



Quandong

magazine of the
West Australian Nut & Tree Crop Association (Inc)

Fourth Quarter 1997 • Vol 23 No 4

ISSN 0312-8989 • \$2.50

Quandong • Fourth Quarter 1997 • Vol 23 No 4



Figure 4.8. *Archidendron jiringa* (Jack) Nielsen. a. Habit; b. mature pod.

The Jengkol (*Archidendron jiringa*) (See: About the Cover, p. 2)

NEXT MEETING: Tuesday November 18: 7.30 pm

We hope to have two excellent guest speakers at the next meeting, on:

Bush Foods for WA

Famous local cookery writer and illustrator **Jan Oldham** is expected to talk about how bush foods can be used, and their characteristics and likely potential, while **John Milligan** of the specialist food supplier Milligan's Gourmet Gallery in Swambourne (9385 3455) will give us his view of the trade in these foods and the commercial potential for growing some of them locally.

Jan is a great enthusiast for these bush foods and has been a moving force in bringing them to public notice. John's company is the agent for the Bush Tucker Company range and has recently returned from a trip to the UK where he was able to introduce them to a possibly huge potential export market — see article on page 3.

Venue: Kings Park Theatre Room. Full details on attached leaflet.

No charge to attend. Visitors welcome. Queries to Tree Crops Centre, 9388 1965.

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About the Cover

The cover illustration shows the Jengkol, *Archidendron jiringa*, from *Non-Timber Forest Products of East Kalimantan* (See review p. 18). Jengkol seeds are cooked and used as a condiment or side-dish, and have a very pungent smell. They are sold, raw or cooked, in the market places.

Material appearing in Quandong is the views of the authors. It is offered in good faith, but neither WANATCA nor Quandong take any responsibility for any use of this material.

[Sunday Times / 1997 Oct 12]

The Bush goes British

Bush tucker has done it again. This week, our scrumptious indigenous cuisine has become the topic of lip-licking conversation with the British Guild of Food Writers and the British medical establishment.

The ever-so-pukka British Royal Society of Medicine at King's College, London, has been chosen as the venue for a fantastic bush banquet, the culinary highlight of a food and health forum.

What makes it specially appropriate is that medically speaking they're onto a good thing. You cannot get red meat any healthier than our roo and emu—lean, low-fat and grazed in our pristine outback.

This is especially relevant and important in the northern hemisphere, where fear of mad cow disease has people staying away from red meat in droves. There is no risk of that dreaded disease with our Aussie game. And comparatively speaking, we are clean green and ever-so healthy, specially when compared with Britain, Europe and America.

The timing of the bush banquet, the appropriately named Australia on a Plate, could not have been better planned.

Internet

Our good news story began with surfing, this time on the Internet.

Dr Anthony Leeds, from the nutrition department of Kings College, London, was responsible for planning the dinner. They had decided on a wild food theme for their dinner and so Dr Leeds was checking the Internet for clues. When he saw the Net page of our own



John Milligan with a selection of bush foods

John Milligan, from Milligan's Gourmet Gallery in Swanbourne, his eyes sparkled with interest. Electronic mail began flashing around the globe and the rest is history.

Initially, Dr Leeds was only asking for one Australian dish but our John Milligan is some sales person and ended up taking over the whole menu, and at the last count, it will be dinkum Aussie from beginning to end.

Calling the menu 'Australia on a Plate', John instantly seconded Mark Ford, executive chef from the Novatel Vines Resort. Mark has been creating some sensational bush flavoured combinations at the resort, also promoting our exciting exotics up in the Philippines.

Next John chatted up the Department of Commerce and Trade to get official backing

for this exciting mission. Then our intrepid Milligan began to organise things at the other end of the marketing equation, teeing up a joint-venture company in Britain to package bushherbs into appropriate sized combinations so that they can follow up on the publicity the dinner is sure to generate.

John has certainly been busy. Already a few of the major food retailer and prestigious supermarket chains are more than ready to talk kangaroo, emu, wattle seed bush tomato and bunya nuts, with slurps of lemon aspen, kakadu plum and lemon myrtle added for good measure and a bunch of warrigal greens and native pepper leaf on the side.

In just three months John has achieved a minor miracle, a breakthrough he reckons the industry needs. Judging from the reaction of the British Medical Society and the Guild of Food Writers, the world is more than ready to listen and taste our indigenous foods.

At the dinner there will also be guest doctors, nutritionists, dietitians and a celebrity or two, including one of the most vocal British conservationists. The heavies from the Royal Society of Medicine will be intrigued to know that kakadu plum has 1000 times the vitamin C content of an orange.

So what will Mark be cooking for Australia on a Plate? What exciting flavours has John packed in his luggage? And what are a few bush tucker tips and recipes to add to our rapidly growing repertoire?

The meal will begin with canapes of succulent crayfish, blushing with bush and sun-dried tomatoes.

Then fillets of smoked ocean trout glistening with lemon myrtle and spiced with native pepper with a fringe of rocket for contrast.

There will be seared crocodile fillets marinated in lemon aspen, native pepper and macadamia nut oil, with kakadu plum and chilli sauce.

Soup will be swirls of warrigal green with bunya bunya nuts, roasted garlic with grissini and speckled with bush tomato akudjura.

Candied wild lime and champagne will froth into the sorbet as a refreshing palate cleanser. Then it will be time for the duo of roast kangaroo fillet and emu sausages on a mash of wild yam with a *jus* of wild berries.

And the sweet refrain? Illawarra plum pudding with a chocolate and wattleseed parfait.

Baskets of bush breads will be on hand, with wattleseed rye bush tomato and pots of gum leaf butter.

— Jan Oldham

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[Australian Plants / 1997 Sep]

Some Australian native edible fruits: commercial production

Native Pear

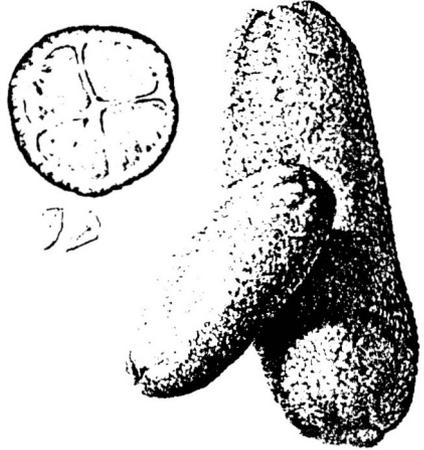
Leichhardtia australis (Native Pear) is an evergreen, twining, non-vigorous woody climber (1 to 3 m high by 1 to 3 m wide), with narrow olive-green leaves (40 to 100 mm long). Clusters of sweet, edible cream coloured flowers, spring to summer, produce large (40 to 100 mm), oval-shaped fruits. It exudes a milky sap when the stem is broken. It occurs in the drier (150 to 400 mm rainfall), temperate areas of all mainland States except Queensland, on a range of soils.

Culinary Uses. Flower clusters may be eaten whole and are brimming with sweet, tasty nectar. Immature fruits are eaten from late Spring through Autumn. They have a sweet, pea flavour, and may be eaten fresh, lightly steamed and used as a hot or cold salad vegetable, or pickled. Although this crop has significant potential, current use is largely experimental.

Cultivation Comments. Supported on a trellis or fence or an unsupported shrub. Frost, drought and lime tolerant. Fruits are only edible when immature.

Native Finger Lime

Microcitrus australasica (Native Finger Lime) is an evergreen, spiny open shrub to medium slender tree (3 to 10 m). Dark green, oval-shaped leaves to 30 mm long. White to pink through purple, fragrant flowers (20 mm) in Spring. Long narrow fruits to 25 mm by 100 mm, which turn from green to yellow or purple when ripe. It occurs naturally in sub-tropical and tropical rainforest areas of north-eastern NSW and southeastern Queensland



receiving greater than 1,000 mm of rainfall, on a broad range of soil types.

Culinary Uses. Fruit ripens late Summer to Autumn. Used in chutneys, jams, marmalades, savoury sauces and refreshing drinks. In great demand for culinary use. Juice vesicles are compressed and burst out (staying in one piece) when the skin of the fruit is cut, enabling them to be used in creative ways.

Cultivation Comments. An attractive, but prickly species which tends towards the smaller end of the size range under cultivation. Closely related to commercial Citrus. Although a tropical to sub-tropical species, it grows well in temperate areas with adequate rainfall, irrigation and tolerates moderate frosts. Can be grafted onto a range of exotic Citrus rootstocks. Very slow growth on its own roots, but moderate growth on vigorous Citrus rootstocks. Grow in full sun or partial shade. Responds well to pruning and shaping.

An attractive tub plant.

Estimated Yield and Gross Return. For estimating purposes, under irrigation, at a spacing of 4 x 4 m (625 per ha), an average yield of 2 kg per tree can be expected in the fifth season after planting. At a farm gate value of \$8 per kg, a gross return of \$10,000 per ha could be achieved. Wider spacings should be used under dryland conditions, and a lower yield (quality and quantity) should be expected. Budded hybrids promise earlier fruiting and higher yields.

Sweet Quandong

Santalum acuminatum (Sweet Quandong) is an evergreen, rounded shrub to small tree (3 to 6 m), with grey green foliage (50 to 190 mm). Small cream coloured flowers occur in Spring during and after fruit ripening. Spherical fruits (15 to 40 mm) turn from green to red, pink, yellow or white when ripe, depending upon on genotype, and contains a large fissured stone. It occurs in 150 to 600 mm rainfall areas WA, SA, Vic., NSW and Queensland, generally on light textured soils.

Culinary Uses. Ripe fruit may be eaten fresh but is generally reconstituted from a halved or dried product. It enjoys a high degree of consumer acceptance as a savoury or dessert fruit with tremendous versatility. Sugar is generally added to "cut" the acid and enhance the flavour. The kernel (similar to small Macadamia) is edible and highly nutritious, but may taste slightly of "bitter almonds".

