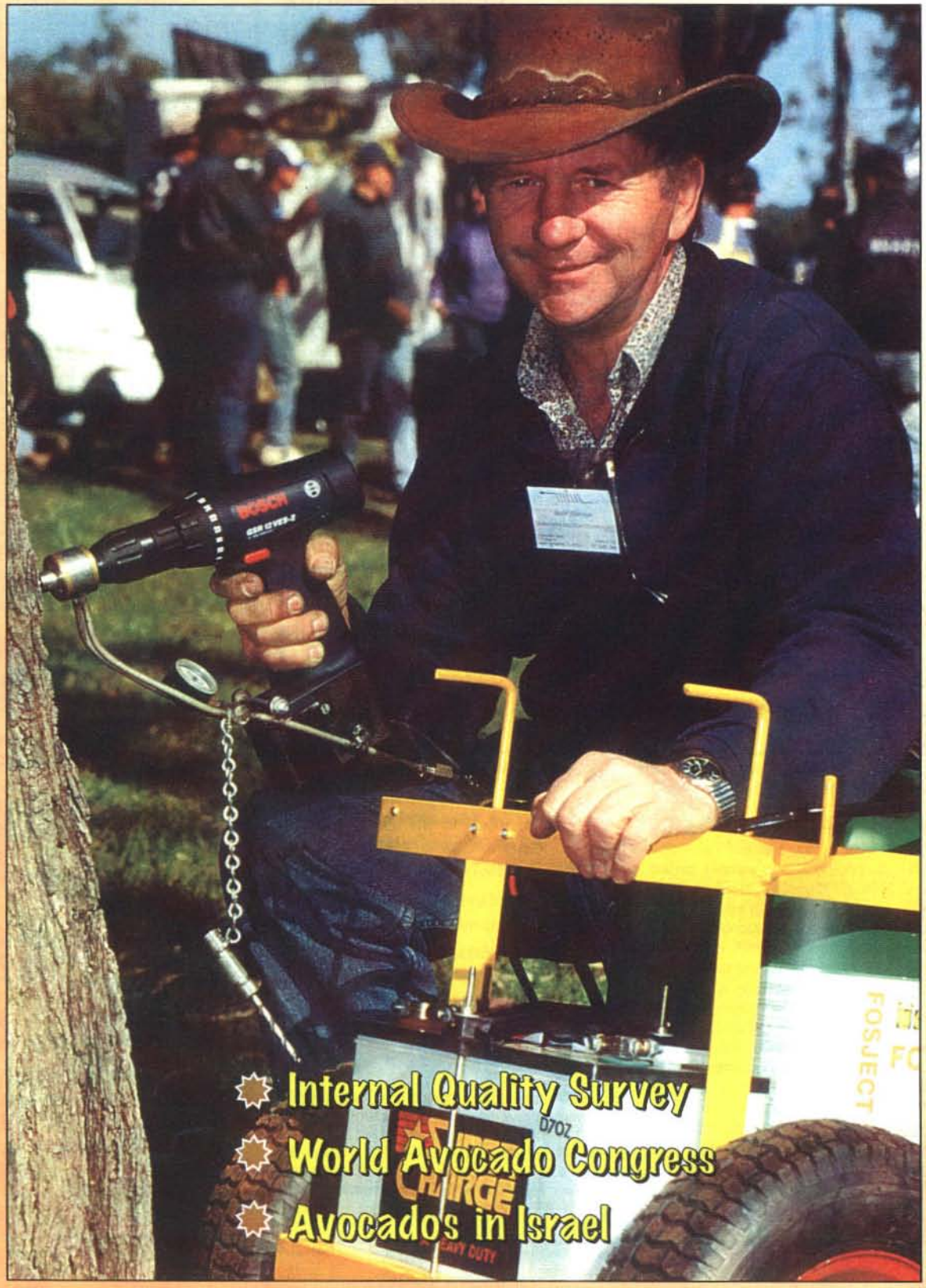
Talking Avocados

The Australian Newsline

Vol 7 Number 1 March 1996



- Internal Quality Survey
- World Avocado Congress
- Avocados in Israel

Print Post Approved - 44307/0006

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ISSN 1039-2394

This publication is distributed free to all Australian avocado growers and is available to non-growers for a 1996 subscription of:
Australia - $15; **NZ** - $21; and other **Overseas Countries** $25, Australian currency only.
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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).

Calendar of Events

March

18-20 **Australian Avocado Growers' Federation** - meeting QFVG Brisbane Markets, Rocklea.

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

27 **NSW Avocado Association** - Annual General Meeting, Summerland House with No Steps commencing 9.30 a.m. Tim Smith will be the guest speaker. Lunch is provided and there will be a tour of the packing house.

April

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

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

May

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

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

22-23 **Expo 14 Horticultural Field Days** - University of Qld Gatton College. Phone 076 356845.

June

3-6 **Australian Horticultural Corporation's Marketing Edge Conference** - Royal Pines Resort, gold Coast.

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

5 **Sunshine Coast Avocado Growers Association** - meeting. Venue to be advised. Contact - Brian Prosser 074 467069.

Front Cover: Geoff Eldridge with his Hand Pump Sidewinder Injector mounted on a miniature trolley, complete with car battery and 25 Litre Fosject container.

Back cover:

Top - Waitress Cathy Faukner and Judge Patrick Raharaha waiting for the start of the Mt. Tamborine Avocado & Rhubarb Festival Wheelie Bin Derby.

Bottom - Preparing the Avocado Barn on the morning of the Mt Tamborine Avocado & Rhubarb Festival.

Boron Application - Walk The Tightrope Carefully

Tim Smith and Tony Whiley, Maroochy Horticultural Research Station, Nambour

Boron is essential in avocados for healthy root growth tree structure, fruit set and fruit development. The benefits of applying boron to deficient trees far outweigh the cost of its application, however adding a bit more for a better response is fraught with danger.

Excess boron is extremely toxic to avocados causing defoliation of trees which leads to sunburnt fruit. The range between boron deficiency and toxicity is narrow, especially on lighter textured soils.

Due to insufficient information the previous boron recommendation given by QDPI was a general application rate for all soils. However growers need to be aware that these recommendations have changed due to research results such as the effect of soil texture on boron availability to trees.

There are large differences in the amount of boron required for lighter soils (sands and sandy loams) verses heavier textured soils (clay loams and clays). It is essential that factors such as the soil texture, canopy size, rootstock type, annual rainfall and the degree of leaching are taken into account before annual application rates are calculated.

The prototype of AVOMAN currently in circulation enables users to take these factors into account and calculate safe levels of boron to apply for their situation.

Toxicity Symptoms

The early symptoms of boron toxicity occur as a marginal necrosis of older leaves, followed by similar symptoms on younger leaves, and may lead to premature defoliation.

Shoots will produce new leaves, but these also accumulate toxic levels of boron and fall. The leaf symptom is a continuous light tan marginal necrosis with sharp dark brown borders which penetrate into interveinal regions. The necrosis starts at the tip of the leaf, followed by the sides and slowly develops around the entire leaf margin

A 1-2 mm wide band of light yellow chlorotic tissue develops around the dark brown necrotic borders. There is a sharp interface between those areas and a diffuse interface between the chlorotic band and healthy green tissue. As the boron toxicity develops further, the leaf margins curl downwards and small necrotic spots surrounded by chlorotic bands appear further into the interveinal regions.

Management Notes

To manage trees correctly for healthy growth, boron leaf concentrations in mature leaves (8 weeks old) should be between 40-60 mg/kg (ppm).

The tree requires a steady supply of this nutrient via the roots throughout the year—particularly when the tree is growing. This is best and safely achieved by calculating the annual application rate required for your trees and splitting it into several applications spread over the growing season. Single heavy application can result in damage to the tree.

Windup Of Association

Members of the Sunraysia Avocado Growers Association have resolved to windup the association because of a lack of support from local growers.

The AAGF is concerned by this decision because it means that there is now a significant group of Avocado growers who are paying levies but who will not be represented at national level.

The only way Victorian avocado growers can have a say as to how their levies are spent is to make personal representation to the AAGF.

From Your Federation

By Astrid Kennedy, Executive Officer

R & D Funding

The Government has rejected both the funding formula recommended by the Industry Commission Inquiry into rural R & D Corporations (RDC) and the submission by your Federation to maintain the status quo. Instead Government will impose a two tiered scheme with no funding ceiling commencing 1 July 1996.

Under a Labor Government, the new system will match industry contributions dollar for dollar up to 0.4 percent of the Gross Value of Production (GVP) of each industry that contributes to the RDCs. Beyond that point, the Government will provide 50 cents for every dollar contributed by industry.

These new arrangements are more favourable than those recommended by the Commission—dollar for dollar up to 0.25 per cent of GVP and thereafter 50 cents for every industry dollar contributed, with no ceiling.

The definition of "Industry" is unclear. In this context it usually refers to the Horticultural Industry. HRDC Chairman David Minnis has said that Australian horticulture has not yet reached contributions of 0.4 percent of GVP, so in effect the current levels of funding (dollar for dollar up to 0.5 percent of GVP) will continue in the short term. The HRDC believes that the decision will have minimal impact on horticultural R & D in the short term.

There is a suspicion, however, that the definition of industry may be redefined to mean the individual sectors which makes up Australian horticultural. Should this happen then the new arrange would not favour the Avocado Industry which is approaching contributions of 0.4 percent of GVP to R & D.

The Federal Coalition also dismissed the Industry Commission's recommendations as inappropriate and vowed that a Coalition Government would maintain the present system of matching industry R & D funding on a dollar for dollar basis up to 0.5 percent of GVP.

AQIS Review

The Minister for Primary Industries and Energy, the Hon Bob Collins MP, has established an independent Commission of Inquiry to review Australia's animal and plant quarantine policies and programs and make recommendations on the future framework for quarantine policy development, management and implementation.

Your Federation is preparing to submit the industry's views to the inquiry and to participate in the public hearings scheduled for May/ June 1996.

Your Federation will address two issues only:

1. The need for consultation with industry on any matter that may affect that industry.
2. The assessment of Acceptable Risk must be based on scientific evaluation and not such things as economic considerations or GATT negotiations.

Both these issues featured in negotiations with AQIS in the early 1980's and your Federation will do everything in its power to ensure that any revisions in Australia's quarantine policy or risk assessment process does not erode the policy that was implemented as a resulted of those negotiations.

The AAGF Executive has called on the expertise of ex directors Mr John Dexter and Mr Warren Meredith to assist with the submission. Submissions must be lodged by 8 March 1996.

Sydney Market Could Be Sold

New South Wales Premier, Bob Carr, has ordered a top-level inquiry into the future of the historic Paddy's Market and Flemington Market. The inquiry will examine, among other things, the option of selling the markets to developers.

Options for the Flemington market range from corporatisation to privatisation or even the sale of the entire site. This could involve the moving of the fruit and vegetable market to the outskirts of Sydney. Moving the markets to the Sydney outskirts would pose serious transportation problems to many retail outlets.

Flemington Market has a land value of $32 million but this would be likely to escalate as the area of 40 hectares is opposite the Olympic 2000 site.

Stall holders at Paddy's Market have also expressed concern that they will be forced out to make way for a glitzy seven-days-a-week, Asian-style market. On 5 November, the Sun Herald newspaper quoted a long-time stall holder at the market who said, "Since they built the high rise over the Paddy's site we have been targeted by developers who are prepared to offer $15 million to take over the markets."

The former state Labor Premier, Neville Wran of Turnbull and Partners, has been engaged to assist the inquiry. The committee will also draw on reports given to the previous NSW government which recommended the sale of several State-owned authorities including the Flemington Market.

The committee of inquiry was to present its report to the NSW Cabinet by mid-December.

Venue For World Avocado Congress IV

Bids were put in by Australia and Mexico to host the next World Avocado Congress scheduled to be held in 1999. Following a presentation by representatives from each country, a secret ballot of the World Congress III delegates was taken to decide the venue.

The ballot was won by Mexico and the World Avocado Congress IV will be held in Morelia, Michoacan, Mexico. Mexico is the worlds largest producer of avocados 9800,000 tonnes from 124,000 hectares) of which 80% are grown in the state of Michoacan.

As Australia was the only other contender to hold the World Avocado Congress IV, it is likely that it will be awarded the World Avocado Congress V in 2003 should it wish to bid for that event.

Previous World Avocado Congress venues were:

World Avocado Congress I - Pretoria, Republic of South Africa (April 1987).
World Avocado Congress II - Anaheim, California, USA (April 1991).

Tamborine Man Develops New Injector

Following five years of trial and error to develop a better method of injecting "Fosject" into avocado trees to control Phytophthora root fungus, Tamborine Mountain farmer and engineer, Geoff Eldridge, has made a major breakthrough with implications far beyond the avocado industry.

His device is so well thought of that it won the 'Queensland Farm Invention over $500' award at Towoomba Ag-Fest '95; the 'Australian Farm Invention over $1000' award at the Nation Field Day, Orange '95; and was "Highly Commended" at the 'Farm Safety Award for Innovation and Excellence', also at the Orange Nation Field Day.

His invention, which he calls the " Sidewinder", is a combination of a high pressure injection pump and an injection nozzle that seals effectively into the wood of a tree. The device will allow growers in some instances to replace normal spraying of numerous pesticides, fungicides, trace elements and growth regulators with a more cost effective way of chemical application.

Conventional air spray technology requires relatively large quantities of air, water and chemical in order to effectively blanket the trees being sprayed. Even then, borers and sub surface fungi generally remain unaffected. Air spraying is also indiscriminate in action, often killing the good bugs as well as the bad.

Those chemicals, trace elements, soluble fertilisers that are systemic in action can, in some cases, be injected directly into the trees vascular system with the following advantages:

1. Only a small fraction of the chemical is required to achieve the same or better results.
2. There is no spray drift or risk of contamination of the surrounding environment.
3. There is little or no risk to beneficial bugs.

Geoff sites as an example the treatment for zinc deficiency, a problem common in Tamborine orchards. Last year he spread 225 kg of zinc sulphate with no improvement in leaf levels. This year by simultaneous injection with "Fosject" he will use only 5 litres of zinc nitrate. QDPI trials indicate that he should get a positive result.

While there appears to be no restriction beyond those shown on the manufactures labels to injection of chemicals, commercial growers should check with chemical manufacturers or their agricultural department to determine the risk of higher than acceptable residue levels.

