Spring 2005

The Avon Sandalwooder

Welcome to the 4th issue of the Avon Sandalwooder, a newsletter produced by the Avon Sandalwood Network

From the Chair

Bruce Storer, Chairman, ASN Inc

I hope this newsletter finds you in good Christmas sprit and enjoying the season just past. We have noticed the improvement in the health, seed set and germination rates of both hosts and sandalwood plants this year and I think that a good season speaks for itself.

The success of plantation establishment can be influenced by the season and it is important to make the most of good seasons. If you can obtain a high survival rate in your plantation you will save a lot of time and money, and good seasons, especially in the east, don't come around too often, as we all know.

It is very pleasing to see the network continuing to grow in membership numbers. I think we are moving on the next phase of the sandalwood industry, having spent our early days focused on plantation establishment, to now concentrate our efforts on new products, marketing and further research. We intend to focus on marketing and products at our next workshop, visiting buyers and processors where possible. I have heard rumours that sandalwood has increased in price, dare I say it?

We have written to the Forest Products Commission (FPC) urging them to continue to assist the ASN. As this is a government organisation we believe it is in the community's interest that good communications are maintained. The FPC has been of great assistance in the past and we would like this to continue.

With formation of AVONGRO, a non-government organisation aimed at developing tree cropping in the wheatbelt, it is important to work together towards common goals. A lot of government money is being invested under the NRM framework, and it is important that we are all working together to benefit the industry, focusing on priority issues.

Well I had better get back to nut picking up here in Gabbin. It is 38 degrees, the flies have nearly carried me away and my cup runneth over with nuts, big fat ones!

Seasons Greetings, Bruce Storer ASN Chairman.

ASN members at the Cunderdin Field Day, Sept. 05

Membership & ASN Update

Tim Emmott, ASN Secretary & Newsletter Editor.

Welcome to the 4th 'bumper' edition of the Avon Sandalwooder. The ASN continues to grow, thanks to the enthusiasm and support of our members, executive committee and contributors to our newsletter and workshops.

With 85 members, and a devoted executive committee, the ASN is now well positioned to begin tackling key industry development issues relevant to our region. We aim to ensure sandalwood becomes a profitable, sustainable industry in the Avon region of WA, creating new opportunities for regional communities whilst addressing land degradation issues.

Membership

Welcome to all new members that joined at the September workshop. A reminder for past members that membership for the 05/06 financial year is now due. Thank you to those of you that have already paid.

AGM and Field Day

The AGM and Spring workshop was held in Cunderdin on the 28th of September 2005. In total 62 people attended the workshop sessions, with 24 keen members arriving early for the AGM. Cunderdin / Koorda farmer and sandalwood grower Bruce Storer was re-elected as Chairman.

Funding

The ASN is looking at a variety of funding opportunities. We currently have two registers of interest lodged with separate funding sources. Our immediate goal is to secure funding to maintain the momentum of the network (workshops, newsletters etc), continue to support private growers and begin to address key development issues.

Next Workshop

Due to the diversity of our members, the ASN will be holding two separate workshops in Autumn 2006. We aim to run one in Perth, focusing on products and industry / marketing issues. The other workshop will be country based, focusing on agronomic and cultivation issues and will involve more time 'in the field'. Both workshops are planned for early March 2006.

Seed and seedling supply for 2006

The ASN maintains a database of members with sandalwood seed for sale. The database is being updated for the 2006 season. If you have seed for sale, contact the ASN secretary to go on the database. Also, regional farm tree nurseries in the region are filling up fast with orders, so if you're planning to purchase host seedlings for 2006, don't delay with getting your orders in.

Best wishes for 2006, Tim Emmott, ASN secretary

Growers Update & Views

Aaron Edmonds, Farmer, Sandalwood Grower and ASN Committee Member, Calingiri WA

We have experienced an awesome germination of sandalwood this year. I am finding with bigger nuts germination is taking anywhere from 6 weeks to 10 weeks. I hope to harvest between 100-200kg of seed this summer, from my older plantation trees.