Cultivation Comments. Attractive, (but often difficult to cultivate) species for hot low rainfall areas on light textured (sandy) soils. A partial root parasite which benefits from a host plant (supplied with host plant established in pot). With the exception of the Macadamia Nut, probably the most researched native food

plant — a very promising commercial fruit. It is tolerant of highly saline soil (dry), limestone and drought but very intolerant of root disturbance (minimise at planting out), heavy textured soils which become waterlogged (even short periods), and chemical fertilisers with greater than 3% phosphate. Under cultivation, there may be difficulties with establishment after planting out.

Responds well to pruning to contain size. An attractive amenity plant, particularly when in fruit. Due to the inherent genetic variability of seedlings, grafted plants of superior selections should be used. Frahn's 'Paringa Gem' PBR is the best genotype known to ANPI for the premium restaurant and gourmet markets (detailed information is available on request). Important criteria for selecting genotypes include, fruit size (20 to 30 mm), flavour (no meaty after taste), deep cherry-red (not too dark or too light) colour, freestone, firm texture (retained after stewing), non-skin splitting, high yield, high flesh to stone ratio, cropping at young age, compressed ripening time, resistance to quandong moth, non-root suckering, and non-biennial bearing (i.e., not heavy crop one year and light the next). Biennial bearing is a serious problem in inferior selections. The Santalbic Acid contained in the kernel is reputed to be a strong natural antibiotic.

Estimated Yield and Gross Return. For estimating purposes, under irrigation, at a

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spacing of 3 x 4 m (833 per ha), an average yield of 1 kg of dried fruit per tree can be expected in the fifth season after planting. At a farm gate value of \$30 per kg, a gross return of \$25,000 per ha could be achieved. Wider spacings should be used under dryland conditions, and a lower yield (quality and quantity) expected.

A crop for marginal area cultivation

Sandalwood Nuts (*Santalum spicatum*) is the subject of current research to develop the kernels of the fruit as a commercial food nut. Selective breeding of high yield strains could see the cultivation of Sandalwood Nuts

in winter rainfall, semi-arid areas of Australia where agriculture and grazing has resulted in devastation of the land and its return to desert.

Quandong (*Santalum acuminatum*) has proved itself as a suitable tree crop for arid, degenerated land where the available water is salty. With many of the world's food shortages being experienced by people living in such environments, the Quandong has the potential to be cultivated in these regions and to provide another source of food.

Based on information from Australian Native Produce Industries Pty Ltd (ANPI), PO Box 163, Paringa SA 5340.

[*Agroforestry News / 1997 Oct*]

Alley cropping in China

Intercropping using the fast-growing Paulownia (*Paulownia elongata*) is well established in China. In their Paulownia intercropping system, the trees rapidly grow to usable sizes:

<u>Age</u>	<u>Average dbh</u>	<u>Average height</u>	<u>Average volume</u>	<u>Use</u>
5 years	19.9 cm	7.8 m	0.12 m ³	purlins
8 years	29.5 cm	10.35 m	0.37 m ³	boards
11 years	38.4 cm	12.46 m	0.54 m ³	plywood

Trees are planted at 5 m spacing in rows which are 20 m apart, with tillage crops grown in the alleys between trees.

Light penetration through Paulownia crowns is relatively high, despite a large crown — higher than willows, for example. The intercropped species are chosen to be partially shade tolerant.

Most of the tree roots are distributed under the tillage layer (0-40 cm deep), hence wheat, millet and corn (maize) are all well suited to intercropping.

In terms of microclimate, the intercropping

system leads to soil and air temperatures tending to be cooler in the day and warmer at night compared with monocropped controls. Water stress is reduced as a result of cooler temperatures and reduced winds.

This intercropping system has been extended to some 3 million hectares in Northern China, where it is playing a major role in ensuring high and stable crop production, resulting in significant economic gains.

[Source: The Temperate Agroforester, Volume 5 Number 3]

High-value and Specialist Timber Trees for WA

(A REPORT ON THE TALKS GIVEN AT THE WANATCA MEETING, 19 AUGUST, 1997)

The first speaker of the evening was David Noël, who described a system of raising cabinet timbers, documented in the publication *Farm Forestry Seminar and Design Workshop*, Dorrroughby Field Studies Centre.

When forest is cleared and allowed to regenerate, the first plants to grow are usually weeds, called pioneers. Later, secondary species take over and trees become re-established. The Seminar looked at what happens when long-cleared pasture, "land that has lost its memory of the forest," is regenerated. This land will have lost much above-ground biomass, carbon-containing material such as mulch and compost, the soil is disturbed and there has been partial destruction of seed sources. It is then necessary to restore some of these items to help the process of regeneration, for example, bringing in mulch and woody material.

In natural forest, the canopy shades the ground so that all lower growth is suppressed. There will be a population of small, spindly tree seedlings that linger for years in a kind of suspended animation. If a mature tree falls and

opens up a space in the canopy, the light stimulates these little seedlings into a growth sprint. There are certain advantages in beginning regeneration of pasture lands - in particular, there is plenty of sun light. There have been attempts at growing plantations of cabinet timbers in the past, but none have been terribly successful. Special strategies had to be developed. Planting a mixture of species is essential. Some valuable timbers cannot be grown in monocultures. For example, Red Cedar, *Toona ciliata*, is severely damaged by Cedar Tip Moth when it is grown in large quantities. When individual Red Cedar trees are interspersed among many other trees, the problem is much alleviated.

This program for planting uses a mixture of forty native species, mostly from the eastern states, not including eucalypts or acacias. They are a mixture of pioneers and cabinet timbers. The right mix will grow quickly and reach ten metres in four years. The low canopy will close in two years and suppress weeds. Weeds are less of a problem in WA because we have dry summers that don't encourage weeds, but by the same token, we need to pay more attention to providing mulch. Blue Quandong, *Eleocarpus grandis*, not related to the Quandong of WA, *Santalum spicatum*, is an important component. Other mixtures of species can be used for different locations.

The second speaker of the evening was Andrew Thamo of the Small Tree Farm nursery in Balingup. The current style of growing

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eucalypt plantations is to grow the trees long and mean and skinny: trees are planted densely and left with minimum maintenance to self-prove. This is the least expensive method.

The primary use for such trees is as fuel wood, the secondary use is for pulp and rayon production, and the tertiary use is for mine props. Virtually none is milled for timber because they distort severely when they are sawed. A process has been developed to use this type of timber, but it is very expensive. The stems are cut into small pieces, kiln dried, re-cut to be square, and glued back together into larger pieces. This costs about \$3,000 per m³, of which the grower only gets \$30 - all the rest is processing cost. It also uses a lot of formaldehyde, which is a toxic chemical. This can only be done by a few mills, so there is a very limited market for this kind of timber, and the mill controls the price. Traditional foresters say that it takes seventy years to grow a log to a good milling size. Andrew thought there should be a better way.

A small tree has proportionately more young, growing tissue around its periphery. This is under tension, which, when released by sawing, bends. A tree of larger girth has a proportionately greater centre under compression, which is stable when sawed. Thus, it would seem to make more sense to grow trees that were short and fat, rather than long and skinny. Andrew then went to New Zealand to learn more about this idea. He was given seeds of trees that had proved to have desirable sawing characteristics, but almost killed them with kindness - only two seedlings survived. These were planted out and forgotten for a few years. They proved to be quite different from each other, and one was stable when sawed and one split. Andrew has now embarked on a long-term trial (twenty years) to try to determine if good sawing properties

are genetic or cultural.

In the meantime, he is continuing to grow trees ("Bartlett's" strain of *Eucalyptus botrysaligna*, a natural hybrid) according to a well-managed program. His aim is to produce a half-metre log at fifteen years. The crown-to-stem ratio of *E. saligna* is 15/1 in natural growth, which means he needs to have a space of 7.5 m between trees. Young trees are progressively harvested to ensure that trees never contact, they are pruned to keep a good shape, and the trimmings are mulched and left on the ground. This requires a high degree of management. Hay is grown in between the rows and the paddock has proved to be good for lambing, thus the forestry project fits well with farming. Advantages to the small grower is that this scheme is viable in small blocks, has a high-value end product, can create own niche market, good potential for the grower adding value by good management, and harvest is spread out over time, spreading cash flow and taxation commitments.

He has harvested some 16-year-old trees that were grown with wide spacing, air dried them for several years, and found them to be

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very stable when sawed. They were made into an attractive table, for which he was offered \$2000 when it was displayed.

Andrew is the author of *Using Trees on the Farm*, and is currently working on another book.

The third speaker of the evening was Dr. Sujit Dey, who is well-known to WANATCA members as an expert on Lychees and Mangos. Now he is revealed as an expert on and enthusiast for high-value timbers. His interest began thirteen years ago with a book from England on beautiful wood. He has been collecting specimens from around the world, and now has two sheds filled with about 150 species, from small pieces up to large planks which he will make into furniture. He brought about twenty pieces for the audience to admire. The rarest and most expensive wood in the world is Pink Ivory (*Berchemia zeyheri*) from South Africa. Ironwood-Cooktown is the densest wood in Australia.

Many people have felt great passions for beautiful wood to the extent that some species have become very scarce. King Edward the Seventh had all his furniture made from Kingwood, a small tree that grows in Central America, and has a dark, dense wood. Ebony, Kingwood and many of the other Rosewoods are now so scarce that they are listed as

endangered species, and trade in them is prohibited. Many of these were formerly used for making musical instruments.

