citing incompatibility between Australian pallets and the emerging world standard, with consequent double handling in international trade.

The meeting was told that AS4068, the Australian standard, includes two different pallet sizes, the 1165 x 1165 mm and the 1100 x 1100 mm.

The international standard, ISO 6780, covers four sizes 1200 x 1000 mm; 1200 x 800 mm; 1140 x 1140 mm and an interim only standard, 1219 x 1016 mm, which is the USA standard 40 x 48 inch pallet.

The AUF group's meeting was told that the 1200 x 1000 mm pallet is now the accepted standard in Europe and is the pallet size used in New Zealand.

Australia's main trading partners in Asia are actively looking at adopting the size, and there are also moves in Japan—which currently uses the 1100 x 1100 mm size—to adopt the ISO standard.

Opposition

Ausveg, the Australian Vegetable and Potato Growers' Federation, has expressed its opposition to any premature move to the international standard pallet.

"The vegetable and potato industries are in total opposition to this proposal until such time as the proponents provide a cost/benefit analysis for our industry that provides a compelling argument that such a change will be in the best interests of the industry," Ausveg executive director Brian Newman said in a letter to the Packaging and Handling Group.

"This proposal was floated about 12 years ago and received no support at that time. The ramifications of such a change encompass all sectors of the industry which would be involved in costs running into hundreds of millions of dollars," he said.

"Exporters wishing to utilise the international standard pallet are free to do so (and many do on a single use basis). Australia is very fortunate in being one of the few countries that enjoys the benefit of a uniform handling system based on the Australian standard pallet of 1165 x 1165 and we see no reason to move away from this arrangement," Mr Newman added.

At the December meeting the AUF group put on hold its investigation into modular packaging for the 1165 x 1165 mm pallet until more information becomes available.

The group comprises representatives of all sectors of the fruit and vegetable industry involved in the packaging and handling of fresh produce.

PLU Numbers And Bar Codes Becoming Obligatory

By Rob Suggett, National Marketplace News, December/January 1997/98

To label or not to label? To sticker or not to sticker? Fresh produce suppliers are gradually having the question made irrelevant if they want to sell to bigger buyers.

Some consumers like to yelp about stickers on pieces of fruit, particularly those on apples that can get caught in the teeth, and if that sticker merely provides the name and address of the grower, the complaint is probably justified. But if the sticker bears a variety name and a PLU (Price Look Up) number, it's a case of buyers' interest taking precedence over the consumer.

In other words, if growers and packers want to sell to the chains, provision of PLU numbers and/or bar codes is virtually obligatory.

Why? Because it means dollars. Without an accurate means of identifying varieties at the checkout counter, the direct result can mean lost profits. The difference in price between a Red Delicious apple and a Pink Lady apple is significant.

If Pink Lady is keyed in as Red Del, it's money down the drain. To those in the industry the different appearance of the

varieties might be obvious, but that is not necessarily the case for a checkout operator. Unfortunately, avocados are treated in the same way as apples.

Label and sticker suppliers now offer stock variety and PLU labels at lower cost by not incorporating the grower or packer's name.

Now that the number of fruit and vegetable lines in most outlets has multiplied to hundreds, identification on unpackaged bunch lines has become much more important.

Innovation Leads Melbourne Markets Through Change

Twenty-four wholesalers at Melbourne Markets have embraced change as an opportunity to enhance the flow of fresh fruit and vegetables through the market, and set the scene for Melbourne to grow as Australia's premier fresh fruit and vegetable distribution centre.

The 24 wholesalers are foundation members of Farmpay, a voluntary scheme which provides a commitment to growers that payment for produce consigned through them will be met within 21 days.

Farmpay replaces the old system of compulsory bonds and licences which was part of the now revoked Victorian Farm Produce Wholesale Act. It has been developed to provide confidence in the Melbourne Market for more than 20,000 growers from far-flung regions of Australia who supply \$1.2 billion worth of fruit and vegetables which pass through the Melbourne Market each year.

Jeremy Gaylard, Chairman of the Melbourne Market Authority, has stated that the Farmpay service is the most comprehensive and straightforward scheme of its kind in Australia, and is the first of its type that does not require contributions from growers.

It was developed in consultation with wholesalers and grower groups, and has an unprecedented simple approach that has won support from growers and grower associations around the country.

Under Farmpay, growers need to take only one action—to choose an Accredited Farmpay wholesaler when they consign their fruit and vegetables to the Market.

That action means they are dealing with a wholesaler who is committed to meeting payment within 21 days, and provides access to bonds which are up to four times larger than those available under the previous system. Growers will not be charged for access to Farmpay and do not need to enrol or fill out any membership forms.

Mr Gaylard says it is entirely voluntary for wholesalers to become accredited to Farmpay, but expects that most of the wholesalers operating from the Melbourne Markets will soon offer the service.

"To join Farmpay all wholesalers must open their books to an independent auditor to satisfy Farmpay's conditions. They must also:

- Guarantee payments will be made within the required 21 days;
- Post a bond equal to 100% of their average 21 day trading cycle; and
- Pay an annual membership fee (currently set at \$3,000 per year) to underwrite the operation of Farmpay," Mr Gaylard said.