I have established another 10 hectares this year targeting sandy areas, frost hot spots and now areas at risk of water logging. Parrots are my biggest issue. Trees established next to bush are prone to parrot damage, very upsetting as it definitely affects tree health.

We need to focus on generating positive income flows from our sandalwood projects, and my views on the future for the nuts is outlined below.

View for the role of sandalwood in WA (A. Edmonds)

The price of crude oil is now in the mid US$60s and likely to continue to increase. I am not at all positive about the outlook for fossil fuels and I can see the agricultural sector (the world's third largest consumer of energy) finding that it will become increasingly hard to profitably grow fertilizer hungry crops such as wheat and canola.

It takes the energy from one litre of oil to manufacture one kilogram of urea! I am expecting urea to climb to over $500/tonne next year. And in that case diesel would most likely be on the ugly side of $1.50. A clear and present threat! So in order for farmers to achieve BIG TIME energy efficiencies they have to tackle the 2 main areas where we guzzle energy like there is no tomorrow:

1. Nitrogen Fertilizer; manufactured by combining hydrogen and nitrogen gas to form ammonia. Ammonia is the precursor for all nitrogen fertilizers. This process is hugely energy expensive. If agriculture is to survive economically in a sustained period of high oil prices, the use of nitrogen fertilizers must be reduced SIGNIFICANTLY. The solution is legumes. Luckily the sandalwood system is based on legumes. Ironically sustainability gains come as a bonus when you reduce energy consumption. In this case no fertilizer run off, improving catchment water quality.

2. Perenniality; with annual crops energy is expended every year to establish crops. With perennial crops there is a one off energy liability. Other cost savings come into the equation as we do not need to OWN expensive depreciating capital in the form of machinery! Sandalwood nuts could be harvested with a macadamia harvester that could cost as little as $10,000. Once again sustainability gains come as a bonus when you reduce energy consumption. In this case perenniality reduces soil erosion, lowers water tables and addresses biodiversity depletion in the landscape.

So agriculture must aim to produce an oilseed from a perennial legume based system. Producing an oilseed (also rich in protein) exposes the end product to a large array of potential markets no matter what the future holds because we are always going to need oil for food and energy and we are always going to need (cheap) protein for food. Have you noticed how the price of meat is going berserk? It takes 6 x 44 gallon drums of oil to produce a cow (feedlot) not to mention the water as well.

It is ironic though hardly surprising to me that I have been getting far more enquiries from abroad as to this production system in particular developing nations in arid environments. I have been visited by a couple of researchers from Italy, and I am corresponding with a couple of leads, one an Non Government Organisation in Tanzania and the other a biodiesel plantation owner in India.

We are not thinking grand enough here and there is so much at stake. This oil situation has really put the willies up me. I need to get much more of the farm into sandalwood. The higher the oil price goes the more Mum and Dad are coming around.

Anyway, I hope you can see why I am so focused purely on the nuts. We don't know what the price of a barrel of west Texas crude will be in 25 years, let alone what price buyers would be prepared to buy the heartwood oil for what is essentially a “want” not “needs” based consumer product - cosmetic products. The wood may simply be more valuable as a source of heating fuel! Now there is a crazy prediction! Or is it?

Regards Aaron

Aaron Edmonds inspecting seed ripening in his older plantation trees (September 2005)

Licencing Requirements for taking sandalwood seed

Melanie Harding, Wildlife Licensing Section, Department of Conservation and Land Management

ASN Member Gordon Taylor of Quairading collecting sandalwood seed from his young plantation (Oct 2005)

All classes of flora that is native to Western Australia are protected throughout the State under the Wildlife Conservation Act. Flora is defined as any plant (including any wildflower, palm, shrub tree, fern, creeper or vine) and includes any part of a plant including seeds and spores.