Sandalwood (*Santalum spicatum*) has contributed enormously to the economy of Western Australia. Once quite common as far south as Mandurah, it is now much rarer. In arid country it is a slow-grower, but does very well with more water and nutrients. It is used for the oil which is distilled from the heartwood. There are still seventeen licenses for 2000 tonnes of sandalwood to be collected from the bush every year. Collectors get \$12 per kilo, so this represents \$24,000,000. Collectors are supposed to reseed, but the seedlings have a survival rate of less than 1% because of rabbits and other plant eaters. South Australia stopped exploiting and started protecting sandalwood in 1929, so it is more common in that state.

Sandalwood nuts are of good quality, and there was a scheme to grow sandalwoods interplanted in fruit orchards. The nuts would be harvested to be used in breakfast cereal until the plant was large enough to be distilled for oil. Sandalwood is a root parasite: it can supply some of its own needs from its own leaves and root system, but it must absorb trace elements and enzymes from its host plant. Originally, it was thought that sandalwood did no real harm to its host, but it is now clear that it does harm hosts such as citrus or lychee. The best hosts in Australian conditions are mulga (*Acacia aneura*) or jam (*A. acuminata*).

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Curtin University has had grants to study both Australian and Indian sandalwood (*Santalum album*). Indian sandalwood is a much bigger and faster-growing tree, taking perhaps 20 years to maturity as opposed to 70 years for Australian sandalwood. Both countries guard their sandalwood resources jealously. Every tree in India is labelled and coded and accounted for. In the Goldfields, there are signs warning that it is forbidden to so much as pick up a branch.

Western Australia has many other rare and valuable timbers: 47 eucalypts, 16 acacias and 38 other species. Their characteristics are a fine grain, high density and hardness, strength and a wide variety of colours and grain. Some are stable when green, which is good for woodturning. One problem with some WA high-value timbers is their low moisture content, so they are hard to dry and they tend to warp and crack. A large solar kiln has been built to deal with this problem. CALM in association with Goldfields Specialty Timbers are selling these timbers. They are collected from 5 million hectares of virgin woodland, 3 million hectares of land with regrowth between 40 and 100 years old, and another 15 million hectares of land with scattered timber. They are used for high quality furniture and joinery, musical instruments, craft and woodturning.

Sheoak, *Allocasuarina fraseriana*, is valuable, although the yield is low, about 10%, because of cracking along the medullary rays. It grows very well, but needs shaping and pruning as it grows. The French are buying it all up. Other important WA timbers include black Gidgee (*Acacia pruinocarpa*), Western Myall (*A. papyrocarpa*), Mulga (*A. aneura*), Jam (*A. acuminata*), Native Pear (*Xylomelum occidentale*), Flame Grevillea (*G. eriostachya*), Gimlet (*Eucalyptus salubris*), Rib-fruited Mallee (*E. corrugata*),



Acacia melanoxyylon (from: *Acacias of Southeast Australia*, by Terry Tame)

Red Morell (*E. longicornus*).

Other valuable timbers include Huon, King Billy and Celery Top Pine, Blackheart Myrtle (*Nothofagus cunninghamii*), Blackwood (*A. melanoxyylon*), Musk (*Olearia argophylla*), Blackheart Sassafrass (*Atherosperma moschatum*), Satin Sycamore (*Ceratopetalum virchowii*), Silky Oak (*Grevillea robusta*), Beefwood (*Casuarina cunninghamiana*, *Grevillea striata*), Queensland Maple (*Flindersia brayleyana*), Queensland Walnut (*Endiandra palmerstonii*), Silver Quandong (*Elaeocarpus sp.*), Blackbean (*Castanospermum australe*), Black and Pink Gidgee,

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Queensland Ebony, Kerosenewood, and Ironwood Cooktown (*Erythrophleum chlorostachys*).

There are ten species of Australian timber that are world-class material for musical instruments. All are being sought out and bought up by Europeans to replace the traditional timbers that can no longer be purchased. For example, Mulga and Western Myall are replacing Ebony for the manufacture of flutes and oboes. Gimlet has the potential to replace Brazilian Rosewood for the manufacture of stringed instruments. In addition, woodcarvings from the Pacific region have a huge market with eastern Europeans.

Here are some sample prices per cubic metre for precious timbers (circa 1994): Ebony, \$33,000; Zebrano, \$11,000; English

Yew, \$9,400; Teak, \$6,000; Gimlet, \$3,500; Red Morrell, \$3,500; Sheoak, \$2,800; Jarrah, \$2,400; Poplar, \$1,840.

It was pointed out that the audience should keep in mind that many trees which are grown for fruit or nuts also have valuable and beautiful timber, for example, cherry, pecan, walnut. Persimmons and Black Sapotes are members of the ebony (*Diospyros ebenaster*) family. Two exotic species which have adapted very well to Australia also have fine timber: olive, with its dramatic stripes, and carob, with striking colour and figure.

The audience was also reminded that working with some species can be hazardous: some can cause skin irritation, and some have sawdust that is toxic when inhaled.

A note about names: names of trees and timbers are extremely confusing. 'Common' names can apply to many different species. One publication that can help clarify matters is A Glossary of Wood, by Thomas Corkhill. It contains about 10,000 terms about timber and its use, with diagrams and descriptions and associates common and botanical names of thousands of species.

— Pat Scott

Win a free subscription

To encourage early payment of 1998 subscriptions, WANATCA is introducing a scheme by which all members who have paid their subscription by January 1, 1998 will go into a ballot for free subscriptions.

Renewal notices are being sent out with this issue of *Quandong*. Members who have already paid for 1998 and later will automatically go into the draw. The lucky winner(s) will have their subscriptions extended for the number of years prepaid, so if you renew for 1998 and 1999, you could win 2 more years free, to 2001.

The rates for 1998 are Full Member, \$45, Student Member, \$22.50. This small increase is the first since 1991. Life Memberships increase to \$600.

The Association's audited balance sheet is shown on page 29.

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Trench hedges for cherries and pecans

When I was very young, I lived in a tiny village in England. It was 3 miles (5 km) to the nearest school, and we had to walk there and back each day.

Luckily there were many distractions, such as tiny wild strawberries fruiting in the hedgerows, which led to some not very original excuses for why we were late to school.

One of the best distractions was a huge old cherry tree, in an abandoned former garden, which had been blown over in a storm some years earlier. This continued to fruit, and with its branches right on the ground, was easy to plunder.

It seems to me that this accidental happening could be adapted as a way of growing some tree crops in a novel way which would make them easy to pick and possibly quicker to bear.

The idea is to use very tall planting stock, and plant it in a sloping trench with its tip near the normal ground level and its roots bent down and mounded over. Such stock, 2 m tall or more ('whips'), is not hard to obtain from commercial cherry propagators, as long as they are clear on what is wanted. I have also seen pecan stock like this, with thick, low-

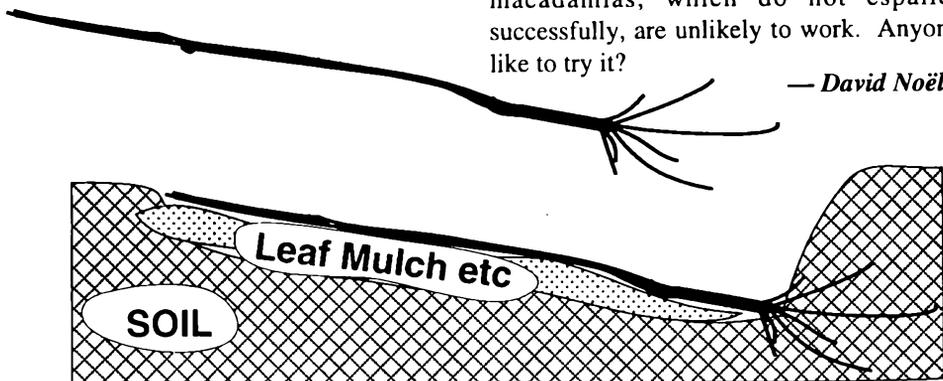
budded stems 2 m tall, on short (40 cm) swollen, turnip-like tap roots.

In theory, the upper buds on such a fruit stem should grow rapidly upwards, giving a 'hedge' of fruiting shoots. The almost-horizontal section of trunk might make the shoots bear early, as happens when fruit-tree branches are weighted down or wired horizontally. It would be a method of 'ultra-close planting' which needed only one original plant each 2 or 3 metres.

There should be quicker 'hedge' growth with the trench left open, so that light would stimulate buds to grow upwards from the original whip. As time went on, the trench would tend to fill with soil and debris, and the uprights might well form roots at their base — this might be a useful feature, automatically replicating the 'layering' technique used to propagate plants such as hazelnuts.

My feeling is that this technique ought to work with conventional stone and pome fruit stocks, and could work with pecans and walnuts. Bushy, evergreen trees like macadamias, which do not espalier successfully, are unlikely to work. Anyone like to try it?

— David Noël



Planting a 'whip' in a sloping trench to give a crop hedge

[WA Horticulture / 1997 Sep]

Healthy macadamias — crop for the picking

Macadamia nuts are Australia's only commercialised native food crop. They are sought around the world and have all the nutritional and low cholesterol qualities demanded by health conscious people.

It is for these reasons that many people are considering macadamia nuts as a form of superannuation, hobby, investment, or part-time business venture.

[WANATCA member] John Cory, of Shelterbelter Tree Planting Systems, said there was a capital outlay to start the venture, and a nonproductive period until the trees started to bear a crop, but the same restrictions applied to any tree crop.

He said the maintenance and management of the macadamia was not as intensive as many other crops and much of this could be done with machinery. Macadamia trees were very popular as a superannuation crop because investors could "see it, touch it, eat it and also receive dividends from the nuts".

The property where the trees were planted also increased in value as the trees got older and produced higher yields. But perhaps most importantly, a productive macadamia crop was an achievable outcome.

"The extent to which you become involved and the number of trees you plant each year is entirely up to you," Mr Cory said. "However, as with anything, you will get out of it proportionally what you put into it. If you do everything correctly you will achieve a successful result."

