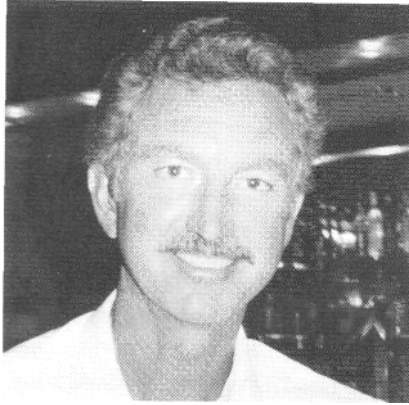


Australian Avocado Research and Management Programs: 1992



Len Francis

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Australia is beautiful, naturally rich, gentle of terrain and weather, and big. It has only one-tenth the avocado acreage of California, but could have four- to ten-fold as much as California. All the growers I met on my fall visit to the country were full of life and hard-working. These were my major impressions during the third leg of the international research liaison program of our California Avocado Society.

The Australian Avocado Growers Federation (AAGF) held its biennial research symposium September 29-October 2, 1992. It was an excellent opportunity to hear the researchers present their results, and to interact with them during the four main days of the event. Over two hundred people attended. There were many memorable discussions with the core of Australia's avocado growers— fine people. They came from all the avocado areas of Australia: south from Victoria state, west from Perth, and north from Atherton. Conference '92 was held at the Conrad-Jupiter Hotel and Casino in Broadbeach on The Gold Coast, about fifty miles south of Brisbane. The Gold Coast is in the southeast corner of Queensland state on the east coast of Australia. It was odd to look into the Pacific Ocean and view the sunrise instead of the sunset. I was not only upside down; I was backwards. As far away as California was, as I looked north it was still just above and to the right of the bulge of our planet called the equator.

The Gold Coast was a beautiful setting and logical, as avocados are grown north, south, and west of it. One full day of the conference was allocated to field trips through two of the areas and to two orchards. Demonstrations of phosphorous acid injection and

pruning were held at those sites. Pruning became a major interest of my visit and will be discussed later in this report.

I was accompanied on this trip by my family: Charlene, Jim, and Christina. Because Brisbane was the first city we stayed in, it became our center point. I mentioned that Australia is beautiful. It is green—at least everywhere we were: forests of eucalyptus or Monterey pine or grassy open areas where forests had been cleared by fire accidentally or on purpose for agriculture. As much as 100 miles of the land in from the coast is, or was, rain forests. With 40 to 80 inches of rainfall each year, rain forests are still abundant. This was the case for at least the 150 miles north of Brisbane to Childers and for the 650 miles south to Sydney. The "outback" is somewhere (we drove 250 miles due west to try to find it, but failed), and I understand it is more arid. The rain forests were left behind, but the "Darling Downs", with its diversity of row crops, pasture land, and livestock, still is a high rainfall area. About 125 miles inland is Tawoomba, a beautiful city where avocados are doing quite well. Back on the coastal side of the "Great Divide" avocados do well on the hillsides and hilltops where soil drainage is adequate. The lowlands, where bananas and sugarcane thrive, are generally too wet for avocados. Yet in fact, some avocado groves survive the wet soil conditions where bananas are interplanted with the avocado trees—they act as "pumps."

Yes, bananas and sugarcane, also mango and papayas, and a few avocados. Australia is more tropical than subtropical in at least the northern two-thirds. Remember, this is a country slightly larger than the continental United States. I was amazed to learn that avocados are within a 1,600-mile expanse along the east coast (from San Diego to Watsonville in California is about 450 miles), yet Australia has only 7,000+ acres of avocados.

The Australian avocado industry began commercially in the 1940s. Their annual production of 50-60 million pounds is mostly consumed within the country. Orchard acreage increases mirrored the California trend in the late '60s and early '70s. Production is expected to increase up to 100 million pounds by 1996. That translates to an average production of 14,000 pounds per acre. They are currently averaging only 7,000 pounds per acre, but several groves are producing 20,000 pounds per acre. The main varieties grown in Australia are Hass, Fuerte, Sharwill, and Shepard. Shepard is a Santa Barbara-originated variety that did not produce adequately in California, but it does very well in northeast Australia.