To collect Sandalwood (*Santalum spicatum*) seeds, a licence from the Department of Conservation and Land Management (CALM) may be required depending on where the seeds are to be collected from and for what purpose.

CROWN LAND

To take Sandalwood seed from Crown land for **non-commercial purposes** a Scientific or Other Prescribed Purposes Licence is required. This licence covers activities such as research, or non-commercial propagation for revegetation projects. Once a licence is issued, written permission from the land manager must be obtained prior to collection. The fee for this licence is $10.

To take Sandalwood seeds from Crown land (Shire Reserves, Pastoral leases, Unallocated Crown land etc.) **for sale**, a Commercial Purposes Licence is required. The licence is valid for up to 1 year and the fee is $100. Written authority to collect Sandalwood seeds must be obtained from the land manager and must be supplied with the application.

In addition to the Commercial Purposes Licence, Sandalwood seeds cannot be taken unless a special endorsement is added to the licence. Special endorsements must be applied for at a CALM District/Regional Office nearest to where the seed is to be collected, after CALM's Head Office has issued the licence. The endorsement states the approved areas from where the seeds may be taken and special conditions pertaining to the quantities of seed to be taken to ensure the conservation of the species.

Please note that taking sandalwood seed for commercial purposes from conservation estate (e.g. National Parks, Nature Reserves, Conservation Parks) is not permitted.

PRIVATE PROPERTY

The taking of Sandalwood seed for **non-commercial purposes** from private property does not require a licence, however you must obtain the landowner's permission prior to collection.

To collect sandalwood seed from private property **for sale**, a Commercial Producer's/Nurseryman's Licence is required. The licence fee is $25 and is valid for one year. Written permission from the landowner must be supplied with the application. The reverse side of the licence application form provides a pro-forma letter of authority for obtaining a landowner's approval to harvest protected flora from their property. This may be used at your convenience if appropriate.

Once a Commercial Producer's/Nurseryman's licence is issued, that licence only covers the properties listed on the licence. Therefore, if you wish to collect sandalwood seeds from other properties not listed on your licence you must apply for another licence.

If you are collecting seed from plantation Sandalwood a licence is still required for the sale of the seeds. Licences apply to all species native to WA whether they are from cultivated or natural populations.

FURTHER INFORMATION

Further information and application forms can be obtained from CALM's Naturebase website *www.calm.wa.gov.au/plants_animals/licensing/flora_licensing.html* or by contacting CALM's Wildlife Licensing Section on 9334 0441.

ASN Secretary inspecting seed ripening in remnant trees, Northam district

Yield Expectations

Geoff Woodall, Centre of Excellence in Natural Resource Management, University of Western Australia, 444 Albany Highway, ALBANY 6330, Western Australia, Phone (08) 98928427, Fax (08) 98928547

A common expectation is that each sandalwood plantation will produce 3 tonnes of merchantable sandalwood per hectare after twenty years?

"I suggest that many plantations established to date will not reach this production target!" You may respond "I'm expecting 3 tonnes from my plantation because I receive more than 400mm of rainfall and I planted jams at the right density" I would probably respond with "yes but there is more to it than that!"

Over the years I've seen some fantastic examples of fast growing cultivated sandalwood, some with very good oil content and others with a diameter of greater than 95mm at 5 years of age. Unfortunately I've also seen many similar aged trees with a diameter of less than 25 mm.

Host(s) selection and host to parasite ratios influence sandalwood growth but there are many other factors that determine how productive your plantation will be.

Effective rainfall, soil type/profile and landscape position are as important, if not more important, than host issues, assuming that you are able to grow some sort of host on the site.

Effective Rainfall

I often use the term effective rainfall, which is rainfall minus evaporation. When you consider both these parameter, it easier to comprehend that the wheatbelt is very much a water limited environment and water availability strongly affects sandalwood growth.