Mr Cory said WA provided an ideal climate for the growing of macadamia trees. WA's relatively dry climate, with little summer rain and well-drained soils that were normally



John Cory walks through a 19-year-old macadamia orchard at Chittering

duplex in nature and therefore could maintain moisture for use by trees, were the right conditions for the trees.

Many of the areas where macadamias were grown in NSW and Queensland had volcanic soil through which big amounts of water moved relatively quickly.

The macadamia industry in Australia is still relatively young, having only been significant for the past 25 years. It was developed through a lot of trial and error, and for the young WA industry this was an advantage, because growers could be confident of not making the same mistakes some eastern States counterparts had before.

"We have all the expertise we need in WA," Mr Cory said. "We have the markets, both domestic and export, that are under-supplied because of a lack of kernel, and we have land that is a fraction of the cost of that in NSW and Queensland. You won't make a million overnight, but you can expect a good return if you manage your plantation carefully."

[West Australian / 1997 Sep 26]

Tubular hive a honey for orchardists

Cardboard tubes seem set to replace traditional wooden beehives in orchards.

The 55 cm long, 15 cm diameter cylinders provide more convenient homes for bees used in pollinating fruit trees, particularly in high-density planting.

Invented by Agriculture WA researcher Rob Manning, the tubes are an extension of five years of research by the United States Department of Agriculture into a way of packaging honey bees for export to Canada.

Mr Manning adapted the US design for the bee pollination tubes. He tried them on cherry trees at Agriculture WA's Stoneville research station last spring.

Researchers had monitored individual trees over several years and Mr Manning was able to show that his bee tubes lifted production by 170 per cent.

On this season's prices, a grower would have increased returns from \$180 to \$320 a tree.

The bee tubes hang from trellis wires, take up little space and are protected from the weather by plastic covers. The plastic warms the hives quickly in early morning sun.

Each tube contains about 9000 bees. The tubes have three ventilation holes and openings for the bees to enter and leave via plastic grilles.

Bees entering the tubes deposit pollen on the plastic, and departing bees pick the pollen up and distribute it to different flowers.

Mr Manning said that the tubes were most effective in high-density orchards where trees



Rob Manning with his award-winning innovation - 'Bee Tubes'

were under hail or bird nets.

Orchardists who plant up to five times as many trees as usual to the hectare, under trellis systems, have little room left for wooden hives.

The tubes are easier to transport than wooden hives. They could be used to allow apiarists to export bees to Korea.

The tube hive earned Mr Manning a trophy from the Hills Orchard Improvement Group at the recent Karragullen horticultural field day.

Earlier in the year he received a State Government primary industry innovation and technical excellence award.

— *George Boylen*

[Australian Nutgrower / 1997 Sep-Nov]

Pioneer Pistachios— processing, promoting and selling Australian pistachios

Chris Joyce and David Crawford own two of Australia's largest pistachio farms, and so it was only natural that they combine to own and operate Australia's largest pistachio processing plant and marketing company.

The partnership began in 1993 when Chris was investigating hulling and drying facilities for his farm at Kyalite in southern New South Wales. Only 100 kilometres away, David Crawford was going through the same process at Robinvale in Victoria. Both growers were also making plans for marketing their pistachios. When this was discovered, they decided to pool their resources and establish Pioneer Pistachio Hullers, and the marketing arm, Australian Pioneer Pistachio Company.

It's a partnership that was meant to happen. As Chris explained, David is more practical and does a great job running the processing operation, and Chris's expertise is in marketing. So the partners fill the role that suits them best. In fact, I'm told that David gets very worried if he sees Chris walking through the processing plant with a screwdriver in his hand.

Like any perishable commodity, pistachios must be processed as soon as possible after harvest. Bins of fresh pistachios arrive at the hulling plant all hours of the day and night during harvest in March. The bulk of these come from Chris and David's pistachio crops, but bins from other growers also arrive at the hulling plant located on David's farm at Robinvale.

The first step in pistachio processing is the hulling to remove the skin-like covering on the nuts. This must be done quickly to prevent fermentation and shell staining. The nuts then pass through a flotation tank to remove blank



Chris Joyce and David Crawford of Australian Pioneer Pistachio Company with some Pioneer Pistachios

nuts, and proceed to the dryer. Drying is done in two stages. The first stage is high temperature drying to dry the shell and the second is low temperature forced air drying to reduce kernel moisture to 6%.

Chris and David have recently installed new machinery to speed the processing operation and improve quality. A new huller has boosted capacity and reduced damage to the nuts, a large and sophisticated dryer has improved drying capacity, and a new and very efficient needle-picker salvages every nut with

a split. Chris explained that this has increased the split/nut return and reduced the output of the lower-value nonsplits. The complete upgrade has therefore increased the saleable yield.

Despite the bumper 400 ton crop in 1997, the new processing equipment at Pioneer Pistachio Hullers hulled and dried the crop as fast as it was harvested. Chris admitted that juggling the processing was a fun exercise, but the plant, he said, has plenty of capacity. In fact it can handle 100 ton per day, and when the facilities do reach their limit, Chris and David have the infrastructure in place to double the capacity.

From the hulling plant, the nuts are transported for grading in Robinvale. The graded nuts are then packed into 25 kg bags, taken away for roasting and salting, and finally packed in poly-lined cartons ready for delivery.

Australian Pioneer Pistachio Company aims 100% at the snackfood market. Chris said that the produce departments in supermarkets are the main target because there is quick turnover and the nuts are treated as fresh produce. This means that when the customers buy them, they are fresh and so taste nice and crunchy. If produce is left to lie on the shop shelf too long after roasting, the kernel softens.

At the point of sale, each carton of Pioneer Pistachios is displayed with a prominent Australian label complete with kookaburra logo. A range of pistachio information leaflets are also provided and Australian Pioneer Pistachio Company has merchandisers checking that in each store the pistachios are displayed correctly.

While the bulk of the produce is sold through the fresh produce departments in leading chain stores, new markets are

developing with prepacked national brands. The main strategy in marketing Pioneer Pistachios is promoting the fact that the nuts are Australian nuts.

The pricing policy, Chris explained, is to remain competitive with the Californian product. At present there is a 20-30 cent per kilogram premium over the Californian product and about \$1-2 a kilogram over the Iranian product. However the bumper crop this year saw production increase from 10% of domestic demand to 25%, and it is expected that as local production increases further, premiums will be more difficult to obtain.

With an infrastructure in place for both processing and marketing, David and Chris can offer a range of postharvest services to pistachio growers. Many growers close to the hulling plant elect to bring their crop in for processing as it is harvested, while others



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more distant may need to hold harvested pistachios in a cool store while awaiting transport. Chris said that the nuts deteriorate rapidly after harvest and cool storage was essential if processing was delayed.

However big bins of warm nuts are not easy to cool and most growers have to place the nuts in smaller boxes for initial cooling. Chris explained that if cooled immediately after harvest, there was no loss of quality even if hulling is delayed for some days. Pioneer Pistachio Hullers recommends that all nuts for processing arrive in half ton fruit bins. Transport can be arranged from the main growing regions.

At Pioneer Pistachio Hullers growers can bring nuts for:

1. Hulling which involves removing the hull from the nut, removing blanks, and drying the product to safe storage moisture levels. The current charge is \$0.21/kg of inshell nuts received, with a minimum charge of \$100 per run.

2. Needle picking and sorting which removes all nonsplits from the splits. This machine is integrated into the sorting line where the nuts are sorted to remove stained, insect damaged and other unacceptable nuts from the first grade product. The process is done using sieves, air blowers, and an electronic colour sorter before passing across a hand picking table. Nuts are also size graded. The charge for this service is \$0.35/kg plus \$15 per man hour over the table.

APPC offers cash purchase for graded nuts or the opportunity to participate in a pool. Outright purchase of hulled dried graded nuts is recommended to small growers with less than a ton of dry nuts. Payment in full is made at the end of May each year. Growers producing larger quantities can elect to pool their nuts. In this instance there is no guarantee

of price or payment time, but the first payment is expected in May, with 90% paid by December each year. Progress payments are made monthly and market reports are issued at this time.

To plan the seasons processing and marketing, growers inform Chris and David of their intentions in February each year. While predicting crop size is difficult, some would say impossible, growers are asked to give the approximate size of their upcoming crop by February. All produce sold under the Pioneer Pistachio label is graded to a high standard to ensure a good, even quality. This means that Chris and David can be confident that their product is a quality product.

Growers have been very supportive of Pioneer Pistachio Hullers and most of the Australian pistachio crop is marketed through the Australian Pioneer Pistachio Company. This is fortunate for Chris and David but it is also fortunate for the Australian pistachio industry, because it ensures that the quality of Australian pistachios in the marketplace is consistent, the flavour is fresh, and that customers will look for the Australian product.

— *Jennifer Wilkinson*

[*Australian Nutgrower* can be contacted at PO Box 1, Dargo, Vic 3862]

Propagating Jujubes by tissue culture

An item located recently from the Web (Internet) appears to give a route for rapidly propagating clonal jujube varieties. Here is the reference:

Mathur N., Ramawat K.G. & Nandwani D. (1995) Rapid in vitro multiplication of jujube through mature stem explants. *Plant Cell Tiss. Org. Cult.* 43(1):75-77.