"If growers have not received payment within the 21 day period they simply contact the Farmpay Registrar which triggers action to investigate why payment has not been received. That contact needs to be made within 14 days from the due payment date."

The Cutrale family, who have operated in the Melbourne Market for more than 40 years, are the first wholesalers to become Farmpay accredited.

Frank Cutrale says they believe their business can only benefit from this scheme. "It will allow growers to deal with registered wholesalers with confidence," he says.

"We think growers will react positively, especially since there is no joining fee or no additional paperwork for them."

"And importantly, as wholesalers, we will have the same, normal relationship with our grower clients", he said.

Chairman of the QFVG, Richard Armstrong, said Farmpay provides a level of confidence that is important in today's business world. The Melbourne Market and its wholesalers have had an ongoing and productive relationship with its 8,000 grower members, which will be taken that one step further with the simple and fair trading terms provided by Farmpay.

"It's a win/win situation for both growers and wholesalers which certainly makes the Melbourne Market very attractive."

Mr Gaylard said that Farmpay is to provide Melbourne Markets with the stability and growth that will continue to ensure that the Market plays a significant role in Australia's fresh fruit and vegetable wholesale industry.

Growers may obtain a list of Farmpay Wholesalers by calling 1800 060 321, or by poll fax on 1800 678 062.

Trade with Confidence at Melbourne Markets

Farmpay



- payment in 21 days
- larger bonds available
- no joining fees for growers

Foundation members offering Farmpay are:

A. Cutrale (03) 9687 3414	Sculli & Co Pty Ltd (03) 9687 2255
All Produce Traders Pty Ltd (03) 9687 6418	Silk Bros (Melb) Pty Ltd (03) 9687 6821
V. Brancatisano & Sons (Fruit) Pty Ltd (03) 9687 1370	F. W. Westmore & Son Pty Ltd (03) 9687 1687
V. Brancatisano & Sons (Veg) Pty Ltd (03) 9689 4600	The Melbourne Pear Co Pty Ltd (03) 9687 1269
S. H. Chin Bros Pty Ltd (03) 9687 2859	Quong Hoong Wah Pty Ltd (03) 9687 2602
Demarte Pty Ltd (03) 9687 7600	Venuto & Co (03) 9687 6818
Great Australian Mushroom Co. (03) 9689 1390	H. Louey Pang & Co. Pty Ltd (03) 9687 1807
John Holman & Co. Pty Ltd (03) 9689 5122	Russo Wholesalers (Vic) Pty Ltd (03) 9687 6280
Kapiris Bros. (Vic) Pty Ltd (03) 9689 6711	Prestia Wholesalers Pty Ltd (03) 9689 4569
Lucky & Sons Pty Ltd (03) 9687 4722	A. Prestia Pty Ltd (03) 9687 5500
Potter (Melb) Pty (03) 9689 4533	Raft Produce Pty Ltd (03) 9689 6555
Prestige Produce Pty Ltd (03) 9687 6449	Bruno Roda Produce (03) 9687 9355

More wholesalers are to offer Farmpay soon
For up-dated lists of Farmpay accredited wholesalers
call 1800 060 321 or poll fax 1800 678 062

Price Reporting Service Makes Dollars And Sense!

Getting a handle on the latest and most accurate prices for produce bought and sold at market can mean the difference between a business that is getting by and one that is doing well. Now this information is available to all growers, buyers and end-users who are involved with the Melbourne Markets. The Melbourne Market Authority has appointed DataFresh as the exclusive and sole supplier of daily price reporting for all produce sold in the market.

Unlike the previous price reporting service, the DataFresh report covers every line that comes to market. In the last year alone, over 250 lines were reported on from the time they appeared until the end of their selling seasons.

Minor crops and specialty lines such as hydroponic tomatoes, rare fruits, specialty tropical lines and new lines are now included as well as their regional source. Not only is this useful for the grower and buyers of such lines, but it enables other interested industry parties to see what the market is doing; where the areas of interest are and if there are new areas of competition within their industry. It also allows end-users to become aware of new lines that they could incorporate into their services e.g. Restaurants, catering services,

airlines, food manufacturers, hospitals, etc.

To ensure the commercial viability of DataFresh, the price reporting service is now subscription based. The benefits of paying for the new service are that DataFresh can maintain the high standards it has set for itself and remain completely independent and without any bias or interest in any sector of the fresh produce industry.

DataFresh also have the resources, personnel and infrastructure to ensure that prices are gathered every day from the source—buyers and sellers on the floor of the market. All information is processed and a comprehensive report is made available on every market day.

The process of gathering information and making it available virtually immediately helps to position the Melbourne Market as Australia's most competitive marketplace to buy and sell produce. The information is timely, accurate, independent and means that growers and buyers alike know exactly what's going on and if they're getting value for their dollar.

DataFresh surveys the whole market every market day of the year. Interested parties can choose from daily reports, weekly reports, monthly reports or annual reports. These can be tailored to include

one line of produce, multiple lines or all lines of produce which allows growers and buyers to track the best prices in the market, monitor seasonal price and availability fluctuations and make better business decisions.