How It Works

The new injection system consists of an electric drill that firstly drills a hole into the tree. A special hollow screwed injection nozzle is then screwed into the hole. Once inserted, a switch is operated and a controlled volume of chemical is injected. At completion of injection, the nozzle is unwound and, if desired, a purpose designed plastic plug may be inserted to permanently seal the hole.

Hole drilling, nozzle screwing, plug screwing and chemical switching is carried out with a 12 volt power drill. Fluid pressure is generated by a compressed air operated pressure multiplier and fed to the drill nozzle assembly via a small high pressure hose.

Continuous operation is possible as the unit is powered either by a large automotive type battery or directly from any 12 volt vehicle electrical system.

Three systems are currently being manufactured:

1. A miniature trolley complete with car battery, hand pump and 25 L Fosject container. [See Front Cover]
2. A tractor mounted unit with 3PL driven air compressor capable of operating two drill assemblies simultaneously.
3. A trailer mounted self contained unit with a 5HP petrol engine, air compressor, alternator, battery and two drill assemblies.

All drills are connected to their unit by an umbilical cord delivering electrical power, control signals and the chemicals to be injected.

Claimed operational advantages of the Sidewinder system are:

- The one power operated tool drills the hole, injects the chemical and permanently seals it.
- Near zero risk of an operator coming into contact with the injected chemical.
- Fast consistent injection rates regardless of time of day, i.e. 100 shots/hr of 25 mL of 20% Fosject in Hass avocados.
- Minimal damage to cambium layer and rapid healing over of the hole.
- Ability to inject two or more chemicals simultaneously.
- Reduced operator fatigue as only the drill nozzle assembly needs to be carried.
- Ability to reinject close to old injection sites.

Mr Eldridge also points out that when not in use injecting, the air compressor and powerful 12 volt cordless drill have numerous other on-farm uses.

Are Trees Damaged?

There has been some doubt cast on the effect of high pressure injection on tree health by the manufacturer of low pressure spring syringes. It has been said that high pressure injection forces fluid into the delicate capillaries of the sap wood even when the tree is not able to take up the fluid (as is the case at particular times of the day or year). This could cause extensive damage to the tree's capillary systems and reduces the effectiveness of fighting root rot with phosphonates as the chemicals do not reach their destination—the roots.

In answer to this claim, Mr Eldridge says that QDPI has carried out leaf tissue analysis that confirmed translocation of potassium phosphonate when injected at pressures up to 1000 PSI.

Tissue damage that may be caused by high pressure injection would be inconsequential compared to the effect potassium phosphonate has on a tree when injected. Regardless of the injection method, the injected chemical will permanently alter the tissue at, and for a considerable distance above, the injection site.

Proof Of Effectiveness

Mr Bob Rawlins of Alstonville who also produces an injector system said that a tree transfers nutrients via the vascular layer. This consists of the phloem layer that carries and distributes water and nutrients in a downward direction, the cambium layer which is responsible for growth, and the xylem layer which transfers water and nutrients upwards from the root system.

Both the phloem and xylem layers are made up with interconnecting cells. When the avocado tree's root system is attacked by Phytophthora the amount of nutrients being absorbed drops considerably. This reduces the flow to both phloem and xylem layers leading to hardening of the cell walls and increased working pressure in the tree. This is the reason for poor results with syringe injecting. Syringes are unable to produce the necessary pressure to overcome cell resistance.

Mr Rawlins has been using his Hydraulic Tree Injector at his Farm since 1988 and has recovered the health of all trees, including the ones that veterinary syringes were unable to help. After eight years there does not appear to be any detrimental effect from regular injecting. The health of his trees has never been better and last year he achieved a record crop with all varieties.

For those wanting more detail, contact Mr Eldridge on 07 5545 1446.

Australian Round-up

Sunshine Coast

Members of the Sunshine Coast Avocado Growers Association got together at the Browns property at Glass House Mountains on 6 December 1995 to wind up the year with a Field Day and barbecue. Bob and Shirley were great hosts and no effort was spared to ensure the success of the day.

The theme of the Field Day was Water Management and Colin Campbell from QDPI's Waterwise Team co-ordinated a Waterwise Seminar in which research and industry experts addressed most aspects of water conservation, use and storage. It was a very busy seminar with nine official speakers and industry representatives from local suppliers.

A feature of the seminar was the excellent array of handouts for members to take home and further consider. Colin Campbell is to be congratulated on a job well done. Also thank you to all participating representatives, your efforts were appreciated.

At its November meeting, the Executive was briefed on the results of a recent survey of Avocado marketing problems and concern was expressed at the extent of both pre and post harvest damage to fruit. It seems that there is insufficient guidance available to most if not all post harvest handlers of avocados and as a result bruising, chill damage and ripening defects are prevalent at an unacceptable level. Likewise, there is an increasing need for quality control at the orchard level if an acceptable standard of fruit is to be produced in a predictable and sustainable manner.

The Executive has agreed to explore appropriate avenues of redress of these problems with QDPI as a matter of some urgency.

Careful attention to orchard management particularly in the areas of spray and harvesting practices is encouraged. Anthracnose control agents must be religiously applied throughout the fruit development period, with strict observance to recommended spray intervals. To quote one grower, "the copper condom must be worn at all times".

Fruit handling during harvesting is critical to ripe fruit quality. Dropped fruit may appear alright at the time but will almost certainly deteriorate rapidly with ripening. The practice of "drop it—dump it" is recommended. Also post harvest fruit temperature should be carefully monitored to prevent field heat deterioration of fruit.

It is only from the "through life best practice" approach to quality management that the avocado can become a reliable and preferred fruit choice for the consumer. This choice will then be reflected in the increased demand and greater returns that drive industry profitability.

SCAGA members are reminded that the 1996 AGM will take place on Wednesday, 6 March at the Palmwoods Memorial Hall at 7.30 p.m. Quarterly meetings will then follow on the first Wednesday of June, September and December at venues and times to be advised.

The NSW season finished on a good note. From October onwards, most growers received acceptable returns for the bulk of their Hass crop. Prices were slightly higher during December.

The influx of NZ fruit on the market appeared to have no detrimental effect in lowering the demand or prices for NSW fruit.

As predicted, the NSW crop for the '95 season (3,500 tonnes) was higher than '94. Unfortunately, the estimate for the '96 season is certainly down on '95. Most areas have reported poor fruit set followed by heavy fruit drop in the New Year.

At last the weather has provided ideal growing conditions with rain in all areas. Unfortunately, some storms caused hail and wind damage particularly in the Richmond district during December.

Acceptance of NSW Agriculture horticultural staff redundancies in key positions has caused growers to become more self reliant in solving everyday problems. This situation will become critical as the Department sheds more staff. This highlights the growing importance of the NSW Avocado Association and its Branches in providing the venues and opportunities for growers to discuss problems and for the transfer of both theory and practical technology through Field Venue meetings, Field Days and AVOMAN.

The NSW Association's lobbying of politicians, the Commonwealth DPIE and AQIS regarding the disastrous outbreak of Papaya Fruit Fly in Cairns, helped to shake up inspection services. An additional 20 inspectors have been employed to combat this terrible scourge. Furthermore, as a direct result of Association suggestions, "Northwatch" has been established with DPI inspectors being located at 13 remote communities on Cape York Peninsular and the lower Gulf area.

These positive outcomes stress the importance of having a grower association that can go in and bat to protect growers' interests.

Beware Of Look-alikes

For a nursery accredited under an industry scheme such as QNVAS to claim that "all trees are grown to ANVAS standard" is misleading.

The QNVAS scheme is an accreditation scheme operated be the nursery industry in Queensland. However it was not established to address the specific problems of the Avocado Industry, unlike the ANVAS scheme.

The ANVAS scheme is a voluntary accreditation scheme operated by the Varieties Committee of the AAGF.

The principle purpose of this scheme (ANVAS) is to provide avocado plants to industry which are free of serious plant pathogens and root diseases. The scheme also promotes sound nursery practices and the use of virus indexed and registered sources of seed and budwood.

To be accredited, a nursery's facilities must be of a standard to satisfy the guidelines of the scheme. Two inspections and samplings are carried out each year by independent inspectors to confirm standards are maintained and to verify the pathogen free status of the plants being produced.

All nurseries producing avocado trees are, or should be, encouraged to participate in the ANVAS scheme.

AVOMAN Update

Progress on AVOMAN and AVOINFO

There has been major progress in the development of the new AVOMAN software prototype using a powerful new programming language. The new version will operate in Microsoft Windows 3.1, Windows for Workgroups and Windows 95. Several new facilities will also be available in the 1996 prototype which is due for release mid-year.

Prototypes of the AVOINFO reference and diagnostic databases have been developed. The reference database now has a powerful search and sort option and contains the bibliographic details and most of the abstracts of over 4000 references. The AVOMAN team is planning to release a prototype of the reference database on compact disc at the end of 1996. The diagnostic database now has the framework for an easy to use system with potential to incorporate text, full colour images and video clips.

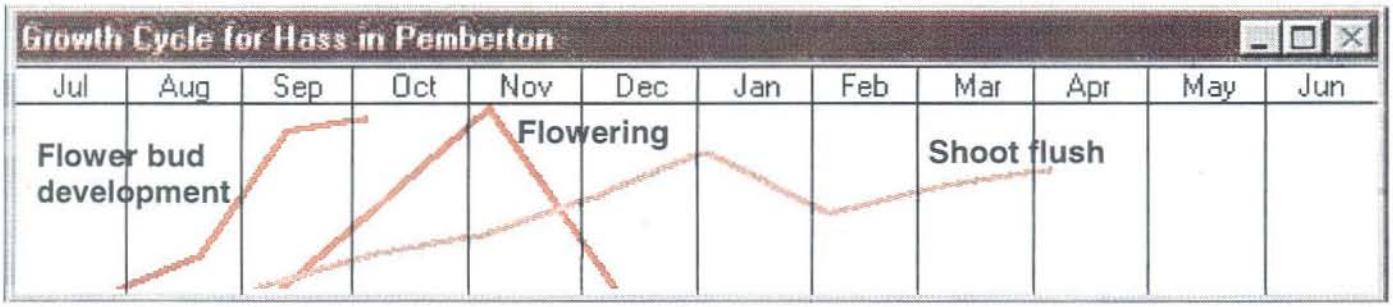
International Interest in AVOMAN

Two papers were presented at the World Avocado Congress III held in Israel during October last year. One paper was on the AVOMAN software the other on the AVOINFO software. In addition, over 200 colour brochures on the project were distributed to delegates, many expressing an interest in the products.

Orchard Recording Charts Well Received

Over 240 wall charts have been eagerly snapped up by growers around the country. This chart is designed to help growers record important orchard practices as described in the last issue of Talking Avocados. A software version of the chart is also currently being developed.

Pemberton "Hass" Its Own Growth Cycle



The above AVOMAN growth cycle for 'Hass' was recorded by Mr Wayne Franceschi of Avonova at Pemberton, WA. Good one Wayne!

Compared to the well known cycles published for SE Queensland note how late in the year flowering occurs. Notice also the absence of summer fruit drop despite a heavy crop set and the lack of distinct shoot flush peaks in spring and summer as seen in the subtropics of Queensland and northern NSW. It's obvious that many areas require different approaches to seasonal management.

The AVOMAN team needs more growth cycles for varieties grown in different localities around Australia to make accurate recommendations for growers' management operations. An addendum will come out shortly to include harvest dates and yield data for the trees being recorded this season. Well done to all those growers who are keeping up their growth cycle recordings!

Are You Using AVOMAN?

Get your copy of the prototype AVOMAN software from Simon Newett. Phone 074 412211.

Protecting Your Interests

By Orf Bartrop

There I was minding my own business and doing my own thing to ensure a good and profitable crop when along comes some nosy bureaucrat and tells me I can no longer carry out certain practices on my farm!

A story most farmers have heard or experienced at some time during their farming career.

There is a story about a farmer who lived near Lismore in northern NSW. An adjoining farm had been subdivided into a housing estate and one of the new inhabitants complained about the noise from fans that cooled his nursery sheds. A health inspector was dispatched to measure the noise level but could not hear the fans due to the noise created by wind in a thicket of bamboo, ironically used to screen the noise of the fans. He returned on a still day and decided that the noise of the fans was unacceptable and caused a nuisance. As a result, the noise of the fans had to be reduced so as not to disturb the neighbours.

With an ever expanding population and more and more farmers finding it difficult to make a decent living out of rural production, land is being rezoned for urban living.

Just imagine that your neighbour sold his land to a developer and a housing estate sprung up on your doorstep. What effect would that have on your enterprise? How long would it be before these city slickers complained about your early morning spraying operations? "I came to the country for peace and quiet," would be their cry. "And what do I get, noisy machinery in the middle of the night and chemical smells that will, no doubt, ruin my health."

Rather than wait for such a scenario to arise, why not act now before being confronted by a citizen's protest group?

Tasmania recently enacted legislation to limit people from successfully taking action to prevent farmers from carrying out normal farm activities. It is called the "Primary Industry Activities Protection Act 1995".

If similar protection is not available in your State, perhaps you should consider lobbying your Local Member for comparable legislation. AAGF Directors have a copy of the Tasmanian Act.

The Tasmanian Act

The Primary Industry Activity Protection Act 1995 is designed to protect persons engaged in primary industry by limiting the operation of the common law of nuisance in respect of certain activities that are incidental to efficient and commercially viable primary production.

What is not considered a nuisance?

A primary industry activity that is carried out on an area of land does not constitute a nuisance if that land has been used for primary industry for a continuous period longer than one year and the activity was not considered a nuisance at the beginning of that continuous period. The activity must be substantially the same as that carried out at the beginning of the continuous period or if it is different, the change has to be brought about by improved technology or agricultural practice. Of coarse, the activity cannot be improperly or negligently carried out.

Power of courts

If a court finds that a primary industry activity constitutes a nuisance, the court cannot order the complete cessation of that activity if by making some other order, such as a change in management practices or timing of spraying etc., the nuisance can be reduced to an acceptable level. Such an order made by a court would have to allow efficient and commercially viable primary production.

Definitions

The term **"primary industry"** includes planting, growing or harvesting crops; breeding, rearing or managing livestock; agisting livestock; obtaining dairy, wool, eggs or other produce from livestock; and obtaining juice, seeds or other produce from crops.