New information on sandalwood

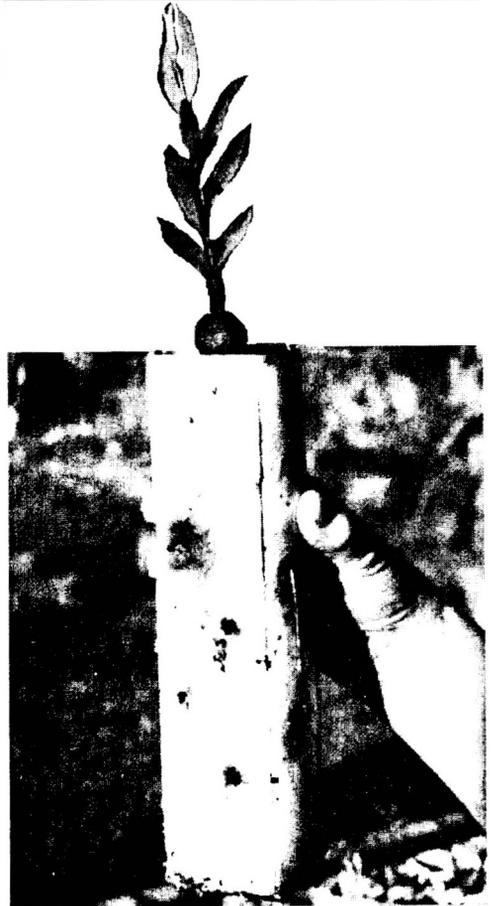
WANATCA member Graham Herde from South Australia visited Perth recently, and as usual brought some new information.

Germinating Sandalwood nuts — a new approach

The Herdes have made a practice of looking for sandalwood nuts wherever they travel, to broaden the range of genetic material available for trial. At one site, Graham noticed some nuts under an interesting looking sandalwood and gathered them up, but noticed that they had already cracked in the sun.

The Herdes thought these nuts would be spoiled for germination, but tried them anyway. To their surprise, germination was rapid and good. Thinking about why this should be, they came up with a new approach which has worked out.

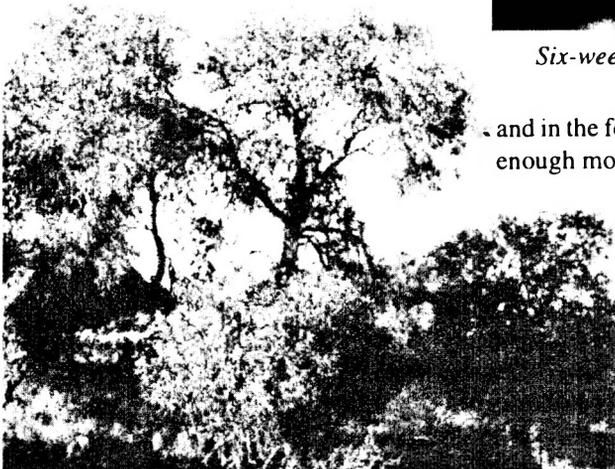
The reasoning was, that sandalwood (and also its close relative quandong) germinate in the wild by a two-stage process. The nuts fall



Six-week old sandalwood seedling in biodegradable pot

and in the following rainy season, absorb just enough moisture to stimulate the kernel.

Then the hot summer comes. The nuts dry out and a fine crack appears in the shell. Conditions are not favourable for further growth, and nothing else happens until the next wet season, when the 'conditioned' nuts rapidly absorb water and grow on vigorously.



The sandaldong or quanwood tree?

Two-season stimulation

The essence of this theory is that two separate wet-season events are required for reliable sandalwood germination in the wild. The Herdes tested this theory in the nursery by soaking sandalwood nuts for some time and then leaving them to dry out completely in the sun. Months later, nuts which had acquired a fine crack in the drying germinated quickly and reliably shortly after water was added. This is the basis of their new approach to raising sandalwood seedlings.

Graham cautioned that these seedlings are very liable to fungal attack, a common feature of arid-land plants. The seeds, placed on top of coarse sandy material, are germinated in paper tubes, with regular fungicide treatment. A host plant is grown on with each seedling.

Is it a Quandong — or is it a Sandalwood?

During their travels in southern WA, the Herdes noticed a quandong tree in fruit in the shire of Dundas which had something different about it. They concluded that the tree, with its bright red edible fruit, was in fact a sandalwood. Wide variation has been observed in various sandalwood and quandong populations in different parts of Australia, but this was a first.

The tree, about 7 metres tall, was regarded locally as a quandong. Further studies may reveal its exact nature — possibly it is a hybrid.

The Parkers plant sandalwood

Here is some more local input:

We have 22 ha at Port Gregory [near Northampton on the mid-west coast] that we hope to establish Sandalwood on.

In 1995 we purchased 6 Sandalwood trees from Bush Berry Farm at Victoria Park. We planted them, but they were too advanced to attach to a host. In 1986 we purchased 200



The bright red fruit of the 'sandalquong'

trees from CALM at Narrogin and again lost them partly to rabbits and with the above-normal rainfall they became water logged and although some did grow they again failed to attach to a host and we lost them all.

Also as we have a property at Mount Barker it was difficult to get away at the optimum time to transplant. In 1997 we have direct-seeded 1000 seeds, some alone and others with a Jam seed [Acacia acuminata] with them. These were planted in late April along with 200 seedlings that I had grown at Mount Barker.

We went up to Port Gregory at the end of June and planted another 160 seedlings; at this time we checked the seeds that had been planted earlier and found that they were starting to germinate. Hopefully we will have more success this year.

We have planted 12 seedlings at Mt Barker and 6 seed direct. If these survive we hope to plant about 1000 seeds at Mt Barker and a further planting of seeds and seedlings at Pt

Gregory in 1998.

In September we went up to Port Gregory to check on the Sandalwood and found that we had had a good germination and that both seedlings and direct seeded plants were very healthy, but rabbits were again proving to be a problem. We placed rabbit guards around nearly 200 trees, but time ran out. Next year we will have to have rabbit guards made when we first plant out.

— **Joy Parker**, PO Box 330, Mt Barker WA 6324. Phone 08-9851 1317.

And an update from Dr Ben Lethbridge, author of the Sandalwood article in the 1997 WANATCA Yearbook:

Lethbridge on Sandalwood

Just a note to update and correct the article "Sandalwood in Australia" with some information that has just come to hand.

Firstly, quandongs do not contain significant aromatic fragrance as have may been suggested in the original article, the worked timber though does have a marvellous lustre and will have value in the wood working trade. *Santalum lanceolatum* does contain oil but also lacks fragrance. *S. spicatum* is the only Australian species which has both fragrance and oil.

Secondly, in early 1994 the Department of Conservation and Land Management (CALM) on behalf of the WA government called a tender for the future processing, marketing and export of Crown Land Sandalwood. The successful tenderer was Wescorp Holdings Ltd. The previous agent, Australian Sandalwood Company Ltd, no longer has any input into the crown land sandalwood industry and the sandalwood export committee has been disbanded.

Thirdly and probably most interesting of

Changes with the Action Groups

Ian Fox, who has been leader of our Jujube Action Group since its foundation, has had to resign due to pressure of business. He goes with our heartfelt thanks for his interest and hard work over many years — All the best, Ian!

We have been fortunate in persuading Phil Ciminata to take over leadership of this group (Phil's contact details are on the back cover). Phil is a world leader on some areas of Jujube production, and has brought in through quarantine many new varieties from China and elsewhere.

Bert Hayes of Northam is the new leader of the Pistachio Action Group, taking over from Tom Bateman, who has moved away. Bert has had a long struggle with pistachios, and finally feels that they are coming good for him, with the first 'semi-commercial' crop this season. He expects to market these as 'red pistachios', fresh pistachios in the husk. This item is greatly sought after by pistachio aficionados from areas such as Lebanon, but it is very perishable and needs quite different treatment to nuts intended for ordinary pistachio usage.

all, a recent ABC Landline programme featured a segment on the growing of tropical sandalwood in the Ord River Irrigation Area (ORIA). *Santalum album* (indian sandalwood), a native of India and Indonesia, has many advantages over the harvesting of *S. spicatum* from Crown land. Heartwood from *S. album* is worth twice as much as the Australian variety (*S. spicatum*, around \$8000 per tonne), has a higher oil content and under appropriate management grows more quickly.

After ten years of trials in the ORIA near Kununurra, CALM scientists have developed methods for the cultivation of this parasitic tree, utilising three different hosts over its lifespan. The CALM scientists are encouraged by the significant heartwood formation being seen after this time. Next year a Perth company will plant 260 hectares of Indian sandalwood and its associated hosts in the ORIA.

S. spicatum is being developed as a woodlot in the arid areas of SA and WA.

— Ben Lethbridge, 62 Grants Gully Road, Clarendon SA 5157

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Bonney, N (1997). Economic Native Trees and Shrubs for SA. Greening Australia.

Not the Exec Chain Gang

In accordance with our Constitution, elected members of the WANATCA Executive Committee serve for two calendar years, with half retiring each year.

This year those retiring are Bob Cook, Alex Hart, David Noel, and Marcus Vigilante. The Committee meets only 4 times a year. This is not a great time commitment, nor is special knowledge of tree crops expected, and we would welcome offers to help out on the Committee.

Some retiring members will be standing for re-election, and the formal election will be held at the AGM, on November 18, as usual. Put your name forward then or contact David Noël beforehand if you would like to discuss the possibility.

Lessons from the Cold Spell

The 1997 Winter in southern WA was an exceptionally cold one. Perth had its lowest temperature on record, down to exactly freezing point, 0° C, and many inland and coastal areas had long runs of frosts.

Naturally enough these exceptional temperatures have had their effects on the plants we grow. A number of reports have come in of macadamias being killed outright, though these deaths were by no means general, with younger trees in frost-prone spots being hit hardest. Bob Cook, with macadamias some 80 km inland near Toodyay, had some where 'the bark looked as if it had exploded' from a series of hard frosts. Even some of the native trees in the area appeared frost-killed.

Bob Nederpelt, with his cactus fruits on the coastal plain 60 km north of Perth, reported high losses of his *Hylocereus* climbing cacti, but little damage to his *Cereus* columnar cacti. Bob's property is very flat and air-drainage is probably poor.