Measurements that I've made in south west WA suggest that growth plateaus at an average annual rainfall of 600 mm. A growth bonus can be expected in areas that have large stores of fresh water at depth or that receive additional water inputs from sub-surface flows or run-on.

However, in some situations, particularly the western wheatbelt, additional water inputs can cause problems in years of above average rainfall.

The following examples demonstrate the difference between considering rainfall and effective rainfall. Both Moora and Katanning receive approximately 450mm of rainfall however annual evaporation at Moora is approximately 400mm higher than Katanning's, thus Katanning receives more effective rainfall than Moora.

For the second example consider Northam and Merredin, they receive about 450 and 325 mm of annual rainfall respectively. The difference is only 125mm but is compounded by the fact that annual evaporation is about 300 mm higher at Merredin than it is at Northam, i.e. the difference in effective rainfall between the two centres is much greater than the125 mm difference in rainfall.

The take home message is that if you're in the eastern wheatbelt don't expect un-irrigated plantations to produce 3t/ha after twenty years.

A positive note for those in the eastern wheatbelt is that land is much cheaper, there are large areas of suitable soils and one may speculate that timber products from drier areas may be of higher quality (though this notion needs to be verified) than timber cultivated under wetter and less stressful environments of the western wheatbelt.

Soils and Landscape position

Soils of the WA wheatbelt are diverse and large changes in soil type can occur over short distances. It's not uncommon, particularly in the western wheatbelt, to encounter a mix of soil types/profiles in the one proposed plantation area.

There are some good examples where a uniform host resource has been established on a range of soils, but the sandalwood growth has been anything but uniform due directly or indirectly to changes in soil type/profile.

At Katanning for example sandalwood cultivated on a sandy duplex soil grew at three times the rate of sandalwood growing on shallow red loam over clay soils, yet the host resource was similar (jam). Similar results have been observed elsewhere in the Great Southern region.

Many plantations established to date are, totally or in part, situated on sub optimal soils.

For example, parts of Don Moir's site at Narrogin, small sections of the Narrogin Ag school trial site (both visited at the March 2005 ASN workshop) and a larger section of the Kwobrup trial site have sub optimal soils/soil profiles. Any large scale plantation is likely to have some optimal soil and a proportion of sub optimal soil.

When calculating your predicted yield it's important to partition your plantation, estimate the yield for each parcel, then calculate the expected yield for the whole site.

Yield Expectations

Estimating the productive capacity of proposed sandalwood plantation sites

I'm amazed at how many individuals do not assess a sites capacity before establishing hosts and sandalwood and yet it's not too hard to obtain some idea of a sites productive capacity, or variation within a proposed site, before establishment.

Conducting some sort of site assessment can help set realistic expectations of potential yield. Having an idea of predicted yield can be useful when managing a site and related financial matters.

For example a very shallow loam over clay soil or dry deeper sand situated on the top of a hill in a 400 mm rainfall area may be expected to produce less than 1t/ha.

Establishment may be difficult, requiring several planting events to establish and manage sandalwood and/or hosts. The economics of planting sandalwood in these situations would need to be examined.

Example:

Assume a hypothetical site is 10 ha and receives 450mm of annual rainfall. The default yield estimate is 3t/ha i.e. total production of 30t (10 x 3). However the site not uniform and is comprised of:

- 7 ha of well drained deep sandy/loam duplex with moisture at depth (during summer the year prior to establishment)
- 3 small areas each of 0.6ha of shallow clay (1.8ha)
- 1.2 ha of deep dry sand at top of site

Table 1 Estimated Production

Soil	Estimated yield (t) per hectare	Area (ha)	Total estimated production (t)
sand/loam duplex	3.0	7	21
shallow loam over clay	0.5	2	1
deeper dry sands	1.0	1	1
TOTAL		10	23

All areas of the site are expected to be able to produce sandalwood but greatly differing amounts of it as shown in table 1.