DataFresh has also expanded its operations to include independent arrival, outturn and pre-consignment inspection and assessment reports for growers, wholesalers and buyers. The reports include colour photographs of the produce and a detailed explanation of any quality problem enabling the relevant parties to track and resolve any quality, handling, packaging, transportation or related issues.

Temperature monitoring and management through the supply, retrieval, downloading and return of data loggers is the other arm of the DataFresh operations which enables temperature conditions to be monitored from field to cool-room storage, transportation, arrival and beyond. Another crucial aspect is to ensure the best quality produce is presented, the best prices are obtained and better business management and decisions are made.

DataFresh can be contacted at the Melbourne Markets, 542 Footscray Road, Footscray, or by telephone 03 9689 3444 or fax 03 9689 3411.

The Markets Will Stay

By Rob Suggett, National Marketplace News, February 1998

It is sometimes too easy in these "global village" days to assume that industry trends overseas will always automatically come here. That is not necessarily so. There will inevitably be local variations.

A case in point is the story told by Queensland Fruit and Vegetable Growers chairman, Richard Armstrong, who said growers are seeing ahead "a new era of supermarkets and growers working together in a positive way."

He was commenting on reports by grower and QFVG deputy chair, Paul Ziebach, who visited the USA and Europe on a Churchill Scholarship, and John Pritchard, QFVG assistant general manager, promotions, who studied the UK fresh

produce marketing. They reported supermarkets working closely with growers—including the provision of new equipment and technologies in "quality partnership", with Australia certain to mirror these trends.

The decline of the central market system, as has happened in the UK, is unlikely to happen here however, for reasons involving both geography and grower-wholesaler relationships.

Australian supermarket chains have certainly dabbled in special arrangements with growers, involving exclusive varieties and technical help, but so have a number of astute wholesalers and brokers in our central markets.

Some wholesalers even have qualified horticulturists on staff to assist their suppliers, along with provision of research funding and accountancy help if required.

Vertical integration of the industry, with financial cross interests between wholesalers and growers, is more common than many believe.

The big UK retailers have become involved directly with big growers for mutual advantage, but also because the wholesalers there generally didn't.

In Australia, there are more opportunities for strategic alliances. The supermarkets, for their part, would just as soon put in an order and expect results.

AAGF Looks To Building Onto The Successful Marketing Project

By Anne Story, Story Horticultural Services Pty Ltd

Introduction

With the conclusion of the Australian Avocado Growers' Federation's (AAGF) three year marketing project, it is now time for the industry to reassess where it is and what activities can help it to continue to build on the foundation developed from "Improving the Management of Avocado Quality During Marketing".

The AAGF was concerned about poor consumer confidence in avocados due to problems of internal quality, identified between 1990 and 1993.

Survey findings all reported alarmingly high levels of internal quality problems. A high proportion of consumers (53% in one study) found avocados that looked satisfactory but were unsatisfactory when cut.

The AAGF developed the project "Improving the Management of Avocado Quality During Marketing" in collaboration with Story Horticultural Services Pty Ltd, Rudge Produce Systems Pty Ltd and the QDPI to address the internal quality problem.

The Department of Primary Industries and Energy's Agribusiness Program provided 58% of the financial support and the balance was derived from cost recovery, grower levies and interest. The project commenced in June 1994 and was completed in October 1997.

The objectives and outcomes of the project were:

1. To expand consumer confidence and demand for Australian avocados by increasing the availability of sound fruit with acceptable shelf life and eating quality.
2. To develop a quality consciousness towards avocados by wholesalers and retailers.
3. To develop and implement a National Training Program for wholesalers and retailers to improve the management of avocado quality.
4. To develop a series of recommended procedures for the correct handling of avocados during marketing (wholesaling, distribution and retailing).
5. To establish a system for recognition of achievement in avocado quality management.

Expand Consumer Confidence and Demand

The results of the Consumer Research component of this project (undertaken in June 1996) verify the importance of providing consumers with avocados that meet their requirements.

Consumers indicated they wanted to purchase ripe fruit at the retail level, which required a major change in attitude and handling practices for the distribution chain. The challenge was to ensure that the consumer received good quality ripe avocados.

The project proved very timely and increased the awareness of consumer requirements and the use of controlled ripening as a technique to deliver this. Over the duration of the project, the wholesale section of the distribution chain has moved markedly to controlled ripening as a standard practice.

Whilst it is very difficult to measure the project's effectiveness in generating consumer confidence, it is apparent that wholesalers and retailers who have undertaken the training program are better able to service the needs of the consumer. One of the real benefits of the training has been that wholesale and retail staffs are aware of best practice procedures in the handling of avocados.

In the final year, the training program significantly penetrated the retail sector through cooperation with supermarkets, and in particular Woolworths. As well as dedicated workshops in each capital city, Woolworths requested a special avocado segment be presented at their three in-house management-training programs in 1997.

By penetrating the retail sector, all of the links in the distribution of the avocado were trained in the correct handling practices.

The majority of retailers were presenting ripe fruit for sale in 1997 (as substantiated in the last retail survey). However, the independent retailer was still favouring ripening in-store although that varied to some extent in the different states.