Some crops have benefitted from the cold. Graham Fellows near Manjimup, raising walnut seedlings, reported excellent germination with no need for stratification. Another report from Manjimup, in cold apple country, has been of an avocado loaded with fruit and performing very well through the cold.

In Perth, some of my small growing-from-seed tropicals, such as abiu, karked it even in an open glasshouse, but others, such as Mamey Sapote and Santol, showed no ill effects. The real surprise was some seedling Jakfruit, growing in pots outdoors, which seemed unperturbed by the cold spells.

Now is the time to look back at what happened, and think about it. If you have a number of plants of the same species which showed varying degrees of survival, follow the survivors carefully, ask others in the area with the same species, and try and work out whether the survivors had some genetic resistance, in the fruiting wood or in the

rootstock, or were favoured by their location or surroundings. Note which came back from apparent death, and which are gone forever. In this way you can select, adapt, and propagate to improve adaption of any crop to your local conditions. And do let 'Quandong' know!

— David Noël

Book Reviews

[The first review is based on one by Martin Crawford of the Agroforestry Research Trust, UK; others are by David Noël]

Temperate Agroforestry Systems.

Andrew M Gordon & Steven M Newman (Eds) CAB International, 1997; 288 pp, Paperback. \$79.95*

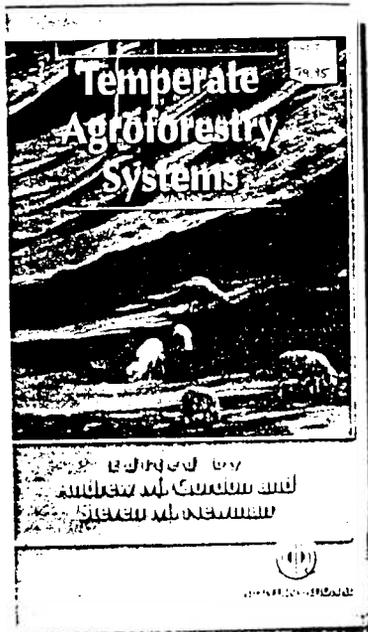
Recent agroforestry research has concentrated on tropics in the context of developing nations, but there is increasing awareness in temperate zones of faults in traditional agricultural systems, and increasing practical activity in the development of sustainable farming systems including agroforestry. This book explores the development of temperate agroforestry and agroforestry systems, concentrating on those temperate areas where the greatest advances, adoptions and modifications have taken place.

The six main chapters deal with the current state of agroforestry in temperate regions of the world, and include historical background, examples, research priorities and policies. Although small-scale forest farming systems are included, home gardens (or forest gardens) are not, being considered a tropical type not important to temperate systems.

The historical background alone makes fascinating reading. In North America, before European settlement, native Americans utilised agroforestry systems much like subsistence farmers the world over: slash and burn systems were common, and fire was used extensively to enhance wildlife forage, encourage fruiting shrubs and medicinal plants, to improve hunting etc. In many areas the native peoples relied heavily on tree crops including sugar from maples and nuts from chestnuts,

oaks and pines; and leguminous mesquites (*Prosopis* spp.) were used for food and as green manure shrubs. The planting of tree seeds (oaks, pines, walnuts), cuttings and transplants was common in the SW, yet little known now to ecologists and historians; lands considered wild by European settlers were often highly manipulated ecosystems.

European settlement brought new agroforestry practices including forms of silvopasture, intercropping with fruit trees and various annual crops, and home gardens. In Europe, the past 300 years have seen the systematic elimination of agroforests. Before that, oaks and beeches for nuts, lopped ashes for fodder, and fruit trees were left scattered in fields and didn't hinder manual



cultivation. Hedgerows were planted along field borders, roads and rivers. Forest grazing by herded flocks of sheep, cattle or pigs was the rule.

Remnants of these practices can still be seen across Europe, most obviously in Mediterranean zones - for example, areas of intercropped olives and vines, and forest grazing systems. In China, several agroforestry systems have been in existence for many centuries, including intercropping with Chinese date; hemp and paper mulberry intercropping; chestnuts with soya beans; and mulberry with soya beans, melon and sesame.

Current agroforestry practices around the world are extensively reviewed, region by region. These include:

North America:

- Windbreak and shelterbelt systems. Wind protection has been shown to increase yields of grains, vegetable crops and orchard trees. They can also improve honey production, buffer waterways, filter airborne sediment and act as snow fences. They can also improve livestock health and growth rates. Farmers expect a 10-40% reduction in home energy expenses with a farmstead windbreak.

- Silvopastoral systems. Traditional practices in the SE include forest grazing and pasturing of pine and pecan; the pine-cattle system is now a common practice. In the NW, forest grazing is a tradition, mainly with cattle; sheep and cattle are increasingly used to reduce the scrub layer before tree planting, and sheep are used to control weeds in new plantations.

- Intercropping / alley-cropping systems. Alley cropping of fruit trees with vegetables improves overall financial viability, diversifies production, and improves the growth and productivity of fruit trees.

Intercropping is also being used to establish forest plantations and to reestablish natural forests. Alley cropping with black walnut has been well researched and is practised with alleys of arable crops (eg. maize), grass or other crops (eg. ginseng).

- Forest farming systems - utilising existing forested or woodland areas to produce other economically valued products. These include honey, aromatics, craft materials, fence posts, fruits, nuts, fuelwood, medicinal plants, mushrooms, pine

straw, sap and syrup.

- Biomass production systems for fuel, fibre, fodder, waste management. Includes poplar and willow biomass systems.

New Zealand:

- Silvopastoral systems predominate here, especially with sheep (also cattle) and plantations of radiata pine. Other tree species being used include poplars and paulownia. Forest grazing is also common.

- Shelterbelt systems have been a lowland feature for the last century, protecting pastures and thereby improving pasture and livestock growth.

Australia:

- Silvopastoral systems include scattered trees in pastures, using Radiata pine and Eucalypt species of good form.

China:

- Silvoarable systems. These are common, for example paulownia intercropping with wheat, oil crops, vegetables, melons; and farmland shelterbelts. Other combinations used are ash,

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or phone

John, Linda Price: 08-9497 2302

Bill Napier: 9399 6683

willow, poplar, black locust, chestnut, birch etc. with grains, medicinals, oil crops, melons etc.

- Fruit/nut intercropping with fruit trees is also popular, including apple, peach, pear, persimmon, walnut and Chinese date (*Zizyphus jujube*). Intercropping of crops with Ginkgo is being developed.

- Environmental systems. These are the primary forms of agroforestry practised nationwide and include home gardens, buffers along canals and roads, and around houses and villages.

- Silvopastoral systems are also common, with sea buckthorn & Russian olive.

- Tree - crop - fish systems. These involve paulownia, willow, poplar and fruit trees with fish ponds and wheat / oil crops / vegetables / herbs.

- Mulberry - crop - silkworm. These combine mulberry with silkworm cultivation and crops of wheat, peanuts, beans or vegetables.

Europe:

- * Intercropping. Vast areas of olive are still intercropped with grape vines in Mediterranean regions. Olive wheat row cropping is another example. Fruit orchards with trees in rows are still intercropped in parts of Europe, with tree species including walnut, almond, peach, apricot. Intercrops include winter cereals (wheat, barley), soya bean, sunflowers, tobacco, sorghum; fodder crops such as alfalfa; aromatic crops like lavender; small fruits like currants and gooseberries; and other fruit trees.

- Forest grazing. Still used in many parts of Europe with sheep and cattle. Larch and Scots pine forests in France are among the highest in fodder productivity. Mediterranean forest grazing is important where they are no longer producing marketable wood.

- Silvoarable systems. The *dehesa* system in SW Spain and Portugal covers some 2 million ha (5 million acres) and involves random scattered oaks intercropped with cereals and fodder crops; the trees have been selected for their sweet acorn production to feed pigs, sheep, cattle and people.

- Silvopastoral systems. Most commonly these include grassed orchards of apple and pear. Several new experimental schemes are being researched.

The final chapter, 'Temperate Agroforestry:

Synthesis and Future Directions' by the editors, compares and contrasts the features of agroforestry research and practice outlined in the previous chapters. This includes a discussion of economic, agronomic and environmental measures of effectiveness of agroforestry systems, optimisation of systems by choosing the right density and spatial arrangement of species, limits to wider adoption and key research needs. They conclude that temperate agroforestry systems are widespread and thus ecologically and culturally important; they are central to production in China. They end by saying: "The two major challenges for mankind as we reach the new millennium are the production of more food and the conservation of biodiversity. Agroforestry is a land-use system that has the capacity to provide solutions to both."

In the last 20 years it has been confirmed that agroforestry can be more biologically productive, more profitable, and be more sustainable than forestry or agricultural monocultures. This book is the first to bring together so many examples of temperate agroforestry and will be immensely valuable to all those working in this area including practitioners and researchers, and students and teachers in this and related fields.

— *Martin Crawford*

Peanut Growing in Australia. *Ian Crosthwaite* Department of Primary Industries, Queensland, 1994. 104p. Paperback. \$24.95*.

The following write-up on the back of this publication gives a good summary:

BEE POLLINATION SERVICES

Increase yields of most fruit, nut, and tree crops!

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Bee Tubes from \$40 each

JOHN SILCOCK

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Phone 09-276 7847

"Peanuts are high in protein and fibre, and are cholesterol-free. Peanut products include nuts in the shell, salted or roasted kernels, peanut oil, and stockfeed or garden mulch made from the shells. The Australian peanut industry is expanding, with many new growers entering the industry. Peanuts are now grown in southern NSW, throughout Queensland, in the Northern Territory and in Western Australia.

'Peanut Growing' is the first book on peanut production in Australia. Topics include: how the peanut plant grows; what conditions the peanut plant requires; establishing a peanut crop; irrigating the crop; managing weeds, diseases and insect pests; harvesting; and calculating costs and returns.