The net result is that the site is only expected to produce 23t, 23% less than the default yield estimate.

The financial implication of 23% less production is compounded by a predicted high establishment and/or maintenance cost associated with the two minor soil types.

An additional point to realise is that host and sandalwood establishment can be inherently difficult and potentially more expensive on some soil types.

For example sandalwood establishment can be difficult on soils that dry rapidly and those that are subject to water logging.

In these areas it may take 2 or three sowings to achieve the target sandalwood and or host density.

Dry sands and sandy gravels are likely to be more expensive to establish and will yield significantly less than a deep sandy loam duplex soil.

With sub optimal soils there are three options

- Maintain the current agricultural enterprise
- Use site for an agricultural/forestry enterprise that is better suited to the soil/climate/position in the landscape
- Establish a sandalwood enterprise but be aware of the sites limitations in terms of sandalwood production and manage cost accordingly

Summary

In summary, assess the productive capacity of plantation sites before establishment. Seek professional assistance if required. Finally, if you set realistic expectations of your site you won't be disappointed in the long run.

Mt Romance Market Update

Jerome Ryan, International Sales and Marketing Manager, Albany Western Australia

It has been over a year since I met you all in Beverley, and in that time the global Sandalwood / Oil Market has been true to form – very volatile and very different now compared to 12 months ago…

On the top of everyone's mind is always the price – PURE Indian Sandalwood Oil is currently over USD1500 per kg (if you can get it) – up from about USD750/kg 12-18 months ago. Most products however remain adulterated with castor oil or oil from other species. The dramatic price increase is predominantly the result of decreased supply, but is due to many causes.

Veerapan (the Indian outlaw renowned for his involvement in Sandalwood smuggling) was trapped and killed by police in southern Indian forests in October 2004. Since the end of 2004, about 40 illegal Sandalwood Oil factories have been closed down by the authorities. The Tsunami of December 2004 also reportedly destroyed a number of supply points on the Tamil Nadu coast line.

Whilst increasing price has caused much interest, it has also had significant negative effect. Some large global users of Indian Sandalwood Oil have now deleted it from their ingredients list and it is unlikely they will quickly return to utilising it should circumstances change. The same is true of the incense industry that is finding it difficult to source sandalwood. These industries are increasingly resorting to low grade synthetic fragrances to replace natural wood in incense manufacture.

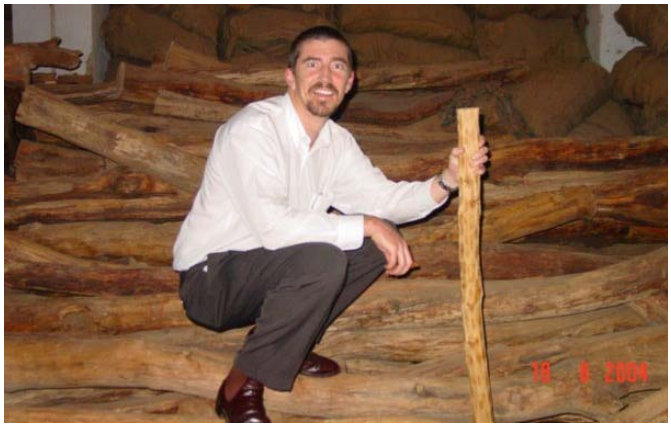
Demand for PURE AUSTRALIAN SANDALWOOD OIL and by-products from MT ROMANCE AUSTRALIA now exceed current productive capacity. Some would say this is a good position to be in from a business perspective however good customer management is increasingly critical to maintain demand and customer preference developed over recent years to ensure strategic customers continue to commit to the unique properties of PURE AUSTRALIAN SANDALWOOD OIL 'long-term'.

Mt Romance has taken the strategic position to maintain supply to leaders in their respective industries who demonstrated early support and collaborative R&D of the Australian Sandalwood products. Whilst we have increased price, we have been sensitive to opportunism and instead focussed on building good long-term strategic and collaborative relationships. In doing so, customers are visiting on a more regular basis to see for themselves the resource in Australia to be more comfortable with its continue availability through good natural resource management and increasing private plantations.