Develop a Quality Consciousness

At the commencement of the project, ripening of avocados was most frequently

uncontrolled and undertaken at the retail level with little or no facilities to manage the process.

Little if any importance was given to pulp temperatures of fruit. Product knowledge of the avocado was very low, resulting in many incorrect practices being perpetuated over the years.

There has been a profound change in the handling of avocados at wholesale and retail levels over the past 3 years. The industry has been moving from a tradition of handling and marketing hard green fruit to one where the majority of wholesalers now ripen fruit to meet retail and consumer demand.

This project has initially provided the awareness and subsequently the support necessary for this significant change in avocado handling to occur in such a short time frame.

One of the most important aspects of the training program has been to change an attitude of people that the handling of a ripe avocado bears absolutely no similarity to handling a green avocado. This in itself creates a quality consciousness.

One outcome of significance has been that the method of displaying ripe fruit at retail level has changed. Single layer displays are the preferred method instead of dumps or stacks.

Develop and Implement a National Training Program

A national training program was developed and implemented as a series of national workshops. The content and presentation of the program was well received. Some 200 growers, wholesalers and retailers have been through the training program, with the majority of wholesalers handling avocados having participated during the project.

Some staff have attended twice because they have used the knowledge gained in the first cycle of workshops to implement changes in their stores. The results were so pleasing that they returned to the second round of workshops to gain even a better understanding of avocados.



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MARKETING REPORT

Increase the Availability of Sound Fruit

A manual of procedures using a best practice approach and a quality format was developed. This manual was given to all trainees and outlines procedures from the farm to the retail display.

Establish a System for Recognition of Achievement

This objective has not been pursued very strongly but recognition has been provided to those who have participated in two ways. Firstly, each participant was awarded a "Certificate of Attendance" and secondly, by running a "Roll of Attendance" in this magazine, which is distributed to every Australian avocado grower.

Summary

In summary, it is viewed by the Management Committee that the outcome of the national training program has:

- increased awareness of the need to correctly handle avocados during marketing;

- increased professionalism of the wholesalers and retailers;
- increased profitability for all sectors (grower, wholesale and retail) due to increased sales, higher prices and increased consumer demand;
- increased the opportunity for the training of handlers of Australian avocados in international markets; and
- provided a solid foundation on which to build exports of Australian avocados.

Further Development Plans

The following activities could be part of a continuing strategy to improve the management of avocados during marketing.

1. Investigation into the cause of significant bruising found in packed fruit in the same position repeatedly, irrespective of fruit origin or retail outlet. This is likely to be associated with packaging, transport and/or handling, and interactions between all or some of these factors.
2. Further refining of the controlled ripening process for different varieties at

different maturity stages and from different production areas. Currently, the one recipe is used for all avocados and this may be improved by further work to validate the variance between varieties, maturities and production areas.

3. To review, consolidate and develop a total avocado management system that incorporates best practice principles, quality management and food safety; encompassing the handling, distribution and marketing of fresh avocados; and fosters the development of networks between growers, transporters, wholesalers and retailers.
4. To re-assess whether the elements of the national training strategy that were not undertaken (namely, a one-page product card summarising the main product care elements, and a short video on correct handling of avocados) should be developed.
5. Continue an ongoing retail monitoring of the internal quality of avocados to further build on existing data, monitor trends and identify problems.

Overseas Horticultural Markets Waiting To Be Tapped

Opportunities are open for Australia to develop a flourishing horticultural export market, says the chairman of the Horticultural Research and Development Corporation (HRDC). As one of Australia's largest agriculture and ornamental horticulture exporters, Brisbane nurseryman, James McGeoch, is in a good position to judge.

"The horticulture industry in Australia is still very domestically focused. The farm-gate figure, alone, is probably worth around \$1 billion a year," he said, "but with value-adding and retailing, that figure probably doubles."

"I see wonderful opportunities for the industry to become more export focused, and this is something I would like to see it take on."

Mr McGeoch recently took the innovative step of producing his own CD-ROM to market his business internationally. The response, especially from the Middle East, Japan and Europe, had been 'fabulous'.

In his business, Mr McGeoch has developed alliances with a number of countries including Indonesia, Malaysia, Philippines, Bahrain and Saudi Arabia. The

business exports to North Asia, South East Asia, Europe, the Middle East, South America and the Pacific Islands.

Mr McGeoch is Managing Director of Birkdale Nursery Pty Ltd, at Redlands, the first nursery in Australia to achieve ISO-9002 quality certification. He is also at present a board member of both the HRDC and the Australian Horticultural Corporation.

After nearly 30 years in the nursery business, he took a significant change in direction in 1990 when he became the Australian supplier to the International Garden Festival in Osaka, Japan. Today 50% of his business is outside Australia.

The HRDC commenced operations in 1988 with two levy paying industries, citrus and apples and pears. Levy paying industries now include nursery, nashi fruit, potatoes, avocados, custard apple, chestnuts, macadamia nuts, stone fruit, cherries, vegetables and strawberries.

The Corporation's R&D budget has increased over the period to around \$25 million in 1996-97, and is forecast to rise to around \$30 million in 1997-98.

Buy And Sell Fruits And Vegetables Online!