A **"primary industry activity"**, and this is the important part, means an activity which is carried out on an area of land being used for primary industry; is carried out for, or in connection with, a primary industry; and does not contravene any State, Commonwealth or council by-laws.

The Act defines an area of **"land used for primary industry"** purposes as any land zoned by a council for primary industry use. The land must be in regular use for primary industry and the owner or occupier must derive his or her principal means of livelihood from primary industry.

World News

California Avocado Commission

A new chairman was appointed to the California Avocado Commission. He is Al Snider, who has been a Board member of the Commission since it was established in 1978.

Snider succeeds Charley Wolk, who retired after serving eight years as a member of the Board and one year as Chairman.

Snider owns and operates an avocado grove in California.

New Zealand Avocado Levy

New Zealand introduced a levy on wholesale avocados in late 1995.

The levy will be imposed on avocados destined for both the domestic and export market at a rate of 3% of the producer's price. This compares with the Australian levy of 15¢/tray (approximately 1%).

The levy has been raised by the New Zealand Avocado Growers Association to carry out marketing activities in 1996.

Drop In Mexican Production Forecast

The US agricultural attaché in Mexico reports an expected slight drop in Mexico's avocado production in the 1995-96 season.

It is anticipated that production will decline from 773,000 tonnes in 1994-95 marketing year (August-July) to 740,000 tonnes.

It is believed that low prices and rising producer costs forcing many producers out of business is behind the decline in production.

Europe, Canada and Japan are Mexico's largest export markets for avocados—but account for only 2% of total production.

Despite this fall, avocado production is expected to peak in five years when the large number of trees planted in the late 1980s and early 1990s reach full production. Growth of between 20 and 30% is anticipated. A similar growth pattern is forecast for the Australian industry.

More than 85% of the avocados produced in Mexico are grown in the state of Michoacan. The main variety is the Hass, followed by Criollo, Fuerte, San Miguel and Taylor.

Production can range from around 3 t/ha for non-irrigated Criollo groves to more than 20 t/ha for well managed irrigated Hass groves.

Chilean Avocado Exports Down

Total avocado exports from Chile in 1995 are expected to have dropped by 34.4%.

According to Fedefruta the harsh winter was the cause of the drop in production.

Only 1.5 million cases are expected to be exported in the 1995/96 season compared to 1.6 million in 1994/95. The US market traditionally takes up to 95% of Chile's avocados with the remainder going to Europe and Argentina.

Further Barriers To Mexican Avocados Entering The US

The United States Department of Agriculture (USDA) proposal to allow Mexican avocados into 19 northeastern states of the US has met with strong grower opposition.

In addition, a recently released scientific study by the University of California has criticised the USDA move stating that Mexico's assurances that its avocados are pest free may be compromised.

The US trade magazine "The Packer" reported the study concluded that "the systems approach embodied in the proposed rule (proposal) is unacceptable. In our opinion, APHIS (Animal and Plant Health Inspection Service) does not yet have a suitable basis of scientific information upon which to move forward with a credible and reasonable plan for the importation of Mexican Hass avocados. The risk assessment contains undocumented assertions, highly questionable estimates and improper methodology. As a result, we consider it to be invalid."

The USDA has received more than 2000 opposition letters and a petition with nearly 1000 signatures against the proposal, according to the California Avocado Commission.

Survey Of Internal Quality of Avocados in Brisbane Retail Shops

By A. Story and A. Fuss, Story Horticultural Services Toowoomba, and T. Rudge, Rudge Produce Systems, Melbourne

A survey was conducted in Brisbane in September 1995 to assess the nature and extent of internal quality defects in avocados. Sound, ripe fruit were sampled from supermarkets, fruit barns and specialist independent fruiterers in suburbs selected on a socio-economic basis. A total of 28 lots of fruit were sampled and assessed.

Fruit was assessed for firmness by hand and then cut to determine the nature and extent of internal defects. The level of internal quality defects was high.

All of the sampled fruit were of the variety Hass. These fruit were mainly sprung or ripe. Less than 50% of the fruit had no internal defects while 22.6% were considered to be unacceptable. Bruising affected 34.1%, the other main defects being anthracnose (9.9%), stem end rot (7.0%), chilling injury (5.5%) and lumps or stones (4.9%). The presence of some internal quality problems was linked to sample lots. The lack of synchrony in Hass between skin colouration and flesh firmness makes it difficult to identify ripe fruit. The thick, dark skin of Hass also masks many of the internal quality defects seen in the survey.

The quality of the avocados sampled was not reflected in price, with a trend for supermarkets to have better quality fruit and the lowest prices.

The Survey

The avocado industry in Australia produced 12,926 tonnes of fruit in 1993 estimated to be worth around $50M. Queensland alone accounts for 56% of the total production by weight. In the last ten years there has been a rapid increase in the number of trees planted and subsequently production. However, market development has not kept pace with this growth and prices have declined.

According to market research, consumers are dissatisfied with the quality of avocados. Consumers are disappointed that avocados often appear sound but upon cutting are unacceptable to eat due to internal defects, including black or brown flesh. Problems were also reported with the ripening of flesh being too slow, uneven, not ripening, or being too soft.

A survey of the internal quality defects in avocados in retail outlets in Sydney confirmed these customer research studies. In the three surveys conducted during 1993 the level of unacceptable fruit ranged from 14% to 26%, with Hass showing more problems than the green skinned varieties, Fuerte, Sharwil, Shepard and Reed. Anthracnose, stem end rot and flesh browning were the main defects noted.

This Brisbane survey aimed to identify the nature and extent of internal quality defects in avocados purchased from a range of retail outlets across the Brisbane metropolitan region and replicate the procedures used by Ledger in his Sydney retail survey in 1993.

Procedure

Three teams of people were formed and sent to different regions of the city. Each team attempted to sample three retail outlets in each of three suburbs in their allocated region. Suburbs were selected for sampling on a socio-economic basis. Where possible, the three retail outlets were to represent a supermarket, a fruit barn and a small independent fruiterer.

At each retail outlet, a sample of 20 fruit was selected for purchase from each variety or line of fruit on display. The fruit were selected on the basis that they were ripe or near ripe, appeared sound and would be likely to be selected by a customer. The variety Hass was selected on softness rather than colour. Unripe fruit were only selected if ripe fruit were unavailable.

Sampled lots were returned to a central location for quality assessment by representatives from all sectors of the industry. Assessors were trained as a group to recognise defects and to rate the severity of each type of defect.

The firmness of each fruit was assessed by hand prior to the fruit being cut into thin wedges to assess its internal quality. The form, incidence and severity of any defects were recorded. The severity was divided into 4 categories; slight, mild, moderate and severe, with category guidelines provided for each defect.

On completion of the internal assessment, an overall rating of acceptability was recorded for each piece of fruit. A fruit was rated as unacceptable if a moderate or severe defect was present. Fruit that were unripe at sampling were held at ambient temperature and assessed when ripe.

Results

A total of 28 lots of fruit were sampled from 24 retail outlets around Brisbane (Table 1). In all 516 fruit of the variety Hass were sampled and assessed, with the number of fruit per lot varying from 7 to 20 (mean 18.4).

In most retail outlets, avocados were displayed in a prominent position in the front to mid-section of the store. Fruit were either displayed loose, often in large dumps, or in single layer trays. There was no correlation between the type of retail outlet and the way in which the fruit was presented, although this information was only recorded for 7 stores.

Retail prices ranged from $0.80 to $1.99 per fruit, with an average of $1.19. Avocados in independent fruiterers were on

Eric and Tracey Badistino (growers) inspecting fruit.

average more expensive ($1.28) than were fruit in fruit barns ($1.16) or supermarkets ($1.13).

About half of the retailers purchased sprung avocados. Most of the others purchased fruit which was hard and green, while a few purchased ripe fruit. Most fruit was left to ripen in the store or at room temperature. Only two supermarkets and two fruiterers were recorded as using or purchasing fruit which had been treated with ethylene gas to accelerate ripening.

At the time of assessment, most fruit were considered to be ripe (69.2%) or sprung (19.0%), and 8.3% were unripe. The remainder were considered overripe at the time of assessment.

Only three lots of fruit had no quality defects at all (Table 2). Two of those lots were from the one supermarket outlet but had been moved through different handling systems. Both systems were able to provide consumers with defect free fruit.

The first line had been sourced by the supermarket as green fruit six days before sampling. This fruit had been allowed to ripen naturally in the backroom. The second line was sourced as control ripened fruit two days before sampling. About one half of the Hass fruit assessed were found to have no internal defects.

There was a trend for fruit purchased from supermarkets to be of better quality than fruit purchased from either fruit barns or independent fruiterers (Table 3). Fruit purchased from fruiterers had the highest frequency of internal defects.

Bruising was the most common internal defect affecting 34.1% of all fruit sampled (Table 4). Most of the bruised fruit (41%) were classified as mild, having 1-3 cm^2 of flesh showing bruising.

Anthracnose was the second most frequent defect (Table 4). Anthracnose was found on 51 Hass fruit, representing 11 sampled lots. In most cases the severity of this disease was classed as mild, with 1-3 cm^2 of the fruit being affected.

A higher incidence was evident in those fruit purchased less ripe and requiring a further 2 to 3 days to become ripe.

Stem end rot was identified and was usually slight in terms of severity with less than 5% of the flesh affected (Table 4).

Chilling injury, the presence of lumps or stones and dark flecks or streaking of the flesh were the other main defects found (Table 4).

Minor internal defects recorded included ripening disorders (firm flesh, 1.2%; slow ripening, 0.2%), seed discolouration (0.8%), stings (0.6%) and blackening of the flesh (0.2%).

Table 1. Number of lots of avocados sampled from a range of retail outlets in Brisbane on 14 September 1995.

Socio-economic group	Location	Type of retail outlet		
		Supermarket	Fruit Barn	Fruiterer
Upper	Kenmore	1	1	1
	Toombul	1	-	-
Mid/Upper	Carindale	1	2	1
	Indooroopilly	1	1	2
Middle	Aspley	-	-	1
	Capalaba	2	1	1
	Chermside	1	-	1
Mid/Lower	Rana Hills	1	-	-
	Clayfield	-	1	-
	Everton Hills	-	-	1
	Everton Park	-	-	1
	Mt Gravatt	1	-	2
Lower	Inala	1	1	-
TOTAL		**10**	**7**	**11**

Table 2. Frequency of internal quality problems in Hass avocados sampled in Brisbane in September 1995.

Quality problems (% lots)	Internal quality (% fruit)		
	Unacceptable	Minor problems	No defects
89.3	22.6	29.2	48.2

Table 3. Frequency of internal defects in Hass avocados purchased from a range of retail outlets in Brisbane in September 1995.

Type of retail outlet	Internal defects (% fruit purchased at outlet)		
	Unacceptable	Minor problems	No defects
Supermarket	18.2	23.4	58.4
Fruit barn	22.6	35.0	42.4
Fruiterer	28.2	31.9	39.9

Table 4. Incidence and severity of internal defects in Hass avocados sampled in Brisbane in September 1995.

Defect	Severity (% fruit)				
	Slight	Mild	Moderate	Severe	Total
Bruising	6.6	14.1	6.4	7.0	34.1
Anthracnose	2.7	4.1	2.1	1.0	9.9
Stem end rot	5.0	1.4	0.6	0	7.0
Chilling injury	1.4	1.4	0.4	2.3	5.5
Lumps or stones	3.5	1.0	0.2	0.2	4.9
Dark flecks	2.1	0.2	0	0	2.3
Other	-	-	-	-	2.9

Discussion

The survey revealed that the extent of internal quality problems in avocados purchased from Brisbane retail outlets is alarmingly high. One quarter of the fruit assessed were considered to have an unacceptable level of internal defects. This is a similar result to that found in the surveys conducted in Sydney.

Hass is one of the major varieties grown in Australia and the extent of internal quality problems highlighted in this variety was very high. Less than 50% of the fruit had no defects.

Ledger also found Hass to have a high proportion of unacceptable fruit, declining from 41% in the first survey conducted in

☛ 12

11 ☛

February to 28% in the third conducted in August. The slightly lower level of unacceptable fruit in this survey (22.6%) may reflect the difference in timing of the surveys.

Bruising was the most common defect noted with over one third of all fruit affected. The incidence of bruising of Hass in the Sydney surveys was comparable with that noted in this survey.

Bruising can result from the impact of dropping and other rough handling of the fruit and cartons during picking, processing and marketing and by customers squeezing fruit to determine ripeness. These incidents cause more damage to ripe fruit than to those which are hard and green. Hence, there is a greater possibility of physical damage (bruising) occurring at the retail level of the marketing chain, particularly when fruit is purchased at a sprung or ripe stage.

The handling of sprung or ripe fruit should be considered as completely different to green fruit and would better parallel the handling of strawberries.

It is difficult to determine the ripeness of Hass by colour change alone, as skin colouring and softness of the flesh are often not synchronised. In some cases the darkening of the fruit does indicate ripeness. However, it is common to find fruit which is fully coloured yet still hard or feels sprung but is ready to eat. In addition some fruit may only be partially coloured but are soft and ripe. Thus fruit firmness is a more reliable indicator of ripeness in Hass than skin colour.

The thick, dark skin of Hass hides blemishes, such as bruising, giving the fruit good shelf appearance. As a result, both retailers and customers are often unaware of the extent of internal quality problems in this variety.

The diseases, anthracnose and stem end rot, were common in Hass. These diseases originate in the field but only develop as the fruit ripens. Consequently it was noted that in this survey infected fruit tended to be grouped in sample lots. Few sampled fruit had moderate or severe cases of stem end rot as these would have been screened at purchase. There was, however, a greater incidence of moderate and severe cases of anthracnose as the skin of Hass can often mask this defect.

The frequency of anthracnose and stem end rot found in Hass in the Sydney surveys was about two and three times greater respectively than that observed in this survey. This accounts for most of the difference in unacceptable fruit between the two studies and is likely to reflect seasonal differences, differences in time in the total marketing system, the source of fruit or possibly higher temperatures experienced in Sydney. In addition, development of these diseases is influenced by controlled ripening, which is more common in Brisbane than in Sydney.

The incidence of chilling injury and lumps or stones to the Hass fruit was also linked to sample lots. Chilling injury is known to occur when avocados are stored below 13°C, with the fruit being most sensitive during ripening. Ripe fruit can be stored at lower temperatures without injury, although this can differ between varieties.