If you are interested in the production of high-yielding, high-quality peanut crops, this book is an essential reference. It contains comprehensive, yet easy-to-understand information for growers, researchers, agricultural consultants and advisers, students and teachers of agriculture."

This book fills a notable gap — a first-class, up-to-date manual on a 'can be very profitable' field crop. An aspect of which I was previously unaware was peanut's mycorrhizal associations.

An interesting aspect brought out was the

crop's potential for cooler areas (eg south WA). Peanuts grow well in suitable (friable) soils in the southwest, but present varieties have a notable limitation. These varieties are summer-rainfall plants, which go from seeding to harvest in a few months. To do this, they need quite a lot of water.

If water can be supplied, peanuts grow well in the Southwest, but it is seldom economic to provide the water needed. In northern WA, where rainfall is in the summer, the natural rainfall is all that is required.

There may be economic potential for growing peanuts in the Southwest in our winter, when the rainfalls occur. This would require selecting winter-growing varieties. As far as I know, this has not been done systematically for peanut, though it has been done for other of our crops, such as wheat.

With this comment in mind, the book is highly recommended.

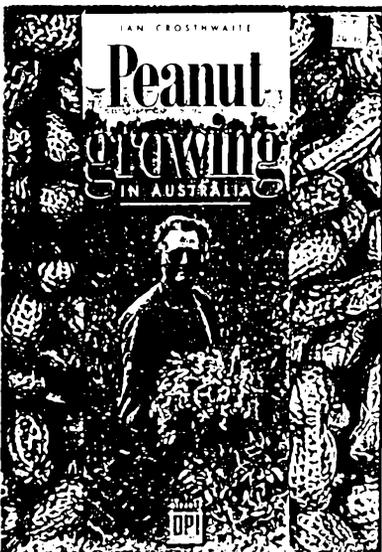
Non-Timber Forest Products of East Kalimantan: Potentials for Sustainable Forest Use. *J.L.C.H van Valkenburg.* Published by the Tropenbos [Tropical Forest] Foundation, Holland, 1997. 202p. Paperback. \$76.45*

I read somewhere that the Indonesians harvest 4000 different products from their native forests.

In Australia, the number is such products is about 1 — timber. We live under quite different circumstances.

Of course, in the past the aboriginal population 'lived off the land' and made wide use of their environment for all their needs, and the current modern interest in 'bush foods' is an echo of aboriginal uses. But modern Australian society and population makes it impractical to use bush resources as more than genetic resources to be preserved and called on as inputs into modern agriculture. And still almost all of our agricultural plants are migrants, brought in from other parts of the world to copy systems developed elsewhere.

This book gives a fascinating picture of a very different modern world, one where the majority of the plants used by the population for food are ones which evolved in the area. Every gradation of origin is found, from foods of totally wild plants, through ones which are preserved during clearing, ones cultivated occasionally as well as collected from wild, ones often cultivated though grown from wild-collected seed, through to cultivated species



brought in from outside the area.

The book results from a detailed and systematic scientific study by a Dutch student of all aspects of use of natural plant resources in a small area near Samarinda, near the east coast of the Indonesian part of Borneo. He made careful counts of plant species, their relative importance and areas covered, and their useful products in a number of trial areas, both undisturbed and cleared, and recorded movements of the products through local markets and commercial traders.

This trade is the local equivalent of our supermarket shopping — it covers the larger part of everyday needs for the population, including both Dayak and lowland Malay people. Its interest for tree croppers here is in the plants concerned, the two major 'commercial' groups being edible fruits, and rattans. Both are dealt with in detail.

The area is one of great plant richness, with 19% of the local trees having edible fruits in some areas. The book gives excellent drawings and colour photographs of many of these — some are relatives of fairly familiar fruits such as longan, durian and mango, others are less familiar, such as the locally-important *Baccaurea* species ('Rambai'), and some are virtually unknown elsewhere, such as the Jengkol (*Archidendron jiringa*) reproduced on the cover of this issue of *Quandong*.

The author records market prices and some interesting local measures — for the longan relative Mata Kuching, *Dimocarpus longan*, he notes "fruits are sold along the streets and in the market, quantities are measured by 'kaleng' (the number of fruits that fit in a standard condensed milk tin)... prices were

fixed at Rp. 500 per kaleng...".

A valuable source book both on indigenous fruits of the area and on sociological aspects of forest-based economies.

Cashew as an Agroforestry Crop: Prospects & Potentials. *Rüdiger Behrens* Published by Margraf, Germany, 1996. 90p. Paperback. \$52.45*

In spite of the title, this book covers far more than agroforestry aspects of cashew, a plant widely regarded as suited for the poorest soils and useful for land reclamation in tropical areas.

In fact the book is a first-class update on all aspects of cashews, with the latest information on cultivation, propagation methods, biology, pollination, yields, world trade and trends. Highly recommended.

The Chestnut Cook Book: Recipes, folklore & practical information regarding the most

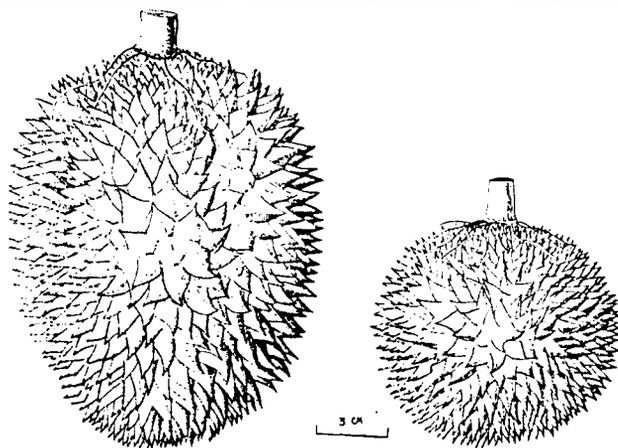
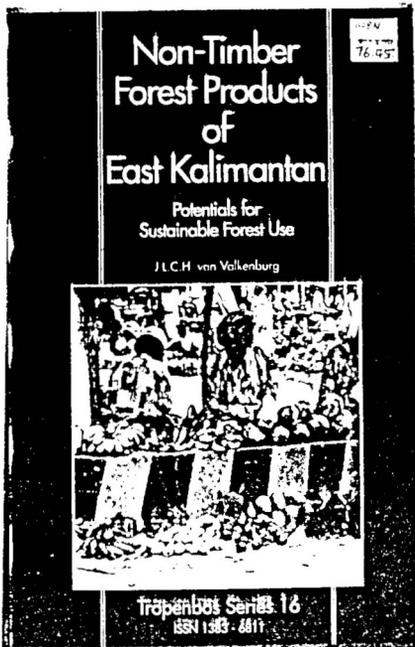


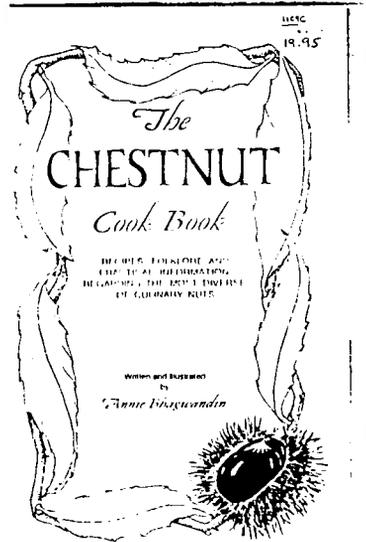
Figure 4.7. *Durio kutejensis* (Hassk.) Becc. Variation in fruit type, from ellipsoid to round.

diverse of culinary nuts. *Annie Bhagwandin*. Published by Shady Grove Publications, USA, 1996. 124p. Paperback. \$19.95*.

Recipe books abound, but this one is out of the ordinary run. It is the first one I have seen specifically on chestnuts — and not just the familiar European chestnuts, but other species too (Chinese, American, Japanese).

Annie Bhagwandin is obviously a chestnut lover. As well as her recipes, gathered from all over the world, she has gathered together some interesting information about the nut's history and usage. As the book subtitle indicates, the chestnut is both very versatile and quite different in its usage, compared to 'ordinary nuts'. J Russell Smith, the author of the classic book 'Tree Crops, a Permanent Agriculture', pointed out that you can get more flour from an acre of chestnuts than from an acre of wheat... And without re-planting each year! A pleasant and useful book.

*Prices are those current at Granny Smith's Bookshop (see ad. p. 31).



TROPICAL AGRICULTURE 1991



CASHEW AS AN AGROFORESTRY CROP

Prospects and Potentials



Rüdiger Bohrens

GRAFTED PECANS

Order now for future delivery

(in 5 litre bags, approx 50-100 cm high)

Philip Bloomfield

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Phone 08-9572 1653 (a/h)

News from Hillside Farm

Hillside farm has moved ahead greatly in the last three months.

Re-siting of the 'Dandy' Chestnut was accomplished on August 24 after some delay — the plant was quite reluctant to leave its home! Alex Hart, who is giving his personal care to Hillside (thanks again, Alex!), watered the tree in well, and it has since shot strongly. Prospects for the tree's survival, while not assured, look good.

Alex has also planted a large number of fig varieties in prepared riplines. These again are looking well and should serve as sources of both information and propagation material.

WANATCA is looking for proposals on how we should make best use of the Hillside site. Exec member Brian O'Donohue has put forward the proposal on page 30 on planting methods.