Ever wondered about electronic marketing? A group called "Food Link" operates an electronic marketing scheme on the Internet. Food Link is just one organisation that has been set up to enable horticultural industries to use the Internet for this purpose.

BUY, SELL, TRADE DIRECT

The Food Link's Trading Post provides buyers and sellers of fruits and vegetables the means to post requests for purchase (Buy), or list items for sale (Sell), to a world wide audience. All inquiries to items posted are sent directly to the person or company.

The system can be preview free for 30 days, after which a fee is payable.

If you are interested and would like more details, contact the Internet link: <http://www.foodlink.com>



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Avocado Quality Assurance: Who? Where? When? How?

Part 1

An edited extract from a paper presented at Conference '97 by Dr Lindsay Milne, Merensky Technological Services, Duivelskloof, South Africa

This article on quality highlights the importance of the research that has been done and the benefits of that research to all in the avocado industry.

Part 1 deals mainly with quality requirements for avocados from the tree to the packing facility.

Part 2 will be published in the next issue of this magazine and will emphasise the importance of quality when it comes to exports.

Quality

Who pays the penalty?

Whether due to climatic extremes, pre-harvest diseases, bad handling during picking and delivery to the packhouse, bad handling or cooling at the packhouse, poor cooling en route to the market, whether by land, sea or air, poor storage conditions at the market, losses during ripening and pre-packing, losses at retail outlets and incorrect usage by the consumer, it is in every case the grower who pays the penalty due to losses in quality.

Who is responsible?

Responsibility is allocated to a great many people and organisations in the whole process of producing and marketing avocados. These include the grower and his employees, packhouse management, transporter staff, shipping and airways staff, local or overseas wholesalers, pre-packers, ripeners, retailers, supermarkets and even the consumer.

Who is accountable?

The important thing to remember is that ultimately it is the grower who is accountable for quality losses. He cannot abdicate his accountability by blaming it on others.

The solution

A total quality management process is required to achieve quality at all stages in the life of an avocado.

Definitions

The basics of quality include cultivar choice, shape, external colour, and freedom from blemishes and disease. Internally the fruit should be free of physiological disorders, bruising and disease symptoms and should be of reliable and excellent eating quality.

Quality certainly means different things to different people.

To the grower it is perceived as the standard laid down by the industry, prescribed by the packer and export agent and in some

cases by marketing boards. In the case of the avocado, this will usually mean fruit of a specific cultivar, of the correct size, properly mature but rockhard, free of disease and free of blemishes.

The wholesaler, whether local or overseas, will probably have similar requirements and will expect fruit to be hard and to have sufficient shelf life to allow time for distribution and sale at the best price.

The retailers' needs vary, depending on whether they are selling firm, triggered, or ready-to-eat fruit. They will want the fruit to be free of blemishes with dependable internal quality and sufficient shelf life to avoid spoilage losses.

Consumers have two moments of quality assessment, first at purchase and second during consumption. At purchase their eyes must tell them that this is a sound fruit, of the kind he or she is familiar with and preferably with a predictable waiting period before being ready to eat. It must also represent good value for money, with the consistent assurance that 'what you buy you can eat'.

At the time of use, consumers must enjoy the even colour, smooth texture and delicious subtle flavour of a mature and properly ripe avocado. They should at the same time, be aware of the health value of the avocado.

The Live Avocado

Education is a major factor required in the quality management process, particularly when it comes to understanding the nature of the avocado fruit. The avocado must be recognised by all those handling it as a living entity.

Respiration

The picked avocado fruit respires. In other words, it utilises oxygen and produces carbon dioxide. The respiration process consists of the metabolism of carbohydrates in the presence of oxygen



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leading to the production of water, carbon dioxide and heat energy. The avocado has a high respiration rate compared with apples, citrus, grapes or kiwifruit and therefore generates more heat during storage than many other products. The Hass fruit has a higher respiration rate than Fuerte.

The avocado is a climacteric fruit that will continue to mature on the tree but will not soften until picked. The Climacteric occurs when both carbon dioxide from respiration and ethylene production reaches a peak, after which the ripening and softening process occurs.

Cellulase is the main enzyme involved in the softening process. Early in the season cellulase activity is low in freshly picked fruit, however levels are higher in more mature fruit.

Ethylene

Ethylene plays a vital role in avocado ripening. It is generally recognised as one of the triggers that induce the enzyme ripening process. However, it has been shown that the ripening process of avocado fruit requires the continuous presence of ethylene and that immediately after harvest, fruit will not readily respond to ethylene induced ripening. This is due to an endogenous ripening inhibitor present in fruit while still on the tree and remaining functional for a limited time after harvest.

Ethylene induces an enhancement of tissue permeability, respiration and ripening. Ethylene production by fruit can be increased due to mechanical injuries, disease incidence and increased temperatures.

It has been showed that infiltration of avocado fruit with calcium in the form of calcium sulphate or calcium chloride depressed and delayed the peak of ethylene production if applied prior to the climacteric.

The respiration rate of Fuerte fruit can be increased by levels as low as $0.01\mu\text{l}^{-1}$ of ethylene during storage at temperatures of $10\text{--}14^\circ\text{C}$. Reduction of ethylene levels during long-term storage is vitally important. Sufficient exchanges of air are essential in container vessels while under controlled atmosphere (CA) conditions; therefore scrubbers are required.