A major deficiency for the Australian avocado industry is its lack of an export market. Given the market, I estimate that Australia's avocado acreage could be at least four times the 70,000 acres that existed in California in the mid-1980s. Urbanization is not the threat to agriculture it is in California. The country has a population of only 16 million. If the message of Dr. Bob Bergh's speech given at the conference [printed elsewhere in this Yearbook] were broadly distributed, Australian domestic consumption would probably double.

Avocado Root Rot

Root rot used to be the major threat to Australia's avocado industry. That wonderful rain

falling during the growing season is just right for the development of the fungus, *Phytophthora cinnamomi*. It is a tribute to the success of the Australians in conquering root rot that there were no research presentations at the conference on this pathogen that continues to plague the avocado industry in California. Through collaboration with Dr. Mike Coffey, at UC/Riverside, Australians Dr. Pegg and Tony Whiley found that both Aliette® and phosphorous acid have substantial control properties for root rot. They then incorporated results from South Africa that revealed that direct trunk injections with either of these chemicals gave almost 100% control of root rot. Except for the labor of doing the injections, root rot is no longer a problem in Australia.

The field trip during the conference included one stop where Dr. Pegg made his recommendations for injection timing. His phenology research with Tony Whiley found that the main injection should be in spring, just after the spring growth flush leaves have reached maturity. The phosphorous acid in neutralized phosphite form is not tied up in the leaves at this time, but rather is translocated down to the roots. We *must* get final registration of Aliette® for use on avocados in California to make root rot a "live with" condition for our growers.

Injection equipment and techniques were demonstrated at the field trip stop with Dr. Pegg on Mt. Tamborine. I really liked the back-pack pressure injection. It makes the injection process simple. This is where Australia's growers want some help: Decrease the amount of labor involved in root rot control. It is appropriate to mention here that most growers down under do their own labor. There may be one hired hand, but the bulk of the work is done by the owners—usually a husband and wife team. I was impressed to hear so many wives talk about manipulating their three-wheeled cherry pickers to get to the top and inside of a 25-foot tall tree to get the toughest fruit to pick. Comments by the husbands were to the effect, "She doesn't speak Spanish, but she's my most dependable source of help."

Dr. Pegg is quite certain that phosphorous acid and Aliette® injected through irrigation will give good maintenance control of root rot. He, however, will not be doing the research as the banana industry has lured him away with major grants.

Tony Whiley: No. 1

Our research program in California is very diverse. It requires a leader in each of the diverse areas. That is probably the case in Australia, also; but the man in the center that everyone—especially growers—looks to for direction and results is Tony Whiley. Officially, Tony is Senior Principal Horticulturist, Department of Primary Industries, Maroochy Horticultural Research Station, Nambour, Queensland. You can see why they just call him "Tony." Tony's major emphasis is efficient, maximum production. He was in the center of researching and implementing all the root rot control methods, but was always studying the physiology of the avocado tree. No one knows it better. Perhaps the most important contribution from Tony is his phenology research. Phenology describes all the cyclic patterns of growth which occur in trees annually. In relating his studies to production, Tony states, "ultimate fruit yield can not be divorced from root and shoot growth activity...."

When the international liaison program was developing, a major factor was to have a coordinator in each country with whom to exchange research literature and to arrange activities and interviews during a visit to that country. Tony Whiley is my research coordinator for Australia, to my good fortune. He and his wife, Delores, hosted my family during a two-day period. He also arranged for me to work with him out of the Maroochy Research Station.

Several of Tony's trials were at John and Joy Dorrian's grove in Childers, about 150 miles north of Brisbane. The Dorrians' grove is on converted sugarcane land. The grove is around ten years old. Instead of thinning the grove by tree removal, John uses a hedgerow-topper machine and prunes the trees every year just before bloom. He is attaining 20,000 pounds per acre on his Hass, consistently. Bloom was occurring during our visit. It wasn't heavy, but was adequate. Most interesting was finding moderate amounts of flowers twelve inches inside the canopy. Substantial set was occurring. There did not seem to be excessive new growth flushes, as normally occurs with major pruning on avocados. This has a lot to do with following Tony's nitrogen program.