In this survey, some chilling injuries coincided with brand rather than retailer indicating that at some point pre-retail, fruit had been stored below 7°C. This suggested that the chilling occurred at farm or wholesale levels as other lots of fruit which received similar treatment at the retail outlet showed no symptoms.

Lumps or stones on the other hand are production issues and may be caused by insect stings, exposure to high temperatures or other damage to the fruit during its development.

Conclusion

The results of this survey of Brisbane retail outlets are very similar to those found in Sydney and confirm consumer research studies. There is an extremely high chance of consumers finding internal quality problems in avocados purchased from any retail outlet in any area irrespective of the price paid.

Hass has a thick, dark skin which masks defects and adds to the difficulty of identifying eating ripe fruit. There is a consumer demand for fruit to be at or nearing the stage of eating ripeness when purchased. Unfortunately, if the fruit have not been handled and stored correctly, internal quality defects are accentuated at this stage.

Thus it is evident that the responsibility of supplying the customer with good quality fruit of reliable ripeness does not rest with one segment of the production or marketing chain.

Problems which originate in the field, such as anthracnose, stem end rot and lumps or stones, are primarily the responsibility of the grower. However, since anthracnose and stem end rot develop upon ripening of the fruit and can be exacerbated by incorrect storage and handling, wholesalers and retailers must also take responsibility for reducing the impact of these diseases on the final product.

While there are already some industry guidelines for handling, storage and ripening of avocados, it would seem that these have not been readily adopted by the majority of the industry. Each sector of the industry, from growing through to retail, needs to be aware of handling requirements and make every effort to ensure that the customers are being provided with quality product, if the avocado industry in Australia is to continue to grow and prosper.

It must be recognised that the system used to handle sprung or ripe avocados is totally independent of the system acceptable for green, mature fruit. The system that any one business adopts may vary, but with attention to detail and clear delineation of responsibility at all points from the tree to the shelf, consumers can be confident of purchasing fruit of high internal quality.

Recommendations

The recommendations made as a result of the survey are:

- The results of this retail survey be distributed to all sectors of the industry, from growers to retailers, through industry newsletters and talks at industry meetings
- Guidelines for correct handling and storage procedures appropriate to the wholesale and retail sectors of the industry, be prepared and presented at workshops.
- Consumer education be conducted in the need to care for avocados to maintain quality, both in the retail outlets and in the home.
- Retailers be encouraged to display fruit in a single layer and separately by their degree of ripeness to avoid excessive handling by consumers.
- Growers be reminded of the need to maintain effective field spray programs for control of the diseases anthracnose and stem end rot and insects which cause the development of lumps and stones, through industry newsletters, talks at grower meetings and field days and popular media (regional or rural newspapers, television and radio), particularly leading up to and at key seasonal events. This can be further reinforced through the AVOMAN project.
- A similar survey be conducted in Brisbane at a similar time of the year about 12 months after information on product handling and storage has been distributed throughout the industry.

AAGF Helps Trade To Deliver The Goods

By Terry Rudge, Rudge Produce Systems Pty Ltd, Melbourne

Australian consumers want an avocado that is ready to eat or nearly ready to eat when they buy it. This means there will be an increasing trend towards controlled ripening of avocados by wholesalers. There have been similar trends in other parts of the world, notably in the USA and New Zealand.

The systems needed to handle sprung or ripened fruit are quite different from those used for hard green fruit because ripe fruit is very prone to bruising. According to horticultural consultant Anne Story, the trade has not yet made the distinction between what are essentially two quite different products. **Handlers should be treating ripened avocados as they treat strawberries ..... gently!**

A survey of internal quality in Brisbane retail stores has reinforced messages from an earlier study in Sydney which showed alarmingly high levels of internal defects especially bruising.

There are changes ahead for transporters, wholesalers and retailers, especially those that currently handle hard green avocados. The AAGF is working with all sectors of the industry to make sure customers get the avocado they are looking for.

Wholesaler Workshops

With an eye to the future, the AAGF has developed training programs for wholesale and retail handlers of avocados. This initiative was supported by funds from the DPI&E's Agribusiness Program.

Workshops for wholesalers have been run in Brisbane, Sydney, Melbourne, Adelaide and Perth. A second round of workshops is now underway. Avocado growers are urged to encourage their wholesaler and retailer customers to attend.

Wholesalers and retailers have a major influence on the quality of avocados delivered to consumers, and the workshops focus on ways of improving handling.

The skill of ripening receives a lot of attention. The ripening process is not well understood and the trade needs to respond to the growing demand for ripened fruit. Once ripened, fruit has a different set of handling problems and handling systems need to recognise how easy it is for fruit to bruise.

Fruit needs to be ripened under the right conditions. This gives retailers confidence in their avocado handler and avoids the need for ripening with inadequate facilities at retail level.

> Avocados must always be handled correctly if consumers are to receive the highest quality product possible

The workshops are an opportunity for handlers to develop more depth of expertise in their business and reduce dependence on a small number of skilled and experienced staff.

Resources For Retailers

Neither independent retailers nor chains are able to commit staff to a workshop program, preferring to use resource materials "in-house". After all, avocados are just one of many lines handled at retail level.

The survey found that videos were an appropriate way of reaching retail staff as they had little time available for training. **The project is developing video and product information cards to target retail staff.**

Retailer training material will focus on sourcing fruit that has been through a reliable ripening process and reducing the time avocados are held at retail level. Any move towards controlled ripened fruit must be accompanied by recognition that the product must be handled carefully to minimise injury due to temperatures and bruising.

Recognition

The AAGF recognises businesses that participate in the workshops by:

1. awarding certificates to participants, and
2. informing growers of the names of participating businesses through a "Roll of Honour". This will be published in Talking Avocados from time to time and released to other horticultural media.

The wholesale and retail businesses shown in the "Roll of Honour" of trained avocado handlers on the next page have participated in workshops on "Improving Avocado Handling During Marketing".

Members attending the workshop in Perth Western Australia.

- Roll of Honour -

Brisbane

B G Brisbane	Anthony Gribbon
	Peter Jankin
Carter & Spencer	Michael Somerville
Chiquita Brisbane	Jamie Bennett
King Pak	Monique Appi
M J Deveney	Robert Staggs
North Coast Ripeners	Michael Engeman
The Harvest Group	Robert Gray
	Phil Griffiths
	Graham Thoms
Woolworths Fruitex	Barry Ross

Sydney

All Crops	Tony Pirelli
C J Watt & Sons	Manuel Marakas
Cremona Bros	Cosimo Cremona
Drive in Fruit Supply	Charlie Giordimaina
	Frank Giordimaina
E A Small	Henry Peters
E F Cooke	Michael Maestri
Fresharvest	David Costa
Fruitlink	Robert Curro
Ghalloub Enterprises	Mark Dwyer
	Tony Ghalloub
	Colin Wright
Stuart Dickson Produce	Neville Tunneycliff
Tilbrook Marketing	Bernie Crump
Woolworths	Buddy Kassoum

Melbourne

Danzante	Tony Barker
	Ange Usai
Dimattina	Philip Petolino
John Holman & Co	Ian Shrubsole
Kedco	Charlie Carroll
	Wayne Kleeman
Louis Melbourne	David Bitmead
Mark Dykes	Brian Dykes
	Gerry Macri
Produce of Virginia	Fonse Muratore
Sculli & Co	Dean Sculli
T A Costa	Stuart Costa
	Stirling Parker

Adelaide

BiLo	Danny McKay
Coles Supermarkets	Steve Richter
De Poi Produce	Peta Southern
H L Banana	Bill Chartres
	Graham Chartres

Perth

Action Food Barn	Gayle Bents
	Joe Delavrentis
BiLo	Steve Larranga
	David Vinciguerra
Claremont Fresh	Colin Griffin
	Craig Harper
Coles	Gary Antulov
	Geoff Rowden
CTB	Peter Hadida
E P T	Shane Sullivan
Etherington	Lindsay York
Farmer Jacks	Sacha Browne
Fresh Finesse	Noelene Swain
Herdsmans Grower Market	Denis Cerenich
Mercer Mooney	Aaron Taylor
Peaches Fresh Food Market	A Schreiber
Regal Marketing	Steve Bilicich

Avocado Grower/Packer Co-operative Formed In South East Queensland

At a meeting of avocado grower/packers held at Nambour on November 17, it was decided unanimously to establish a Co-operative to market their fruit.

An interim Board of five persons was elected with one member each from the Tamborine (South) and Wide Bay (North) areas, together with three members from the central region.

The Marketing Co-operative Board members are the growers/packers:

John Williams	Mt Tamborine	(07) 5545 2766
Colin Jeacocke	Gin Gin	(071) 572655
Brian Prosser	Yandina	(074) 467069
Ron Lawrence	Yandina	(074) 468435
Ray Taylor	Kandanga	(074) 843261

The Co-operative yet to be named has taken as its draft mission statement:

> A Co-operative designed for avocado growers/packers to unite and market their fruit as a single entity.
>
> The fruit to be grown and packed under an accredited QA scheme to ensure that the domestic and export markets can have absolute confidence in consistent quality of produce purchased under the brand, resulting in a premium return to grower/packers.

The Co-operative adopted a marketing plan which provides for common brands based on quality; the majority to be supplied "Ripe for tonight", together with 12 months continuity of supply under the Principal Brand. Monitoring of fruit from the grower through to the retailer's shelf is another key aspect to ensure the consumer can have complete confidence in the brand; continuity of supply by description to retailers also plays a big part.

The Co-operative passed several resolutions covering the commitment of members production and a requirement to comply with a QA plan incorporating minimum standards of orchard management and packaging. The target operational date is March 1996.

The formation of the Co-operative follows over a year of research and development by a working party from the Sunshine Coast Avocado Growers Association. The working party was expanded to cover other production districts to the North and South following a meeting on 21 July of district growers to measure interest in forming such a group. This meeting said "yes we need such a group—tell us how".

This final series of meetings was assisted by grants from the Department of Primary Industries and Energy, Agribusiness Programs and assistance was also provided by the Queensland Department of Primary Industries.

It is expected that over 30 grower/packers will join the Co-operative in the first year, a further meeting of foundation members and others interested grower/packers is scheduled for early February to adopt rules for the Co-operative and receive a report of progress on the marketing plan.

Any grower/packer who is interested is invited to contact any of the above interim Board members for more details. There is no limitation on the location of any interested grower/packer, indeed the concept could apply throughout Australia.

Anthracnose Project To Take New Direction

Gerard McEvilly, Industry Program Manager, HRDC

Anthracnose could still be described as the industry's number ONE problem. As such, it has received a high proportion of the funds raised by the R & D levy to date. The project (AV207), was aimed not only at increasing overall understanding of the disease in the orchard, but also at developing a natural organism capable of replacing the chemical treatments currently used. In both these aims, the project, supervised by QDPI Senior Plant Pathologist Dr Lindy Coates, has achieved considerable success.

Dr Coates, together with then PhD student Marcelle Stirling, studied the microorganisms which naturally reside on the surface of avocado leaves and fruit, and their potential for 'biological' control of anthracnose. They found that some of the natural flora on leaves and fruit (consisting of bacteria, yeasts and fungi) were active against the anthracnose pathogen. They also found that copper sprays had a detrimental effect on the natural microflora, as numbers (particularly of bacteria) on copper-sprayed trees were consistently less than on unsprayed trees. Fruit from copper-sprayed trees in the trial had more anthracnose than fruit from unsprayed trees, suggesting that copper may suppress the beneficial organisms which reside on leaf and fruit surfaces.

In other words, **inefficient spraying with copper could be worse than not spraying at all.** This outcome has been well publicised and has encouraged greater attention to spray application by many growers.

While copper is seen as a low-risk product environmentally, there is some concern at the long term effects of its continual use. In addition, some of the fungicides currently used post-harvest are likely to be unavailable eventually. For this reason, the industry supported the alternative approach of seeking to develop an orchard spray and/or postharvest dip based on the natural antagonists found in the orchard. This technology is generally described as biological control, or "biocontrol".

The research team made rapid progress in this area and were able to run trials with experimental formulations. These results indicated that a number of formulations appeared to be effective as orchard sprays in preventing anthracnose.

As the project entered its next phase (AV504), to involve refinement of formulation and production techniques, as well as further field trials, both HRDC and the AAGF Board suggested that a feasibility study would be timely, in order to ensure that a product designed specifically for avocados would be commercially viable. This was carried out by R.C.S. Hassall and involved extensive consultation with companies involved in pesticide marketing, fermentation processes, research agencies and registration authorities. [The report by Mr Hassall (project AV513) is available from the HRDC for $20.]

The consultants worked on the premise that ultimately a commercial operator would have to be involved in the production and distribution of the biocontrol product. The conclusion reached was that considerable further investment would be required by the industry in developing the product before there would be a reasonable likelihood of involving a commercial partner. At present there are only a few biocontrol products available worldwide as the pioneers of this technology continue to wrestle with the hurdles involved in formulation, registration and distribution (some products, by their nature, have a limited shelf life).

As with the development of new chemical pesticides, horticultural crops generally have to manage with the spin-offs from broad acre applications, since only these markets are capable of paying back the development and registration costs.

As no broad acre applications are apparent, the R, D & E sub-committee, supported by the AAGF Board, determined that the avocado industry was not capable of supporting the full development costs alone. This aspect of the research work is to be put on hold at the end of this season's trials while other avenues are explored. The HRDC commended Dr Coates and her team for their considerable efforts in this area and have requested Dr Coates' involvement in an industry workshop to determine future directions for R & D on this continuing serious problem.

Dr Coates work on biocontrol agents for mango postharvest diseases will be continuing, with ACIAR funding support. The Corporation continues to support the concept of developing viable alternatives to pesticides and is currently funding a number of other biocontrol projects in other crops. All parties involved are also keeping a watching brief on developments by other research groups, including Dr Lise Korsten at the University of Pretoria and Dr Anna Williamson of CSIRO.

Bonnie Walker has been appointed project champion. Anyone interested in this project can contact Bonnie on 066 281788.

Update On Fruit Spotting Bug

Tenders have been invited from research agencies to establish viable colonies of both species of Fruit Spotting Bug, and to complete the identification of pheromones. Tenders were due in mid-February and it is hoped to commence a project on July 1.