Transpiration

Transpiration is the process of water loss by the fruit and is an important factor in determining fruit quality. Temperature, relative humidity, air velocity, surface coatings such as waxes or wrappers and packaging will affect the evaporation of water. Rind moisture loss has been shown

to have a significant effect on fruit quality and the degree of cold injury in Fuerte fruit stored at 5.5°C .

Water loss is certainly one of the important factors leading to overseas fruit deterioration. Increased moisture loss resulting in stress during storage, not only enhances polyphenol oxidase activity and visual symptoms of physiological disorders, but also increases the prevalence of pathological disorders. The relative humidity in the storage atmosphere therefore plays a vital role. More mature fruit are less subject to moisture loss than relatively immature fruit.

A basic rule in heat dynamics is that the greater the temperature gradient (T) and the less the volume of air in the system, the higher the moisture loss will be from the fruit. By decreasing the volume of air (i.e. by using a cooling system with a bigger capacity) and restricting T , moisture loss can be limited. The design of the cooling system in a packhouse therefore plays a major role in preventing water loss from fruit and in final fruit quality.

Temperature

Temperature is the most vital factor when planning long term storage of avocados. However, it is not just temperature per se, it is the maintenance of the cold chain, right through to the consumer, that is of equal importance. Any break in the cold chain will affect ripening—the later the break the greater the increase in fruit softening.

It is therefore clear that a total management strategy in which time and temperature are both controlled is necessary if a good outturn of fruit quality is to be achieved.

After problems were experienced with South African fruit arriving in a soft state in Europe, a detailed analysis of seasonal data was made. The analysis showed that a deviation in holding temperature 1°C higher than recommended, for a 22-day transit time, increased the softness of fruit from a firmometer reading of 25 to 35. Furthermore, a similar increase (1°C) over a total transit period of 28 days caused an increase in softness from 32 to 46 on the firmometer.

Cold injury

The rate of development of external cold injury of Fuerte avocados at various temperatures below 5°C , over time, has been clearly demonstrated; as has the relationship between ethylene production, the climacteric, and ripening of Hass avocados at various temperatures.

A climacteric model for Fuerte fruit established that excessive cold prior to the climacteric is favourable for chilling injury and pulp-spot to develop. Once the climacteric has passed, temperatures can be lowered. Also, large Fuerte fruits are more susceptible to physiological disorders than small fruits. Pulp-spot susceptibility drops later in the season, whereas grey pulp increases steadily, especially if high temperatures occur in the post-climacteric phase.

Trials were carried out on various cultivars. Early season Fuerte fruit were found to be very sensitive to external cold injury. By using 7.5°C as storage temperature for the first week, followed by 5.5°C for two weeks and 3.5°C for one week, reduced the incidence of early cold injury during the first half of the season, when compared with the standard of 5.5°C for four weeks. The step-down temperature also resulted in a significant reduction in pulp-spot symptoms.

Since the above trial was conducted, a more sophisticated schedule of shipping temperatures, based on the moisture content of fruit has been developed. Interestingly, this new stepped down schedule of cooling was found to be unnecessary for Fuerte fruit grown in Kwazulu-Natal, where continuous storage at 5.5°C was found to be satisfactory in terms of external quality and internal physiological disorders.

Various researchers have shown the potential of storing Hass fruits at temperatures as low as 2°C ; however, at 1°C severe chilling injury occurred.

Time

There is a relationship between time and storage temperature with chilling injury increasing with reduced temperatures and longer time.

Dramatic increases in external cold injury in Fuerte occur if the time of storage is extended from 21 to 28 days. Similarly, grey pulp increases in both Pinkerton and Hass as the storage period is extended. It has been shown that total postharvest disorders increase from 14% after 21 days to 30% after 30 days and to 58% after 44 days.

'Brown cold damage' [explained fully in Part 2 of this article] definitely appears to be correlated with age of fruit (after picking) and this, coupled with low temperature storage for long periods, appears

to aggravate the problem. For example, fruit placed at ambient temperature on arrival in Europe (22 days after packing) showed no symptoms. However, after a further 10 days of cold storage, the symptoms clearly developed after holding the fruit for two days at ambient temperature. Once again, this malady appears to be time/temperature related. However desiccation may also play a role.

What can be done about quality?

In the orchard

To produce a fruit with adequate storage capacity it is essential to manage all the factors that influence the inherent physiological characteristics of the fruit. This is described as the pheno-physiological approach. The grower cannot control some seasonal factors such as low or very high rainfall, hail, excessive winds or extremely low temperatures, and furthermore the area of production can have a significant impact on shelf life and post-harvest diseases. However there are many aspects that do require grower management inputs.

Correct irrigation scheduling, with the use of tensiometers or other monitoring systems is essential in order to achieve fruit of optimum size and free of physiological disorders. In a trial carried out in South Africa, irrigation of Hass to field capacity gave superior yields of larger fruit than irrigation according to phenological demand.