STATEMENT OF RECEIPTS AND EXPENDITURE

WEST AUSTRALIAN NUT AND TREE CROP ASSOCIATION

YEAR 1 JULY 1996 TO 30 JUNE 1997

BALANCE BROUGHT FORWARD

Cwith Trad Bank	6,095.10	
Petty cash a/c	190 10	
Debenture - RAC	3,000 00	
Unicredit a/c	561 36	
Unicredit Fixed	3,154.59	13,001 15

SUBSCRIPTIONS

1996	1,740 00	
1997	10,360 00	
1998	1,380 00	
1999	280 00	
2000	40 00	13,800 00

INTEREST

CBA	47 00	
RAC	253 60	
Unicredit	207 28	
CBA Passbook	1 49	509 37
RESEARCH		40 00
RENT		20 00
POSTAGE		20 00

Bank Fees	47 23
Credit Card Charges	33 00
Field Days	175 00
Honorarium	1,040 00
Office Equipment	125 00
Printing	
Leaflets	259 00
Quandong & Yearbook	7,484 00
Plastic Bags	101 10
Postage	
Aust Post	1,187 70
World Mail	462 15
Refreshments	31 60
Rent	
Tree Crop Centre	1,953 40
PO Box	44 00
Stationery	86 26
Telephone	267 97
Web Site	98 80
Balance Brought Fwd	13,994 31

27,390 52

27,390 52

Balance brought forward is represented by :

Balance CBA	6,419 50
Petty Cash	149 89
Secured Debenture RAC	3,501 69
Unicredit	568 65
Unicredit Fixed	3,354 58

13,994 31

I certify that I have examined the books of account of the WA Nut & Tree Crop Association and I believe them to be correct and that the above statement reflects the position of the Association.



Hon Auditor
22.09 97

Proposed Planting Method Trial

Very few people have any idea of the potential growth rate of plants. If a plant does not die on them, its performance is rarely questioned. I was involved in a trial in Africa which brought out how greatly planting methods could affect subsequent plant growth.

Coffee planting by two different methods

After planting out 2 x 5 acres of coffee in Tanganyika using 2 different methods the subsequent difference in growth was phenomenal.

The soil at Ol Molog, on the northern slopes of Kilimanjaro, was approximately 5-7 ft deep ... homogeneous, permeable and extremely fertile. So fertile in fact that it grew 2 wheat crops a year for 11 years and yet showed no response to fertiliser.

My neighbour and I decided that we would each plant 5 acres of coffee. We obtained the coffee seedlings from the coffee research station and planted them in a nursery bed 6 months before we commenced planting in the field. We later both took the seedling material at random from this nursery bed.

The fields chosen were adjacent to each other, identical soils, identical pre-cropping treatment.... i.e they had both grown wheat for several years. Both fields were ploughed and cultivated at approximately the same time and in the same manner.

Planting was timed to coincide with the commencement of the summer rains. No fertilizers were used at planting time or later. Planting commenced in both fields on the same date. All conditions were identical except for the manner in which they were planted.

Field A. 5 acres was planted in 2 or 3 days. A small hole was made just big enough to hold the seedling which was then inserted in the hole and tamped down.

Field B. The 5 acres of this field took about 2.5 weeks to plant. Each hole was dug approximately 600 mm wide x 600 mm deep. Each hole was filled with water from a tractor bowser and allowed to

drain; three-quarters of the excavated soil was returned into the hole. More water was added until the returned soil was absolutely soaked. The seedlings were planted carefully with as much soil as possible from the nursery bed still on their roots (it wasn't much but the effort was made). After planting, a saucer of soil was made around each seedling and the tractor bowser filled this saucer up with water every 2nd day for a week.

Result. At the end of 3 years in field B the young coffee bushes were about 1.2 m - 1.5 m high and beginning to flower and bear a few berries. Field A had bushes about 450 mm - 600 mm high and no sign of flowering.

Conclusion. With the high profitability of coffee at the time it was both satisfying and profitable to see coffee growing at an optimum rate and an unexpected demonstration of the effectiveness of correct planting procedure. The procedure had inadvertently turned out to be an excellent trial procedure where all factors except one were the same.

A proposal for a trial in WA

Purpose of the trial. To demonstrate to the public the optimum growth rate of garden plants when they are properly planted. The results to be photographed each year for 4 years and a video also made of the trials and widely distributed to the press, TV, Garden Centres and contractors.

Trial No 1: To indicate the effect of 3 different planting methods on the subsequent growth of plants, as distinct from any other contributing factor such as fertilizing, irrigation. etc.

Trial No 2: To indicate the differences in growth rate when two different fertilizing treatments are applied at the time of planting to each of the 3 different planting methods..

- Start the trial at the beginning of the winter rains in WA.

- Choose a site where the soil is as homogeneous as possible

- Select a species of plants that are dependable growers, vigorous and where differences in performance can be easily seen; 300 mm high, or even better, use clonal material. But it may be difficult to obtain.

Trial 1. Planting Method only.

a) Dig a "V" in the ground with a spade moved from side to side, fill the "V" with water and then insert the young seedling into it and tamp it down well.

b) Dig a small hole in the ground the same size as the pot that the seedling came in; fill the hole with water, allow to drain away and then plant the seedling into the hole.

c) Dig a hole 600 mm wide x 600 mm deep. Fill with water and allow to drain away. Replace half the soil and saturate it with more water. Plant the seedling on top of this wet soil and place the remainder of the soil around it. Make a saucer of soil around the plant with a radius of 300 mm and fill with water.

- Further treatments to be watering only for 3 years.

- Photograph the growth of each group at the end of each year.

Trial 2. Planting method combined with compound soil additives

- Use the same or similar site and the same type of planting material.

- Mix a quantity of soil with an equal volume of Compound Soil Concentrate to be used in the planting holes to replace the soil removed.

a) Dig a simple "V" with a spade, by moving it backwards and forwards in the ground; Fill the "V" with water; Plant the seedling, and tamp down; Place a 50 mm depth of concentrated soil mix in a circle around the plant to a 300 mm radius.

b) Dig a hole to the same size as the pot (125 mm). Fill the hole with water. Place the seedling in the hole. Tamp down. Make a 300 mm radius saucer around the seedling with the soil mix

c) Dig a hole 600 mm deep x 600 mm wide. Fill the hole with the compound soil mix. Fill with water and allow to drain. Plant the seedling into the thoroughly saturated soil mix. Make a 300 mm radius saucer around the seedling using the soil mix. Fill the saucer with water every second day for a week. (by hand) Keep free of weeds and provide adequate watering to replace evaporative loss for the next 3-4 years

— *Brian O'Donohue*, 3 Surrey Rd Wilson 6107. Ph. 9458 2346, Fax 9451 5502

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**HIGHLIGHTS FROM OUR 'NEWLY-
ARRIVED TITLES' LIST**

1091C * **CASHEW** as an Agroforestry Crop: Prospects & Potentials. Behrens (Ger, 1996). 90p. Pb. First-class update on cashews, latest information on cultivation, propagation methods, biology, pollination, yields, world trade and trends. Highly recommended. \$52.45

1085D * **DECIDUOUS FRUIT & Ornamental Trees.** Fleming (Aus, 1992). 160p. Pb. Superb compilation from Fleming's, leading Aust deciduous fruit tree nursery, sumptuous all-colour photos of fruit, nut varieties. Cross-pollination, maturity sequences. Special sections on espalier, pruning, organic gardening. Contains much information found nowhere else. Highly recommended. \$45.95

1087G * **GROWING FRUIT & Vegetables:** Fresh food from your garden. Passmore (Aus, 1997). 82p. Pb. Colourful magazine-style review of WA home fruit, nut, vegie growing, noted local writer, in ABC TV Gardening Australia series. Highly recommended, and only... \$5.95

1089P * **PLANTS for a FUTURE:** Edible & Useful Plants for a Healthier World. Fern (UK, 1997). 302p. Pb. Excellent, far-ranging book on cooler-climate perennial edible plants, many lesser-known fruits, nuts (Cephalotaxus, Apios) described, fine indexes. Derived from trials on 2000 species. Recommended. \$59.45

1100P * **PROSPECTS for the Australian Native BUSHFOOD Industry.** Graham (Aus, 1997). 80p. Pb. Good analysis of this developing area, properties & establishment costs for 16 native crops, factors in production, processing, and sales sectors. \$40.00

Mail: PO Box 27 Subiaco 6008

Phone 08-9388 1965; Fax 08-9388 1852

Office: 208 Nicholson Rd Subiaco 6008

e-mail: granny@AOI.com.au

Web: <http://www.AOI.com.au/granny/>



Granny Smith's Bookshop

West Australian Nut & Tree Crop Association (Inc)

PO Box 565 Subiaco WA 6008 Australia

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DICE Group: PO Box 27, Subiaco WA 6008

CALENDAR OF FORTHCOMING EVENTS

Deadline for next issue: Jan 20

- 1997
- Nov 18 Tue Annual General Meeting (Jan Oldham and John Milligan - Bush Food in WA)
- 1998
- Jan 20 Tue Executive Committee Meeting
- Feb 17 Tue General Meeting (Neville Shorter - Developments in WA Fruitgrowing)
- Apr 4 Sat *Hills Small Farm Field Day
- Apr 25-26 §ACOTANC-98, Nelson, New Zealand
- May 19 Tue General Meeting (?Barry Shelton - Palms with Edible Products?)
- Aug 18 Tue General Meeting
- Nov 17 Tue Annual General Meeting

*General Meetings are held starting at 7.30pm. *Venue: Theatre Room, Kings Park HQ, West Perth.* These meetings usually include a current magazine display.

• Event with WANATCA participation; § For contact details refer to the Tree Crops Centre.

Material originating in Quandong may be reprinted; acknowledgement of author and source requested.

Current Subscription Rate: \$45.00 per year
(includes all publications for the year). Student Rate: \$22.50

Quandong is produced by the Tree Crops Centre, PO Box 27, Subiaco, WA 6008.

Phone: 08-9388 1965. Fax: 08-9388 1852. E-mail: treecrop@AOI.com.au

Advertising Rates: Whole page, \$80; Half page, \$45; Quarter page, \$25;

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