Discussions involving all interested parties resulted in a decision to concentrate on developing monitoring tools, using pheromones, to assist with spray timing. To finalise the pheromone identification, a reliable source of the bugs is required. It is hoped that a combined approach between the various research agencies will achieve this aim.

Apart from the extreme technical difficulties of working with these insects, progress to date has been hampered by the very low level of industry funds available. With the increase in the avocado R & D levy flowing through to a larger budget in 1996/97, the R, D & E Committee hope to be able to provide researchers with the means to find an answer to this serious pest.

Ongoing assistance and advice will be available to the researchers from both the avocado and macadamia research committees. The project champion for this topic is John Bolton. John has put considerable effort into representing avocado growers' interests and has developed a long term development program. Copies will be available from Astrid Kennedy at the end of March.

Avocado Industry Marketing Forum

The Marketing Forum for the Avocado industry met on February 27 in Brisbane to examine the industry's marketing plan.

The Marketing Forum reviewed the current marketing plan, the first year of a three year strategy, and then looked at plans for the second year.

Over the three years, the strategy's aim is to increase demand for avocados by 30%.

The current plan is a $200,000 campaign which contains a strong public relations component promoting avocados as a versatile fruit across the print media, radio and television. There is also to be an in-store promotion component with special events planned in all states.

Initial feedback from the Western Australian campaign indicates that the success of in-store demonstrations were affected by the availability of ripe avocados. Some planned sampling sessions had to be cancelled as no ripe fruit was available to use in the demonstration, let along to sell as a result.

Continuing efforts need to be directed at retailers on handling and this is the current focus of the Quality Management Project. Again sales in the selected stores varied with the availability of ripe fruit.

This response supports a view already held by the Marketing Forum that there needs to be continued reinforcement of the information available to retailers on handling and storage.

Also in Western Australia a good relationship is emerging with the WA School Canteens Association. The Australian Horticultural Corporation has been involved in a number of school based campaigns with other products through canteen associations and Life Education. This previous experience could be well utilised in the future by the avocado industry in implementing a school based program.

Planning Underway For Avocado Export Strategy

Australia exports avocados worth about one million dollars annually. However, this export activity is carried out in an ad hoc fashion. The industry is keen to change this and creating a strategy that will develop the export trade into the next century.

A large proportion of avocados that end up in overseas markets were originally destined for the domestic market but have been picked up by traders in the terminal markets and shipped to small markets overseas, primarily in Asia.

Australian avocados have already developed a profile in Hong Kong, Singapore and Kuala Lumpur, predominantly in the hospitality sector of the market.

While the efforts of these individuals should not be undermined, many in the industry feel that a more co-ordinated approach to Australia's export markets needs to be taken.

On February 28 an Avocado Export Strategy Search Conference was held in Brisbane. This meeting looked at the requirements of the avocado industry in terms of developing the export trade.

Attending this meeting were representatives from various levels of the industry including growers; current exporters; operators with previous export experience; and experts in post-harvest handling, transportation, technological developments (including modified atmosphere chilling) and packaging.

The aim of the meeting was to identify key issues for use in developing an export marketing strategy up to the year 2000.

A 30% increase in avocado production is forecast for the next four to five years and this strategy is aimed at helping to alleviate the industry's reliance on the domestic market. The industry needs to implement strategies which will absorb this production increase.

The meeting heard that domestic activity to increase consumption amongst present users can only accommodate so much of this increase, with supply rapidly out stripping domestic demand.

The next stage is to look at the priorities that emerged from that meeting and develop an export marketing plan.

Funding for this project is also being sought from the Commonwealth Government's Agribusiness division to alleviate the burden on levies.

Market Research Reveals Increase In Number Of People Eating Avocados

The latest results of Wilson's market research reveal that the percentage of people who had eaten avocados in the past week in the October survey was up 14% from the same period 12 months earlier.

Of the people surveyed, 18.6% said they had eaten avocados in the past seven days. This figure steadily increased throughout 1995. (see Figure 1). The market penetration figures, the percentage of grocery buyers who bought fruit, revealed that avocados have enjoyed a comfortable increases during 1995 over the similar periods in 1994 and 1993. A significant season improvement was recorded between March and June.

The purchasing trend of avocados was also interesting in New South Wales where all regional areas have around half the percentage of shoppers purchasing avocados than their city based counterparts.

Avocados share of the fruit market has remained generally static throughout 1995, however, market share in October was significantly higher at 6.8% that in October 1994 at 5.6%. (see Figure 2)

In the survey consumers were asked for their impressions of avocados with freshness, healthiness and Australian grown emerging as the most popular attributes.

The avocado industry's marketing plan has helped improve the image and consumption of avocados through an increased emphasis on the food media and a greater concentration on the public relations component of the plan. This image building has then been backed by a much more extensive sampling program.

Other fruit consumption patterns revealed in the survey saw that trend in the number of people purchasing bananas increase in 1995 with apples remaining at about the same level and orange purchases following the same trend but at a lower level. Pears enjoyed a dramatic upturn in Autumn, which could be attributed to a promotional campaign that was running at that time.

The difference in consumption by age group was most accentuated in pears and oranges, with older age groups eating more of these products. Generally, apples perform better across the whole spectrum, with 60-70% penetration amongst even the youngest consumers right throughout the year.

In the 12 months to October 1995 supermarkets sold more apples, pears, bananas and oranges than other outlets. This is an increasing trend amongst fruit purchases. Fourteen per cent of people surveyed recalled seeing an apple advertisement in the past week, compared with 7% for orange advertising.

National Trends in Fruit Eaten

Percentage of people who ate fruit in last 7 days

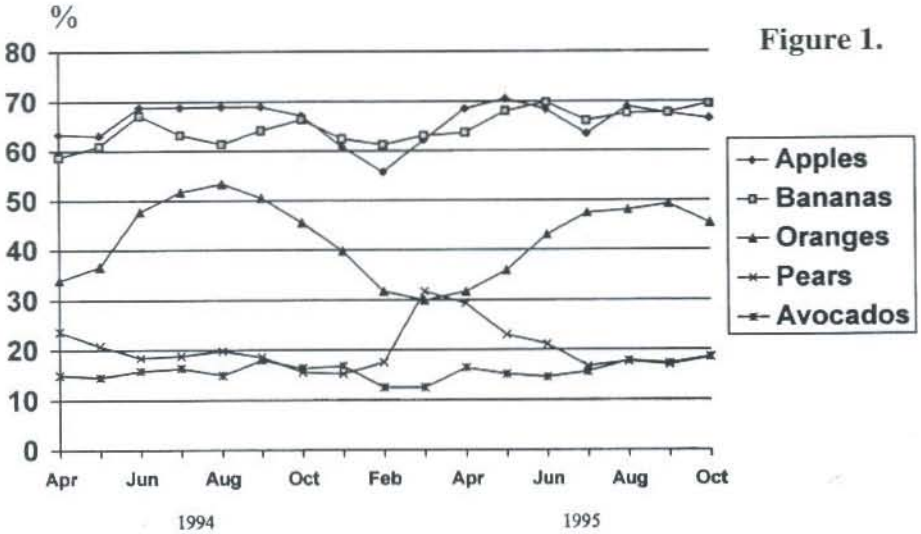


Figure 1.

National Trends in Market Share

Share based on Volume Bought April '94 - Oct '95

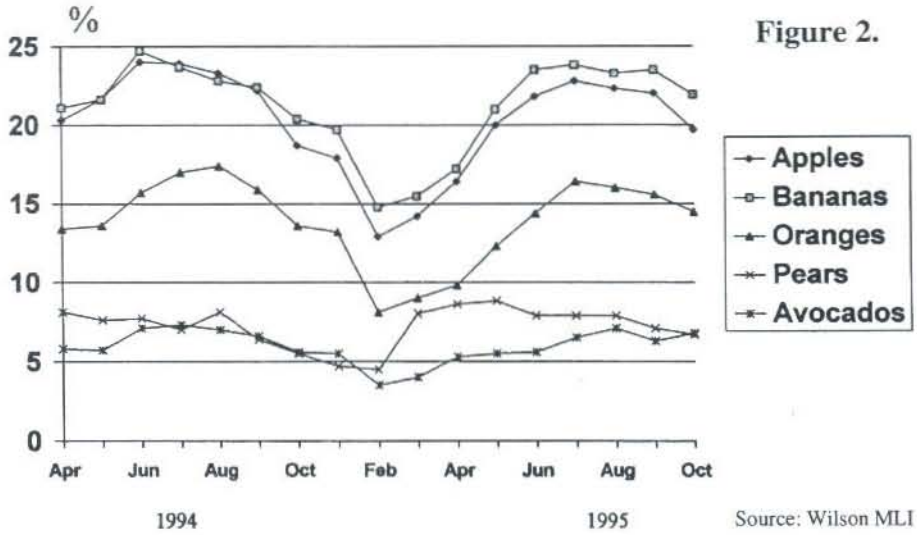


Figure 2.

Source: Wilson MLI

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Report On The 3rd World Avocado Congress

By Ralph Hoskin - Sunshine Coast Avocado Growers Association

The World Avocado Congress is held every fourth year, previous ones having been hosted by South Africa and California. Last year, the 3rd Congress was held in Tel Aviv, Israel in the latter part of October and occupied about ten days.

The formal Congress was a five day, Monday-to-Friday, affair held in a deluxe hotel with all necessary conference facilities including simultaneous translation.

There was a pre-conference tour of Israel with visits to many of the tourist sites of the Christian era. There was an Israeli professional tourist guide (whose national propaganda I found thoroughly objectionable). Importantly, each day of the tour included significant professional content and we were able to visit many avocado orchards and supporting facilities.

It was with some trepidation that Brenda and I, some six months beforehand, took the decision to attend. It would obviously be an expensive exercise for small growers but we decided that this was justified in an attempt to gain a much deeper understanding of our industry. We certainly achieved that main objective. In addition, we learned there were some things we could do better. And of course, there was a marvellous opportunity for some mind-broadening travel on the side. We came home fully convinced that we had made the correct decision. We can recommend the Congress to other small growers and we are looking forward to Mexico 1999!

At the outset, it would be fair to say the Israelis organised a very successful Congress. Where critical comments follow, they should be taken in the context that nothing in this world is perfect and there is always scope for improvement.

About 350 people from 22 different countries attended the Congress of whom some two dozen were Australian. Of these about a quarter were R & D oriented and the rest were growers and nurserymen. Australian consultancy and marketing were conspicuous by their absence. There was a large Spanish speaking contingent and this reflects massive South and Central American production. The Congress language was English with simultaneous translation into Spanish. The standard of translation appeared high and the system worked well except when some speakers used something other than the correct language.

What follows is not a blow-by-blow account of what happened. It describes some matters that impressed on my mind out of the wealth of things we saw and heard.

The Organising and Program Committees did a great job. The program was massive and generally ran in 2 parallel streams with interlocked timing so that one could plan each day's activity and switch streams without missing the beginning or end of a presentation. Perhaps the Program Committee was not critical enough. Some presentations did not justify the time allotted and appeared to be made only so that presenters qualified for national or industry funding for their travel. Occasionally, the audience was abused. I recall one NZ presentation that set out to prove that the appalling condition of NZ Hass in the Australian Market at the end of February is entirely due to the gross mishandling of perfect fruit by Brisbane Market agents!

There was little time for discussion after presentations and growers present could be accused of not participating enough in what discussion there was. This may have been due to the impression that presentations were made for the benefit of the R & D community. This was disappointing given that so many growers attended.

The Godfathers

It became clear to me that there are some highly skilled, highly motivated and totally dedicated researchers in our industry. They were very much to the fore at the Congress. There are perhaps a score of them and they communicate continuously between Congresses without regard to national borders. They are the Godfathers of our industry. The junior R & D people, the extension officers and us growers are the foot soldiers.

Australia's only Godfather is Tony Whiley. His world-wide reputation for excellence was very noticeable. He did attract some criticism (by accident or design). However, he did chair one of the final sessions and it was good to hear him defend himself robustly.

One looks in vain for a successor Australian Godfather. Could it be Tim Smith? Australian work on boron deficiency was mentioned but only in a very low key manner, and Tim's name was not heard at all. Surely we have something to offer the world, here? For us, AVOMAN is moving from the future to the present and it was admirably presented by Simon Newett and others.

I could only admire some other Southern Hemisphere countries. They found the resources to send very young researchers as foot soldiers. They may have had to sleep in no-star hotels but their exposure to world-wide industry will be very valuable nationally. They were sometimes rewarded by their Godfathers delegating the presentation of important papers. What invaluable experience!

In contrast, our Godfather's travel had to be funded by the Congress and Industry and he had to take the time out of his accumulated leave. Are we really the "Clever Country" or is our talent submerged by a bumbling bureaucracy? Lest our Godfather's loyalty be impugned, I heard the story from a South African Godfather!

There were three social events which included some culture. The first two were admirable but the final Gala Dinner was a disaster. It spun out a modest dinner to nearly four hours. If we ever get to Mexico, I shall plead Montezuma's revenge for that event for it is nothing more than the Godfathers' Mutual Admiration Session—an event to be avoided at all costs.

Comparisons

Comparisons are inevitable at such gatherings. They are dangerous because it is too easy to compare apples with pears. Even establishing the ratio between the Israeli and Australian industries is fraught because it depends on the year you take. Israel's production being four times Australia's seems to be a reasonable average over a period of years.

The Congress included a multi-part presentation in which national industries were described. This appears to have been a late addition. Ross Richards was there representing AAGF, but he was not even asked to tell the Australian story. We learned that the Israeli producer accepts an average return of $0.70 per kilo net of everything. The Australian return was quoted at $2.30 per kilo and it was not made clear whether this was net or not and nor was there any differentiation between Australian and US dollars. So we should not be surprised to hear that we have a queue of other nations attempting to break into our home market.

Labour costs are another area where it is difficult to compare. Israeli contract labour is probably more expensive than Australian labour. But a high proportion of Israeli labour (and management) is kibbutzim (plural of kibbutz), where those concerned work for little more than keep and pocket money.

I gave up trying to establish Israeli irrigation water availability and costs. It is apparent that good water is increasingly scarce. The allocation of water to kibbutzim is subject to all sorts of skulduggery and any attempt at discussion usually met with "its a very difficult area".

The Israeli R & D levy is similar to ours but it seems to be used only for local and short-term projects. There would appear to be a huge amount of R & D which is government funded.