Similarly, in trials carried out on seven-year-old Hass trees, showed that well-watered trees in Queensland had twice the yield of the least watered trees mainly due to more consistent yields and greater fruit numbers. Postharvest characteristics of these fruits were not found to differ between irrigation treatments.

Water stress during the first 3-4 months after fruit set in Fuerte affects the activity of abscisic acid and of the browning enzyme, polyphenol oxidase. These in turn adversely affected fruit quality during storage.

In an investigation on the effect of water deficit on ripening time of avocados showed that fruit harvested at night (between 8.00 p.m. and 5.00 a.m.) had a significantly higher water potential than those harvested during the day. The fruit harvested during the day (7.00 a.m. to 3.00 p.m.) were found to ripen a day earlier than those harvested at night.

Nutrition plays an important role in determining fruit quality, particularly with regard to storage ability. The application of nitrogen before flowering together with foliar sprays of PBZ applied at mid-flowering, led to significant increases in Hass fruit size, total yield and shelf-life.

It is beyond the scope of this article to review the literature on nutrition, but it is recommended that growers remain abreast of recent trends and make use of consultants or extension staff where possible.

Mulching was investigated as a possible method of increasing Hass yield and fruit size through improved root activity and reduced tree stress. Feeder root growth was greatly increased throughout two seasons by the application of coarse composted pine bark mulch beneath the tree canopy. Over two seasons, the mulch treatment resulted in a significant 11.8% increase in mean fruit mass and 16.7% more fruits per tree. The combined effect was a 30.4% greater yield. The probable explanation for this increase is that mulching decreased overall plant stress.

Maturity of the fruit prior to harvest plays a major role in fruit quality and this relates mainly to the lipid or oil-content of the fruit. Percentage dry matter in the fruit is directly related to oil content and the total oil and moisture contents are reciprocal and generally sum to a constant for each cultivar.

It is important for the grower to monitor maturity trends prior to the start of picking, to ensure that each cultivar has reached the required standard. Maturity will vary within a single tree, due to multiple fruit-set periods, so selective picking is recommended.

During the extremely high rainfall that occurred in 1996 in South Africa, following two years of drought, the higher soil-moisture levels were found to accelerate the production of oil in Hass fruit.

Diseases such as anthracnose, *Pseudocercospora* (black spot), sooty mould, stem-end rots and sooty-blotch, should be kept under continuous control in the orchard. Sprays of copper oxychloride are generally used for this purpose.

Integrated fruit production using production methods in balance with nature should be the norm aimed for.

Picking is a process that can greatly affect postharvest quality, whether mechanical pickers or pole-pickers are used. It is generally accepted that Fuerte pedicels should be manually clipped, whereas it has been found that Hass can be

snap-picked without detrimental effects on fruit quality.

It is essential to avoid mechanical injury in the picking and handling process. A survey has shown that 49% of the decay occurring in apples stored for long periods, could be ascribed to infections arising from mechanical injuries.

Temperature already plays an important role during the picking process and in the potential for creating physiological disorders. Measurements made on cherries, picked into lug boxes in the United States, showed that if fruit was stored in the sun, pulp temperatures at the top of a lug could reach 38°C (with an air temperature of 27°C). Fruit at the bottom of the lug were at 16°C; however, if fruit were stored in the shade, the maximum temperature reached was 24°C. Avocado fruit should reach the packhouse within two hours of picking.

Although an increase in fungal stem end rot induced by a *Dothiorella* and *Colletotrichum* complex when fruit were harvested wet has been reported, this was not confirmed in a later trial. However it was found that wet picked Fuerte fruit had a significantly higher incidence of black cold damage during early picking, which may also be ascribed to the low storage temperature of 5.5°C. Lenticel damage of wet picked Fuerte fruit was also significantly higher during early picking when compared to dry picked fruit. In general the incidence of lenticel damage was high for all fruit early in the season.

Although pulp spot incidence in the trials was significantly higher for wet picked Fuerte fruit than for dry fruit, it occurred at an extremely low level and could not be considered a commercial problem.

Although wet picked Hass fruit had a significantly higher incidence of lenticel damage during early picking, this may not pose a problem due to the darkening of Hass fruit on ripening. Incidence of vascular browning in Hass fruit picked wet during late picking dates increased significantly when compared with dry picked fruit. For this reason, wet picking of Hass late in the season, is not recommended.

Late picked fruit tend to ripen much faster, particularly when grown in warmer areas.

Whether plastic lug-boxes or large wooden crates are used for picking, hygiene is important and the picking containers should be regularly washed, preferably using a fungicidal sterilant such as sodium



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or calcium hypochlorite, copper sulphate or quaternary ammonium compounds.

Transport to the packhouse should be by means that minimise fruit vibration. In field trials, the main cause of fruit injury during transport was contact with the sides or the bottom of the bins. Therefore, the percentage of injured fruits in bulk bins (13.6%) was less than in field boxes (33.4%) as relatively fewer fruit were in contact with the sides and bottom of the bulk bins. Injury incidence was reduced by 50% when bins were lined with canvas.