The nitrogen program is based on Tony's understanding of the avocado's physiology. He terms the avocado tree, "vegetatively biased." It likes to grow leaves, more so than fruit. An apple tree the same size as an avocado tree would produce five times as much fruit. Nitrogen stimulates leaf growth at the expense of flower development and fruit set, so don't apply nitrogen (the program says) from midwinter until spring flush leaves are fully expanded. The trees will set more fruit and develop less leaf growth.

Several other growers have adopted Tony's nitrogen program, and most are in the 20,000 pounds per acre production level. Critical to the success of this program is to have adequate leaf and soil nitrogen levels before nitrogen application is stopped at pre-winter—the end of November, for California. Nitrogen application would begin at the start of summer. For California, this would be after July 1; August 1 may be even better to be sure spring flush leaves have fully expanded. What I am not sure about is how heavy the first application can be: 50 pounds of nitrogen per acre, or maybe 100 pounds of nitrogen. In Alex Banks's presentation at Conference '92, he suggested 40% of the annual total amount on the first application, 40% a month later, and 20% another month later. Alex's title is Extension Horticulturist; he is the equivalent of our Cooperative Extension farm advisors.

This nitrogen application-timing is probably the most important idea for me to share with our California growers. It will probably take some refining for our conditions, but I believe this technique alone would increase production at least 20%

Tony Whiley's phenology trial is located at Maleny, above Nambour, to the west, on the Spencer and Lyn Grey orchard. The Greys also cooperate on Tony's rootstock, variety, and fruit set-foliage trials. There is a picture with this report showing the rhizotrons, the underground observation chambers where Tony or his associates can track root growth patterns. The root growth cycles are associated with the leaf and bloom cycles. Tony is also measuring carbohydrate levels of the trunk and stems in association with root, leaf, and bloom cycles. We can all look forward to the results of this trial and Tony's interpretation of them.



Fig. 2. Tony Whiley on research site with cooperating grower-friend Lyn Grey. Rhizotron cover behind Grey.



Fig. 3. Window to the roots. Rhizotron was installed by Whiley before trees were planted.

Some General Comments

1. None of our rootstock selections deemed tolerant to root rot give significant control under Australia's weather and soil conditions.
2. Velvic is the rootstock of their preference. Velvic is an Australian rootstock

selection. Although it is not a root rot tolerant stock, it apparently is the most compatible with Australia's soil conditions. It is a Guatemalan variety.

3. Frost is a very minor problem. Only the most southern areas experience occasional frost.
4. Phosphorous acid applied to the soil will convert from phosphite to phosphate; but according to Dr. Pegg, it does not convert when it is injected into the tree. This has a negative significance for possible use of it as a fertilizer. It would be great to inject phosphorous acid as a phosphorus fertilizer and receive root rot control at the same time.
5. Bees are used extensively for pollination, and therefore fruit set; but cross-pollination is not deemed necessary because their growing conditions are so ideal.
6. Hass-86 looks very good as a variety in the northern area of Queensland. This is a Bergh selection that has not proved any better than regular Hass in California.
7. Gwen is not doing anything spectacular. This variety may need cross-pollination there, just as we suspect is its requirement in California.

Maintaining Tree Size

Earlier in this report it was mentioned that pruning became a major interest of the visit. Australia is concerned with tree size because of production losses from crowded orchards; and because of harvest capabilities, they rely greatly on mechanical picker positioners for harvest by the growers themselves to avoid the high cost of labor if they hire it done. The positioners work on trees under 25 feet tall. Labor costs are also a major concern for removing trees for grove thinning and for pruning.

Now, California has a few crowded orchards about two-thirds of them! Spending money to remove trees, and then losing production for at least two years causes a delay in the decision process. But paying the picking bill for a 40-foot tall orchard where all the fruit is in the canopy moves even the most ardent procrastinator to buy a chain-saw.

Most of the Australian growers believe in maintaining tree height and fruiting side branches down to ground level. Orchard thinning by removing every other tree begins before loss of side branches. After five to six years, the trees begin crowding again. At this time, the practice is to take about one-fourth of the grove and staghorn each tree in that section. A staghorned tree has been cut back to only 6 to 8 feet tall, with 3 to 4 side branches only 3 to 4 feet long; all foliage is gone. Fruit set happens in the second year after pruning. After 4 to 5 years, the entire grove has been pruned back to a very open condition that could last 10 to 12 years.