A comparison of avocado husbandry is difficult. The soil is different, and so is the weather being for the most part more extreme. The pests are different and are usually dealt with by biological means. There is no Fruit Spotting Bug and no requirement to use organo-chemicals. Root rot is no more than a local problem. A yield of at least 10 t/ha seems necessary to be profitable but there was little evidence of 20 t/ha being achieved on a regular basis.

Packing and Marketing

Ninety per cent of Israeli fruit is centrally packed and marketed and the grower has no interest in his fruit after it leaves his farm gate. There are seven packhouses. We visited the second largest which packs over 20,000 tonnes per year—more than the total Australian crop. Its operation was a real eye opener.

The packing standard, like the Australian one, is visual. The visual standard was noticeably lower than ours, even for export fruit. The attitude seemed to be that, as long as the internal flesh was undamaged, then the fruit was acceptable for export. So we saw heavily surface blemished and misshapen fruit making the grade. Some of it we would have downgraded and some we would have rejected altogether.

Trays are designed to take 4 kg of fruit and are machine assembled and glued in the shed. The board used appears to be more robust than the Australian standard and the assembled tray is particularly strong at the corners. There are no outers and the substacks consist of 4 trays, each of which is deep enough to ensure that the fruit is never vertically compressed after packing. There are no liners/inserts and the fruit is free to slosh around in the horizontal plane. Consequently, the visual presentation is poor. And what does that matter if the average retailer tips the contents of the trays into his shop counter bin. The fruit suffers little or no damage in transit and packing material costs are substantially less than ours. The sides and ends of the trays are cut away so that atmospheric circulation is excellent.

The conclusion is inevitable that the Australian grower, in comparison with Israel, is required to over grade and over pack his fruit to no significant advantage.

Nearly all the Israeli crop is handled by Agrexco. What is not exported is directed onto the home market where per capita consumption is about four times the Australian figure (it would seem we have hardly touched the surface of our domestic market). Their high home consumption is attributable to lavish and most imaginative television promotion. On a per tray basis, Israeli promotion expenditure is double the Australian figure.

Equipment and Gadgets

We certainly saw some hardware but one device that sticks in the mind is the "Ripemeter" of which we were shown the prototype. The ripeness of an avocado is a function of a number of qualities one of which is the speed of sound through the flesh. The Ripemeter is an ultra-sound device that measures the number of days before an avocado is ready to eat.

A pre-production run of 200 machines had been enthusiastically received by retailers. Customers were able to buy fruit with confidence about the use-by date. Poking fingers in the fruit was no longer necessary and store losses had declined dramatically.

The cost of a production run machine might be $200.

Whither Hass?

The Israeli crop includes a significant proportion of Hass which is suitable for about half the total avocado cultivation area. But the proportion would appear to be in significant decline. The popular cultivar for new plantings is Ettinger which seems to flourish well in all growing areas and with good returns to growers for a lower investment in irrigation water.

It was impossible not to notice the dismal morale of the California growers present. They can see no way out of their intractable water shortage problem which is already seriously curtailing production. Yet they think that Hass or the Hass look-alike, Gwen, are the only cultivars to grow. I overheard a Californian Extension Officer predicting that California would be out of avocados within 10 years. Given the unwillingness to consider other cultivars and alternative water resources, his prediction may come true.

Israel has a similar problem, maybe three years down the line. The difference in approach is remarkable. Primary producers acknowledge that the population has first call on inadequate water resources and make no attempt to resist the pressure. The immediate response is to investigate new cultivars which will tolerate high levels of chlorides and the use of recycled brown/grey water. Already they are making significant progress. Given the resources which they are devoting to the problem, they are likely to succeed in developing this untapped but probably acceptable alternative water resource.

Research

The final day of the congress included a visit to the Institute of Horticulture which is part of the Volcani Institute near Tel Aviv. We were left in no doubt that Israeli research philosophy is geared up to finding permanent long term solutions to perceived

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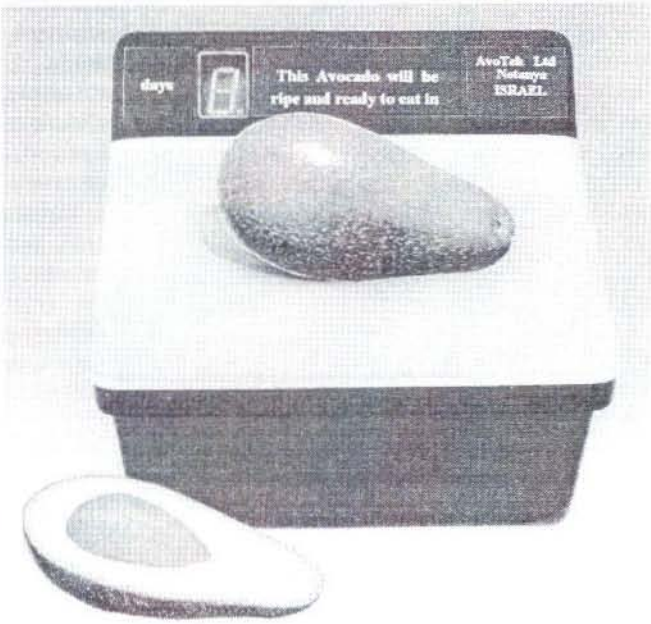

The prototype Avo-Check Ripemeter. A machine using ultra-sound that calculates the number of days until a hard avocado will be ripe and ready to eat.

Avocado Production in Israel

From The World Avocado Congress III report by Simon Newett and Tony Whiley, Maroochy Horticultural Research Station, Nambour Qld

Avocado production in Israel is between latitudes 31-33° north. This is equivalent to growing avocados in Australia at Coffs Harbour, Sunraysia/Renmark, Perth and Pemberton. However, there is a major geological feature in Israel which modifies the climate producing mean temperature conditions more akin to northern NSW and southern Queensland. This is the Rift valley which extends from southern Africa through to Turkey producing the lowest dry land on earth on the shores of the Dead Sea in central Israel. Agricultural production areas on the floor of the Jordan valley are commonly 400 m below sea level which at this latitude produce mean temperatures similar to those found at subtropical latitudes.

Growing Areas

Out of the 7,800 ha of avocados in Israel, about 72% are grown along the coastal plain, mostly in the north and central parts. About 20% are grown in the inland valleys of Huleh to the north of the Sea of Galilee (Lake Tiberias), around the Sea of Galilee and in the Valley of Jezre'el. The remainder are grown in the southern Lachish region on the foothills of Judea's mountains and in the Negev.

Seventy per cent of avocados are cultivated by Kubbutzim, the remainder on small family farms of 1-3 ha.

Climate

The climate is described as Mediterranean, i.e. hot dry summers and cool wet winters. Rains generally start in mid November and last till late March (about 4 months). Some light rain may be received in April/May. Average rainfall is 500 mm along the coast. Temperatures are in the extreme range for avocados. In the Jordan Valley mid-summer mean monthly maximums are in the high 30's whilst out of the valley and away from the coast damaging frosts and sometimes even snow can occur during winter.

In May, hot dry desert winds called 'Hamsins' can blow for 2-3 days reaching 44°C with 3% humidity. The 'Hamsins' usually come at a critical time in the phenological cycle (viz. during early fruitlet growth) and lead to significant fruitlet fall as well as a burn and subsequent corking on remaining fruit (typically 15% of the fruit remaining on trees will have corking). When severe 'Hamsins' are experienced the whole Israeli crop is affected—in two of the last 15 years the crop has been reduced by 60-85% of its potential. If fruit has reached approximately olive size when the 'Hamsins' arrive there is greater potential for holding them on the tree. In some production centres frost during winter can also have a devastating effect on the crop.

The low humidity conditions cause the lenticels on the skin of 'Fuerte' to whiten giving the fruit a different appearance to that grown in Australia (Figure 1).

Soil

The soils used for avocado production are nearly all alkaline with values typically ranging from pH's of 7-8. Soils of calcareous origin predominate, though some

some particularly well presented avocados from Ozavo and a WA grower whose name I failed to record. It retailed well at nearly AU$50 per tray and compared favourably with some Kenyan rubbish at about $27. One wonders what our growers received out of the $50!

I would not want to bet on how long the niche Gulf market for Australian avocados will last once the embryo Israeli-Arab love affair really gets under way.

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problems. Almost invariably, the preferred solution is a new cultivar—hence their approach to their water problem. Consequently, the majority of the avocado field work at the Institute seems related to new cultivars. There is a large block where many new cultivars are being trialled. There is a smaller block on which is being assembled a comprehensive gene pool of Persea species. It includes some weird looking trees which at first sight appear to be unrelated to avocados. Such is the richness of genetic material available that anybody wanting to design a new cultivar would need to go to the Institute.

The Institute's annual budget runs to millions and, as far as could be ascertained, none of it is grower funded. It is a massive investment by the Government on behalf of all the Israeli people in an industry which generates a significant proportion of Gross National Product. Because there is no requirement to demonstrate a short term financial return, the Institute does the basic research which CSIRO no longer seems to do for us. Furthermore, the Institute's funding would appear to be fixed at least for the medium term so that programs are not subject to financial perturbation. This leaves the senior staff to concentrate more on the real work and less on the administration or covering their rear. And that is what I call a really Clever Country!

To summarise, we found the Congress well worth the time and money. If the hail does not do too much more damage, we shall save up the pennies for Mexico in 1999.

Avocados in Oman

We returned home via Oman, one of the small Gulf states. It was pleasing to see a considerable amount of Australian produce in many Muscat shops. There were

Figure 1. Whitening of lenticels on the skin of 'Fuerte' fruit due to the low relative humidity during fruit development.

basaltic and dunal soils are also used. Calcium levels are very high in soils of calcareous origin and calcium content is measured as the actual weight of calcium as a percentage of total soil weight—often this is around 20%. The soil pH has been increasing in some areas due to the accumulation of salts from the irrigation water. Kibbutz Giv'at-Haim Ihud reported an increase in pH from 6.9 to 7.2 within a few years. The alkaline soils can lead to iron and zinc deficiency as well as boron deficiency (tied up by calcium).

Most of the soils used for avocados in Israel are heavy clay loams which are usually perched on a well drained gravelly subsoil. Nevertheless, under most conditions in Australia, particularly in the presence of Phytophthora root rot, these would be considered unsuitable for avocado production. On the heavy soils in Israel, rows are generally planted on mounds as trees would drown during the wet winter months if drainage was not provided (Figure 4).

Irrigation

Source of Irrigation Water

One third of irrigation water comes from the Sea of Galilee, the balance comes mainly from wells that tap into the coastal aquifer.

Scheduling methods

Growers tend to use intuition rather than science when it comes to irrigation scheduling, with the methods use in the following order of popularity:

- by eye ("a good manager should be able to tell when the trees are water stressed");
- by evaporation pan, using an evaporation index varying from 0.3 in March/April, up to as high as 1.1 at flowering; and
- by tensiometer using one placed at 30 cm, trying to keep below 20 centibars; a second placed at 60 cm, trying to keep below 45 centibars.

There is some experimentation with dendrometers and neutron probes but Enviroscan has not been used.

The dendrometer is a micrometer measuring device which is mounted on the tree trunk and is able to measure minute changes in tree contraction and expansion. The principle behind this device is that the trunk will shrink when under moisture stress. During critical times in the phenological cycle irrigation should be sufficient to prevent this shrinkage. The instrument is recorded each morning, rather like a max/min thermometer, and then zeroed.

Frequency

Most orchards irrigate daily in summer, this is especially the case in the hotter and drier areas where daily evaporation is highest. The practice of daily watering is to keep the feeder roots moist under the hot dry conditions. The average daily evaporation rate in summer is 7 mm near the coast and 11 mm in the Jordan Valley but they can go much higher than this when the "Hamsins" blows. Some orchards in the south only irrigated twice weekly. Irrigation is seldom applied in the cool, wet winters.

Volume of Water Used

Irrigation requirement varies from 6.5 to 10 mL/ha per annum in northern Galilee and up to 16 mL/ha per annum in parts of Jordan Valley. This is considerably higher than the estimated 4.5 mL/ha per annum for Queensland's Sunshine Coast but is partially explained by the significantly higher evaporation rates and lack of summer rain in Israel.

There is much debate in Israel about water requirements by avocado trees. Some research indicates that more water may give bigger fruit but will not significantly increase yield.

Water Quality

Salinity is the major water quality concern in Israel. Most of the water either comes from the National Carrier (ex Sea of Galilee) which is clean and pressurised, or it comes from the underground coastal aquifer which does not appear to be contaminated by iron. For both sources, a simple in-line filter (e.g. Arkal) is usually used. In addition, water from underground sources is passed through a hydrocyclone filter to remove sand particles.

Equipment

About 85% of the industry uses mini-sprinklers because they give some degree of protection from frost and it is believed they may give a slight microclimate advantage during pollination and fruitset

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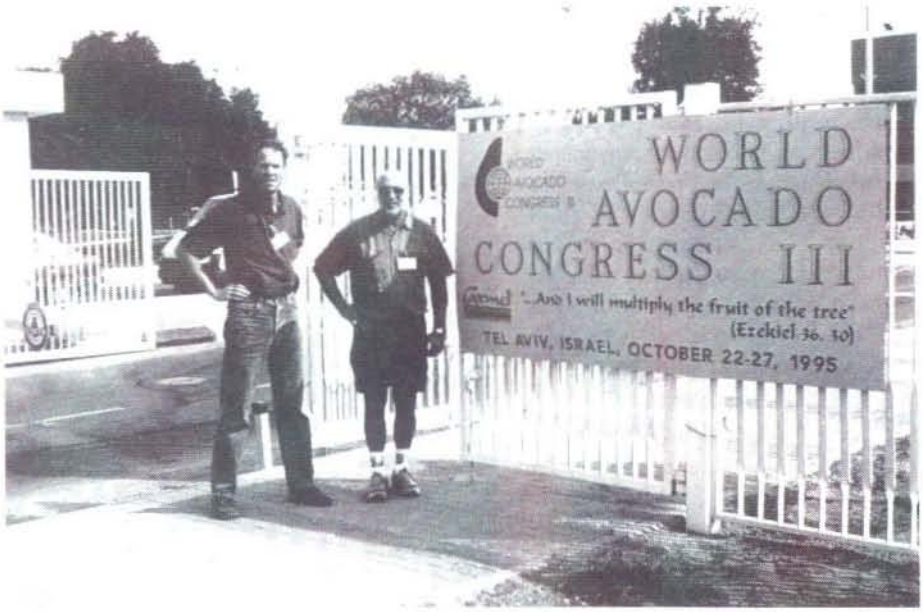

Figure 2. Simon Newett and Tony Whiley at the World Avocado Congress III.