At the packhouse

The first step to be taken at the packhouse is to collect a **representative sample** from each grower's fruit, preferably on an individual orchard basis. This sample should be carefully evaluated for damage, including wind-damage, hail-damage, sunburn, the presence of diseases, insects or insect damage and mechanical damage incurred in the picking or transport process. This analysis should be reported immediately to the grower and/or picking team, so that corrective action can be taken where necessary. The presence of pathological problems on fruit on arrival at the packhouse, is usually a fair indication that orchard practices are not being well managed.

Whether the packhouse is your own or not, ensure that **packhouse hygiene** is rigorously applied. This includes personal hygiene of staff as well as regular sterilising of cold rooms, packing equipment, etc. Any fruit falling on the floor or rejected for disease should be disposed of far from packing facilities and orchards.

At Westfalia Estate in South Africa, representative samples of export fruit are held back under simulated sea-shipment conditions, representing each vessel's fruit. In this way differences between inherent problems in the fruit and actual commercial storage, can be evaluated. Corrective action can then be taken.

Monitoring of temperatures in the packhouse is of vital importance. Packers and transporters should not rely solely on temperature dials and electronic devices. Conventional mercury thermometers should be used in an ice/melted-ice mixture to calibrate at 0°C. Such a thermometer can then be used to evaluate measuring equipment. It is not uncommon to find equipment that reads up to 2°C off the actual temperature. Such a deviation is not acceptable in avocado storage. Note that handheld electronic probes may give different readings when the instruments themselves are in a warm or a cold environment.

The Perishable Products Export Control Board in South Africa applies a **grading system to the cooling facilities** in packhouses. If the minimum standards are not met, the packhouse may not pack for export. On arrival at the packhouse, if the fruit is not packed immediately, it should be pre-cooled to approximately 16°C in order to remove field heat. Lower temperatures may result in condensation during packing.

Waxing is commonly used for export fruit in order to improve appearance and also to increase shelf life. The European Union has currently placed a restriction on the use of polyethylene waxes and allows the use of natural waxes only. 'Stafresh', a natural wax emulsion containing shellac and carnauba wax, gives results equivalent to or better than polyethylene wax ("Tag") in terms of physiological disorders, external appearance and shelf life.

Grading is carried out according to local or international standards. The Organisation for Economic Co-operation and Development (OECD) has produced a booklet giving standards according to cultivar, size, shape, colour and blemishes.

Packaging used will vary according to market requirements. However, adequate ventilation is the basis of being able to hold all the fruit at the correct storage temperature. Ventilation holes should register, i.e. be continuous throughout a pallet stack, and should comprise approximately 8 to 9% of the vertical surface area. Where link-sheets are used to stabilise pallet loads, these must also register with the ventilation holes in the cartons. A space of 5 mm between the fruit and the lid of the carton is desirable. However, the trend today is towards open-top cartons.

Carton markings have now become international practice, where cultivar, class, exporter, country of origin and average fruit mass must be recorded on the carton. Most exporting countries also use grower codes (in order to monitor potential problems arising from specific producers), packer codes (in order to monitor quality, productivity and accuracy) and date codes. Packing dates or date codes are essential in monitoring the time x temperature chain involved in export of fruit. When sea transport is used, the date of packing should be used for setting cutoff dates after which fruit cannot be successfully exported. Date codes are also of vital importance in monitoring the movement of fruit through the marketing chain.

After packing, fruit temperatures should be reduced to the final storage temperature as soon as possible, especially if long term

storage is required. This is often achieved by placing the cartons in a standard cold room. The temperature of the fruit entering storage, the throughput of fruit, the ambient temperature and the desired rate of cooling influences the refrigeration capacity required in a cold room for cooling of fruit.

Rapid and uniform cooling can be achieved with forced-air or pressure cooling. An air pressure difference is produced between opposite faces of the pallets, which forces air through the packaging and carries heat away. Avocados can be forced-air cooled to storage or transport temperatures in 8 to 12 hours with air-flows of 1.0 and 0.5 litres per second per kilogram, respectively. Faster cooling times are not practical as the pressure drop across the pallet required for higher air flows is very high, and when low temperatures are used early in the season, chilling injury can occur. It should be remembered that the air velocity needed for cooling is greater than that needed for storage, therefore fruit in the cooling room will tend to lose water faster than under storage.

Vapour pressure

The rate of moisture loss from avocados is primarily controlled by the difference in vapour pressure between the air in the intercellular spaces of the fruit and the air surrounding it. Vapour pressure increases as the air moisture content and air temperature increase. The air in the fruit is nearly saturated or, in other words, is close to 100% relative humidity. Therefore, the temperature of the fruit determines the humidity ratio of this air. From a psychrometric chart it can be shown that low temperatures result in low humidity ratios and high temperatures cause high humidity ratios.

The difference in humidity ratio between the air in the fruit and the storage air is significantly more when the fruit is not precooled than when it is cooled and put in unsaturated storage air. Decreasing the difference in humidity ratio between the air in the fruit and the air surrounding it can reduce desiccation of fruit in refrigerated storage. Both temperature of the fruit and humidity ratio in the surrounding air must therefore be controlled.

Fruit respiration patterns were monitored in response to rates of water loss in Hass avocados. The lower the relative humidity the greater the percentage weight loss and the faster the fruit ripened.



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