At the field trip stop at Duranbah, New South Wales, the grove owner, Graham Anderson, was working on an alternative to staghorning. Thirty-foot tall trees, before crowding killed the lower branches, had their tallest interior branches cut back all the way. The remaining large branches were cut back to small foliated lateral branches. This allows new growth in the interior of the tree and fruiting on the lower branches. Tree size was reduced about 50%, yet fruit still set. Graham's program is to then keep the center of the tree open, and height and width reduced by pruning back 2 to 3 major

branches each year. He has been able to maintain 20,000 pounds per acre production on Hass and Fuerte.



Fig. 4. Open-spaced orchard that has had every other tree removed, then was staghorned when crowding occurred again. New growth is one year old.

Other Problems of Paradise

Root rot was a major problem in Australia, but they conquered it and are living with it. But all that wonderful climate of rainy summer days and warm winters has caused other continuing pest and disease problems. There are a couple of fruit-spotting bugs that can cause severe skin cracks under the worst situation, and minor star-shaped cracks at the minimum. They can cause new fruit to fall off. Those beautiful rain forests are the breeding grounds for the pests. Control requires spraying every two to four weeks for as long as five months. The saddest part is, there are no effective natural enemies. Getting rid of the rain forests is not an alternative.

Add the Queensland fruitfly, the leaf beetles, leaf rollers, scales of various kinds, a few loopers, red banded thrips, a whitefly, and a couple of mites and there are a few other reasons to spray. Australia is a world leader in biological pest control and they are doing all they can, but sprays are definitely still necessary.

Actually, the most damaging agent needing several sprays each year is anthracnose, the fungus *Glomerella cingulata*. The growers can control root rot, but fruit rot by anthracnose remains a problem. Their researchers are working to find biological control organisms. Moderate success is being achieved by Coates, Stirling, and Cooke in finding some epiphytic microorganisms that show some control of anthracnose. This will still require spraying. Thin skinned varieties are the most susceptible and require up to six sprays per season. Hass is more tolerant, but still some spraying is necessary.

Yes, we have expensive water in California, and Aliette® still isn't registered here for general control of root rot, but we still have some blessings to count.

Other Informative Grower Visits

Mullumbimby was too intriguing a town name even to consider passing up a visit with a very nice couple. Pierre and Gracious Girand invited my family and me to their avocado grove in a remote rain forest in N. E. New South Wales. Here, I learned that root rot can still be a problem. Pierre is seventy and very healthy, but doing all the labor on this thirty acre farm can make it difficult to keep up with the phosphorous acid injections. We had a terrific dinner and learned a lot about farming in an isolated area of Australia.

Bonnie and Tony Walker have a nice avocado grove in Tintan Bar, NSW, about 60 miles south of Mullumbimby. They invited fellow Australians Allan Campbell and Matt Walsh to join us in a delectable lunch in their home. Allan is a former California Avocado Society international director. Matt Walsh, 82 years old, is a retired extension agent. Tony took us to his packing house. This was very enlightening and refreshing. It is a "house with no steps." Management and all employees have one or more handicaps. The packing house is pretty much self-sufficient, and Tony is very pleased with his returns.

Oh, by the way: Tony and Bonnie have koalas that live in their avocado trees. Really. They feed on avocado leaves!

Goodbye

It was a beautiful drive the rest of the way down to Sydney: So many rivers. So much agriculture. So much forest land.

My last visit was with Dr. Chris Rigney. We met at 7 a.m., two hours before flight time. Chris is executive director of Horticulture Research and Development Corporation. HRDC is the major funding organization for research in Australia. Between all research funding sources, 0.8% or more of the gross value of the Australian avocado crop goes to research. This is in addition to the infrastructure and personnel provided by the states and the federal government. This compares to our 0.25 %. Notwithstanding the disparity, though, I must say we have a good, solid program. The good news is, they do too; and they are willing to share with us.

The Australian Avocado Growers Federation is very similar to our California Avocado Society. They are a hard-working group of volunteers, giving their time to improve industry conditions, organized to solve problems, and enjoying the social environment of their member conferences. They have my sincere thanks for conducting such an educational five-day conference and allowing me to indulge myself. Everyone was so hospitable to my family and me that I must say, "Thank you, our Aussie friends!"