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compared with drippers. In some areas drippers are used because pigs and wild dogs damage sprinklers.

Drippers (4 L/hr): Typically 2-3 laterals per tree row with a total of about 12 drippers per tree each of 4 L/hr.

Sprinklers: Usually one per tree delivering in the range of 55 to 120 L/hr, typical delivery rate would be 70 to 80 L/hr. Most growers aim to wet the area shaded by the tree at maturity.

Evaporative cooling

Some research has been carried out with overhead irrigation during 'Hamsin' events. A temperature reduction of 8°C has been achieved in some situations, however, good quality water must be used to avoid salt burn on leaves.

Water costs (Australian dollars)

For first 50% of allocation = $0.25/1000L
For 50 - 80% of allocation = $0.30/1000L
For 80-100% of allocation = $0.38/1000L

At an average price of $0.30/1000L and an annual requirement of 10 mL/ha, water costs per season would be in the region of $3 000/ha .

Fertigation

The majority of orchards apply fertigation with every irrigation. It is injected into the irrigation water at a fixed concentration, thus the amount of fertiliser delivered is directly related to the amount of irrigation applied.

Irrigation Summary

Quite surprisingly, in spite of water shortages and problems with water quality, the Israelis do not appear to have done any comprehensive research on water used for avocados to determine the optimum requirements in terms of timing and amounts. Research and extension staff acknowledge this and believe that they may be applying excess to their requirements. Changes to irrigation volumes are usually the result of "gut feel" and not based on scientific evidence.

Nutrition

Monitoring

Annual leaf samples are taken in autumn (same as Australia) and the fertigation plan is determined according to the results of these leaf analyses.

Fertigation

Approximately 90% of nutrition is applied by fertigation. Most orchards purchase their fertigation fertiliser as pre-mixed liquids for convenience. Distances in Israel are short so transport costs are relatively low.

Fertigation is generally done using liquid products provided by the fertiliser companies. A range of NPK ratios are available "off-the-shelf". Custom blends are also available. Typical blends include NPK in ratios of 9:2:8 and 9:4:8.

Nitrogen is generally in the form of ammonium sulphate or potassium nitrate. Potassium nitrate is relatively cheap because large quantities are manufactured for the defence industry in Israel. Some phosphorus applications are being tried late in the season.

Timing and Rates for Mature Orchards

Fertigation is generally applied with every irrigation. Irrigation is applied throughout summer but not in winter so most of the nutrition is applied in summer (similar to Australian recommendations).

N: 200 - 300 kg N/ha/yr

K: 250 - 330 kg K/ha/yr

Note: these are considerably higher than the typical rates recommended for healthy Australian orchards which are in the order of 100 kg N/ha/yr and 35 kg K/ha/yr. In subtropical Australia high rates of organic mineralisation in soils provide significant quantities of N. Differences in soil type (in particular clay types) may explain the high application rate of K under Israeli conditions.

Trace elements

Some iron chlorosis was seen but this was usually when Mexican rootstocks were used. Where West Indian rootstocks were used there was little or no chlorosis. Iron chelate is applied twice per year using 5 kg/ha with each application. It is believed that the development of chlorosis is often due to over irrigation. Zinc deficiency was mentioned as a problem but not seen in the orchards visited during the Congress.

Boron deficiency symptoms (shothole, twig and dieback back at flowering time and the loss of apical dominance) were widespread and the symptoms had not been identified by the Israelis.

Varieties

Israel is a very small country and does not have the range of latitudes and climates which allows Australia to produce fruit year round. In Israel, to keep avocados on the market for as along as possible, a range of varieties with different maturity times must be grown. Production is based on seven major varieties and there is an active program seeking to improve on the material (including rootstocks) currently in use. This involves the national R & D bodies as well as individual growers and the various kibbutzim growing avocados.

The seven main varieties currently grown are:

Hass	30%
Ettinger	25%
Fuerte	25%
Reed	6%
Nabal	4%
Pinkerton	4%
Ardith	4%

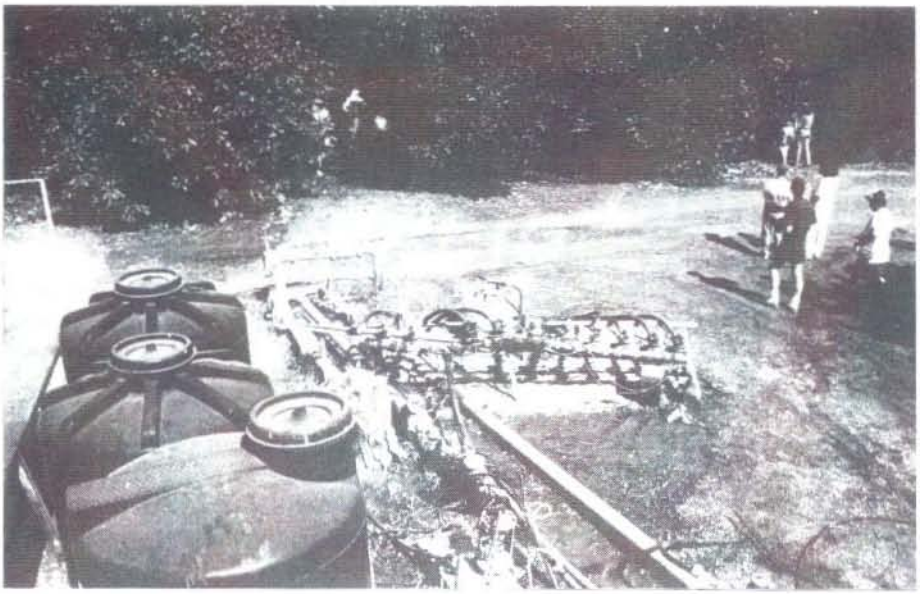

Figure 3. A fertigation system in an avocado orchard in Israel.

'Ettinger' is the earliest variety to mature, is fairly tolerant of cold conditions and looks good but eating quality is inferior to other varieties. It is expected to lose market favour in the future. It has a short on-tree life (its thin skin leads to the skin cracking) but a long shelf life. 'Ettinger' has been tried in Queensland where there were severe problems with skin cracking, anthracnose and fruit spotting bug. Flavour was also poor and it was considered that the variety had nothing to offer the Australian avocado industry.

'Fuerte' is very biennial in Israel and is losing its popularity. About 10-15% of the crop develops internal and external blemishes (the symptoms sound like anthracnose).

'Pinkerton' is gaining popularity because it is productive, easy to grow and good to eat. In the nursery it is being grafted to clonal West Indian rootstocks.

The Jordan Valley is too hot for **'Hass'**, the fruit reputedly only reaches "ping-pong ball" size.

'Horshim' is a new variety that yields much better than 'Fuerte' but the tree is very vigorous and grows large. Fruit has a long neck which makes it difficult to pack.

'Reed' is the last variety to mature and is sensitive to cold temperatures (we have also seen this in Australia).

'Ardith' is a new variety out of the Californian breeding program. It has been evaluated in Australia but offers no advantages over existing cultivars. The fruit is green and pear-shaped with a relatively thin skin.

'Wurtz' is not productive under Israeli conditions and the fruit is recognised as having inferior quality.

Rootstocks

Most of the Israeli industry is based on West Indian rootstocks which afford some degree of tolerance to salinity and are adapted to the calcareous soils typical of Israel's production areas. As water quality is deteriorating there is a high priority placed on finding rootstocks with greater tolerance to salinity.

'Deganya 117' and **'Ashdot 119'** are regarded as good local rootstocks handling the current salinity and calcareous soil problems.

'Maoz' is a dwarfing rootstock but there is some suspicion that it may be infected with Sunblotch viroid which would account for at least some of the growth restriction. This variety is in Australia and should be re-tested for the presence of viroid particles using the new RAPIDS technique developed by Dr R Harding (QUT). If shown to be "clean" then evaluation of this variety as a rootstock should be carried out.

Nurseries

Three nurseries produce 80% of the trees. Strict protocols must be followed by nurseries in Israel, mainly to prevent the spread of *Phytophthora cinnamomi*. The protocols include:

- each potting mix batch is tested twice for the presence of *P. cinnamomi*—before and after trees are planted;
- there is strict control of mother scion wood sources;
- all containers must be above ground;
- no trees may leave the nursery without a certificate of assurance that the protocols have been followed.

One nursery in the centre of the country produces trees on clonal rootstocks for which there is a growing demand. Trees cost around $13.50 each to growers. The government offers a subsidy for top-working varieties which are no longer recommended for export.

Windbreaks

As there are problem with winds during summer, windbreaks are planted to protect orchards. In some orchards 'Ettinger' and 'Reed' are planted as outside rows to serve as windbreaks due to their upright growth and early fruit maturity (fruit usually matures before strong cold north easterly winds arrive in winter).

Pollination

Due to marginal climatic conditions (too hot or too cold) during flowering, fruit set tends to be poor. Therefore, considerable effort is directed towards improving pollination. This is achieved by providing varieties to encourage cross pollination and the introduction of beehives into the orchard during flowering. Growers currently aim to place beehives in the orchard at a density of 10 hives/ha.

The cross pollination effect (from other varieties) generally reaches across 4-5 rows (40m). Usually pollinators such as 'Ettinger' and 'Topa Topa' are planted every sixth row or limbs of the pollinator are grafted in to existing commercial trees. 'Topa Topa' is not popular because the fruit cannot be sold. 'Ettinger' is found to be a very efficient, potent and ubiquitous pollinator. Even in trials to exclude insects 'Ettinger' pollen was found to be carried by wind through insect proof screens and to successfully pollinate flowers.

The pollination workshop during the World Congress revealed the following information about avocado pollination:

- bees prefer wild flowers, citrus and litchi to avocado;
- avocado pollen is not attractive to honey bees;
- avocado nectar is only slightly attractive to honey bees;
- avocado nectar tends to be very concentrated especially by the end of the day (about 70% sugar), bees prefer a concentration of around 20-30% sugar;
- bees prefer nectar that contains a mixture of sugars of which the sucrose content is around 30-40%, the sugar content of avocado nectar is almost 100% sucrose; and
- a search for natural pollinators in Mexico identified various species of Coleoptera (beetles), some Diptera (flies) and some Hymenoptera (wasps and bees). The dominant species was *Euphoria basalis* a member of the Coleoptera family.

A number of techniques to improve pollination by honey bees were tested. These included:

- bee attractants sprayed on trees e.g. "Beeline", this attracted bees to trees but not to flowers;
- spraying sugar solution on to the trees;
- putting avocado flowers in sugar solution;
- fitting pollen traps to hives in order to starve bees and encourage further pollen gathering;
- providing basins of water in the orchard to allow them to dilute concentrated nectar;
- moving hives, especially young hives, every few days within the orchards to discourage them from looking for flowers other than avocados (worked to some extent but for a few days only); and
- saturating the orchard with hives so that competition for nectar and pollen was high and bees were forced to feed on whatever was available. This was the only technique that showed some promise.

Yields

The average national yield for Israel over the last six years has been 7.5 t/ha. The average yield of well cared for orchards in the coastal plain has been 10 t/ha whilst outstanding orchards are able to maintain average yields of 12t/ha for 'Fuerte', 18 t/ha for 'Ettinger' and 'Nabal', and 20 t/ha for 'Hass'.

Tree Spacing

There is a strong trend by growers

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Figure 4. A new 'Pinkerton' orchard in Israel spaced at 2.5 x 7 m.

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towards closer spacings (Figure 4). Spacing varies according to variety but generally ranges from about 7 x 6 m (240/ha) for spreading varieties to 6 x 4 m (420/ha) for upright varieties. Thinning-out of trees is now uncommon with pruning practices used to control orchard crowding (see Pruning).

A density trial was established on the research farm near Akko in the Western Galilee area in 1987. The objective was to achieve heavy production as early as possible. Three varieties were planted at a spacing of 4 x 2.5 m and three methods of management were evaluated.

The three varieties were:

- Hass (started to bear in 1990);
- Wurtz (already abandoned due to unsuitability of the variety); and
- Ardith (a challenge since it is a very vigorous tree).

The management approaches were:

- Applying Cultar to the soil;
- Withholding water in order to reduce flushes; and
- Pruning.

The trial has been affected by extreme weather conditions in several years, -7°C occurred one year and three consecutive days over 45°C occurred in another year.

The results to date:

Applying Cultar to the soil has given poor and unpredictable results. Withholding water has reduced the number of shoot flushes from three to one but has also reduced fruiting wood and has resulted in significantly lower yields. Pruning has given the best results so far.

Pruning

Pruning has been widely adopted by the Israeli industry with approximately 60% of growers engaged in annual tree pruning. Even so, tree canopies in Israel appear quite dense but this is encouraged to provide better protection both against the hot dry weather of summer and the cold conditions of winter.

In Israel (dry summers) good pruning practice involves:

- starting to prune before trees are overgrown (about five years old for close plantings);
- annual mechanical pruning before flower initiation, thus pruning takes place in summer; sunburn is not an issue if pruning is started before trees become overcrowded;
- some follow-up manual pruning before winter to let more light into the canopy;
- trees are topped if necessary (e.g. restricted to 5 m in height); and
- in some orchards a major central branch is removed about every three years;

Figure 5. A mechanically pruned row of 'Reed' in Israel.

It is estimated that it takes one day using an Afron ladder to manually prune 1 ha of trees, this is expensive and has lead to pruning with mechanical hedgers (Figure 5).

A workshop on tree canopy management during the Congress came up with a consensus that 5 m was an ideal maximum tree height. Concepts of "ideal" tree shapes varied from a topped cone-shape (Israel) (Figure 6) to a dome shaped hemisphere (Mexico) (Figure 7) with irregular canopy projections (Figure 8).

Mechanical pruning is also being used in Australia on 'Hass' growing at Childers. Trees are pruned following harvest (July/August). The aim is to prune back the summer flush growth while still leaving sufficient canopy to flower and carry fruit. Further studies with time of pruning are required.

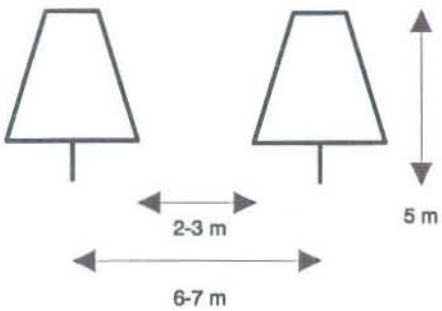

Figure 6. Israeli cone-shaped.

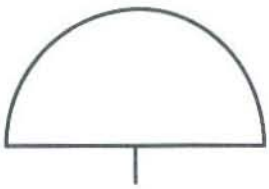

Figure 7. Mexican dome-shaped.

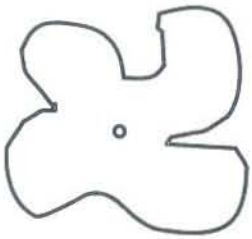

Figure 8. Mexican irregular canopy projections

Weed Control

Weed control is not considered a big job. Glyphosate (Roundup) is used where necessary and sometimes mixed at 2.0% with oxyfluorfen (Goal) at 0.1%. The use of glyphosate is avoided during flowering.

Soil Compaction

Soil compaction is attracting attention in Israel and South Africa. In Israel where minisprinklers are used, care is taken not to drive machinery in the orchard during the irrigation season (summer). The same precautions are not taken in orchards using drippers.

In South Africa even greater effort is taken to avoid compaction, machinery is virtually banned from the orchard altogether and spraying is done by hand held lance at the end of very long hose. In both countries the heavier soils on which avocados are grown are prone to compaction problems.

Insect Pests

An integrated pest management system has been developed for avocado orchards in Israel. To date 94 species of potential pests of avocado belonging to 45 families of insects, mites, birds and mammals have been recorded but very few of these are considered to be of economic importance. The most important insect pests and methods of control are:

- *Boarmia selenaria* (giant looper) is the main pest at present but this is controlled by a timely spray of Bacillus thuringensis early in the season whilst caterpillars are still young.
- *Protopulvinaria pyriformis* (pyriform scale) is controlled by a predatory wasp (*Metaphycus stanleyi*) and/or sprays of white oil.
- *Heliothrips haemorrhoidalis* (greenhouse thrips) is a problem on certain avocado varieties such as 'Ardith' but can be controlled by the parasitic wasp *Thripobius semiluteus.*

Diseases

Only 4 or 5 ha of avocados in Israel are affected by *Phytophthora cinnamomi*. Until recently the disease did not occur in Israel but it is believed to have been introduced via imported plant material. However the dry climate and strict control in affected orchards will probably limit its spread.

Anthracnose is present in the country but is not reported to affect the fruit, probably because of the hot dry summers, and no orchard sprays are applied. The Israelis are also able to pick in the rain without inducing disease problems. This is thought to be due to temperatures being too cold at picking (winter) for diseases to develop.

Fruit Quality

Export Standards

National export standards for fruit maturity and external quality, which are more severe than the EEC standards, are set by a statutory committee and inspected by the Inspection Service for Agricultural Produce for Export—part of the Ministry of Agriculture.

Israelis maintain that their quality standards exceed those set for the importing countries of Europe. A common avocado standard has been set by the European importing countries which were apparently written by the Israelis.

Size

The minimum size is a 14 count in a 4 kg carton (equivalent to 21 in our 6.2 kg carton). This represents a minimum fruit weight of about 275 grams.

Maturity Standards

Maturity standards are measured in terms of oil content and vary according to the variety. For example, the minimum grade standard for 'Ettinger' is 6% oil and 8% for 'Horshim'.

Residues

Fruit is exported as insecticide and fungicide free. Apart from the biological insecticide *Bacillus thuringensis,* no pre- or postharvest pesticides are used on Israeli avocados. Foliar mid-bloom sprays of Cultar are used extensively throughout the industry to improve fruit set and retention but there is concern amongst producers that European markets will react very strongly if they become aware of the practice. Mid-bloom Cultar sprays do not leave residues in mature fruit.

Harvesting

As already mentioned, Israel relies on a range of varieties to extend market presence. The order of picking is as follows:

'Ettinger', 'Pinkerton', 'Fuerte', 'Hass', 'Nabal', 'Ardith', 'Horshim' and 'Reed'.

'Reed' can be left on the tree until August but the industry tries to finish the harvest of export fruit before the heat of summer. Fruit is picked using an Afron ladder (cherry picker) and put into large bins that hold approximately 400 kg (Figure 9). Fruit is sent to a packing shed and packed within 24 hours of picking.

Packing

Israeli growers send their fruit to one of nine packing sheds in the country. The largest is reputed to pack four million cartons each year. Fruit is sometimes cooled if it is not going to be packed for a few hours. Once on the line, fruit is washed with water and dried in air tunnels before being polished by brushes and weight graded. Packing is done by hand. Fruit is packed without stems attached in 4 kg trays without lids and inserts, however, the tray has raised reinforced double cardboard corners which facilitate stacking and good air circulation between cartons.

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Figure 9. Bulk picking bins used by the Israeli avocado industry.

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Marketing and Co-ordination

Detailed crop estimates, by cultivars and regions, are carried out by the Avocado Corporation and from this information a tentative weekly harvest program is formulated for the whole season. This is planned together with Agrexco Ltd which is the sole exporting agency whose role is protected by law. At the beginning of the season harvest starts in each region according to dry matter per cent of each variety which is determined after a repeated systematic sampling survey.

Harvest continues according to the planned schedule which is revised weekly with quotas allocated to each packing house. The quotas are based on considerations of market demands, size of stocks, availability of fruit from each location etc. Weekly meetings are held between growers, packers and extension staff to discuss progress reports, prices, any problems that may have developed with a free flow of information encouraged between the different sectors.

All fruit sales (by law) are controlled by the National Avocado Corporation (NAC), however, it is estimated that about 10% escapes administration by the NAC and is sold locally. Export quality fruit is sold through the semi-government company Agrexco Ltd, the balance is sold domestically. Approximately 70% of the fruit produced is exported and is shipped by sea.

All export fruit is marketed under the one brand name "Carmel". Between 50-60% is exported to France (which then distributes to other countries), 15% to Germany and 10% to the U.K. Two ships a week leave Israel for Marseilles with the journey taking one week.

Nearly all fruit is sold as hard green. The Israelis have had one attempt at launching a ready-to-eat ripe fruit but this has so far been unsuccessful except in the army which appears to be a significant buyer of fruit.

Per capita consumption in Israel is 4 kg. Central co-ordination and control of the marketing has allowed some very effective promotion and television advertising of the product within Israel. Shaul Homsky (retired Israeli extension officer) makes an interesting comment in suggesting that avocado should be in the salad section of supermarkets rather than the fruit section.

Costs of Production

Labour costs are in the order of $4.50 to $7.50 per hour. Fruit prices F.O.B for export fruit are around $1.80/kg. Growers quoted average farm gate prices of between $1.05-1.12/kg. Production costs which include labour but exclude packing shed costs are around $9000/ha.

Research & Extension

The Israeli Avocado Growers Corporation (IAGC) levies growers for research and promotion. The rate is $0.14/kg. About 25% of this goes to research (equivalent to $0.21/6.2 kg tray) with the remaining $0.62/6.2 kg tray going to market promotion. The government contributes funds on a one for one basis for every shekel (dollar) raised by grower levies. Government matching funds are only provided for the exported volume of crops. For example the Israeli banana industry which only provides fruit for domestic markets does not get matching government research grants.

Main Research Topics in Israel

a. Introduction and Breeding of New Varieties
Ultimately this is seen as the best solution to address all of the problems facing the industry. Improved genetic material has the potential to increase productivity without reliance on pesticides. The Israeli industry has invested heavily in this area and is evaluating about 6000 seedling hybrids each year. Israeli scientists are also very active in collecting new material from central and south America for use in their breeding program. Promising new cultivars are also being sourced for evaluation from other producing countries.

b. Improved Rootstocks for High Salinity Conditions
With greater demands being made by the increasing rate of urbanisation in Israel on "sweet" water the quality of water available for agricultural use is expected to deteriorate. To maintain a viable avocado industry in Israel in the future, rootstocks with greater tolerance to saline conditions will need to be developed along with improved water management techniques.

c. Productivity
Areas receiving attention here are improved fruitlet retention, improved pollination and more efficiency irrigation and fertilising techniques.

d. Plant Protection
Prevention of the spread of Phytophthora root rot and the continued development of biological pest control are priority areas of research.

e. Improving Postharvest Technology
Research in this area continues to focus on improving systems to ensure the delivery of top quality fruit to the consumer.

f. Main Marketing Developments
Continued development of domestic and European markets; an extended marketing season (use of varieties and storage); and the development of processed products.

Summary of the Israeli Industry

There are about 8 000 ha of avocados in Israeli from which 80 000 tonnes is expected in the 1995/96 season. About 80% of the fruit is exported under the control of one organisation. An extended harvest season is achieved by growing a range of early, mid and late season varieties.

Strengths of the industry include:

- No *Phytophthora cinnamomi* (apart from about 5 ha) in Israel. Canopies look extremely healthy with no root-rot dieback and deep green rather dense canopies.
- Because of the dry climate and no root rot they are able to grow avocados on much heavier clay soils than would be possible in Australia.
- Virtually no insecticides or fungicides are required.
- The large and affluent European market is close.
- All export fruit is co-ordinated by one organisation and marketed under one brand ("Carmel").

Limitations of the industry include:

- Devastating hot dry desert winds are often experienced around the time of early fruit development that can reduce the crop by 85%.
- The quantity and quality of irrigation water available is deteriorating.
- Pollination is a major limiting factor due to cold or hot conditions at time of flowering.

Points Of Interest Arising From The World Congress

- The potential to increase Hass size.
- Boron sprays benefit fruit set.
- Pinkerton could be a useful cultivar.
- No significant development in the control of phytophthora.
- The effectiveness of Phosphonate fungicides on phytophthora could be diminishing.
- Potential for measuring fruit maturity.

Tamborine Mountain's Avocado & Rhubarb Festival A Winner

By Howard Edmunds, The Original Avocado, Mt Tamborine

On Sunday 22 October, amidst some much needed rain and an action packed program of events, Her Excellency the Governor of Queensland, Mrs Leneen Forde, opened the 1995 Avocado & Rhubarb Festival on Tamborine Mountain.

The festival's major sponsor, Mr Gary Rosser of The Original Avocado said, "this was Mrs Forde's first visit to Tamborine Mountain in an official capacity, and I think the Governor brought the rains with her."

The day's activities began with a large contingency of runners and walkers participating in the 5 km and 9 km fun run and 5 km walk.

The starter's gun was fired by Mick Veivers MLA, Shadow Minister for Youth, Sport And Recreation and former Australian rugby league test player.

Following the run, woodchips were sent flying as five-times world champion Pat Hooper competed against other top axemen in the festival woodchop.

Local chainsaw experts, Joe Beresford and Keith Smith, pitted the speed of their machines against the skills of the hand powered cross-cut saw, with the chainsaws winning on both occasions.

The large crowd were then treated to the art of fence post splitting and a demonstration of chainsaw carving.

During the afternoon, onlookers witnessed the festival's upset when Peter 'Chucky' Jensen won the World Rhubarb Pie Eating Championship, over 76 year old favourite Hughie Druitt.

Rosemary Smith made a gastronomic effort to defend her title, but the junior honours went to local lad, Troy Collins.

"The Great Guacamole Mix-off" at this year's festival saw the reigning champion, actor Tony Bonner, beat his secret ingredient into the famed avocado mix.

This delicious avocado base, into which flavoursome condiments can be liberally sprinkled, or, if you're a connoisseur, perhaps a subtle blend to tease the palate, will have your guests begging for more. No matter where it's served, at a traditional Aussie BBQ or dressed up for a formal occasion, guacamole takes a lot of beating.

Bonner headed off a strong challenge at last year's event, and wasted no time in throwing down the gauntlet to his challengers.

"I'll take anyone on," he said. "I love preparing good food and I'm hooked on the flavour and fresh taste of avocados. It's no secret that garlic is one my favourite taste tantalisers, there will be a distinct Italian blend to this year's creation."

Bonner went on to take out the title for the second year in succession.

His challengers included self-confessed gourmet, Indycar driver and former Formula 3 British champion Gary Brabham, who told us that he believes avocados are the fruit of the gods. "But there is a difference between a good guacamole mix and a great one!" said Gary.

Also mounting a challenge in this prestigious event were television news presenter Mike London, and ABC radio host Paul Lineham. A guacamole lover, London claims that avocados have a stimulant that puts you at the cutting edge. "I often have some before fronting the studio cameras." he said after the event

The Australian ladies tug-o-war team sought revenge against last year's triumphant rhubarb growers. The ladies, with such scalps as the Bronco's rugby league side under their belts, returned to win back their pride after their first ever loss to an all-male side.

All visitors to the festival were invited to pull against a magnificent 15 ton steam engine in a classic man versus machine encounter. As with the chainsaws, the steam engine came out on top.

The fun didn't stop there. For visitors who liked to get involved, there were plenty of activities from egg throwing to the Wheelie Bin Derby. Perennial favourite, Humphrey B. Bear was there with a show for kids of all ages.

With the flavour of fair dinkum Oz, unique entertainer Mike Berris performed throughout the day. His unusual collection of instruments included the wood saw, gum leaves, didgeridoo, stock whips and banjo mandolin.

Music at the festival included the Logan City Canterbury College Choir, direct from their Queensland tour. This polished group of young singers entertained the crowd prior to the Governor's opening.

Gary Rosser said "thousands of people dismissed the dreary weather to attend this years Avocado & Rhubarb Festival. 'Gallery Walk' bustled with heaps of entertainment, with the added advantage of various craft shops to browse through and restaurants to try when visiting one of Queensland's most fertile and picturesque areas."

The Great Guacamole Mix-off. Left to right - Mike London, Paul Lineham, Gary Brabham, Tony Bonner and Brian Sheperd.

Waitress Cathy Faukner and Judge Patrick Raharaha preparing for the Wheelie Bin Derby held at the Mt Tamborine Avocado & Rhubarb Festival

Adding the finishing touches to the Avocado Barn on the morning of the Festival