Going forward, our new owners, PURITY AUSTRALIA, offer many new opportunities to the Australian Sandalwood Industry and are committed to the continued development of new and unique indigenous ingredients that compliment our existing achievements.

Significant and immediate capital investment is underway for new production facilities to maintain market confidence through delivery of consistent product quality, continuity of supply and stable price. This is being reflected with new long-term contracts being agreed with leading global fragrance houses.

We look forward to continued association with the Avon Sandalwood Network Inc, and offer whatever assistance possible to welcome your participation in the exciting and dynamic Australian Sandalwood Marketplace in time to come.



Top: Indians preparing sandalwood (S. album) chips for export to the Middle East
Centre: Jerome Ryan (Mt Romance) inspecting stores of 'Agmark' sandalwood (S.album) legitimately harvested through government authorisation. Lucknow NE India
Bottom: Mt Romance, Albany Western Australia

Strengthening the developing sandalwood industry

Tim Emmott, Farm Forestry Coordinator, Greening Australia WA, Northam
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In 2005, Greening Australia (GA), in partnership with Geoff Woodall, Centre of Excellence in Natural Resource Management (CENRM) commenced the first stage of a cross regional sandalwood project.

The initial aim was to extend the positive results achieved in the south coast region of WA with plantations of high host density that contain a biodiverse mix of hosts, to the Avon and Blackwood regions. The potential application of direct seeding hosts in these regions was also assessed.

In the south coast region GA and CENRM have identified over 200 native plant species that can be used as hosts in biodiverse sandalwood systems, and have successfully established in partnership with landowners, over 300 ha. of productive biodiverse sandalwood plantations.

This project focused on numerous actions, including surveying native stands of sandalwood to determine natural and potential hosts, technical support, continuing research and communication. This article provides an overview of the on-ground components, conducted in the Avon and Blackwood / Hotham regions in 2005.

2005 On-ground projects

This project involved the establishment, in partnership with landowners, 106 hectares of biodiverse sandalwood systems in both the Avon (58ha) and Blackwood/Hotham (48ha) catchment areas, focusing on direct seeding a diverse range of native hosts.

Expressions of interest (EOI) to participate in the project were initially sought, resulting in an excellent response from landowners. Sites were assessed and ranked, then chosen sites confirmed with participating landowners. Appropriate host seedlings were ordered and seed collected, based on the regional flora surveys of remnant sandalwood in the regions.

In total 15 individual sites were selected (9 in the Avon and 6 in the Blackwood), ranging from 3 ha to 20 ha in size at various locations. Annual rainfall at the sites varied from 320mm (Gabbin) to 600 mm (Duranillin). Soil types varied including deep yellow sands, duplex soils and red loams.

Site preparation guidelines were developed and discussed with each participating landowner. All of the participants in the Avon projects were members of the ASN. Sites were established between June and August of 2005, using a diverse mixture of native host plants, with the aim of establishing sandalwood seeds in autumn 2006.

In the Blackwood / Hotham, all of the 6 sites were established by direct seeding a diverse mixture of local provenance host seed. In the Avon, 7 of the projects were established using a combination of nursery raised seedlings and direct seeding local provenance host seed. The remaining 2 sites in the Avon were established solely by direct seeding.

Seedlings (where used) were established between 200 and 600 stems per ha, and the amount of host seed used in the direct seeing ranged between 500 and 700 grams per hectare.

All direct seeding in the Avon was conducted with a Chatfield planter that scalps, rips and seeds in a one pass operation. In the Blackwood / Hotham, several sites were direct seeded using a Chatfield planter and several with a modified direct seeding machine (Egad) pulled by a 4WD ute. Host seed was bulked up with fine vermiculite.

Direct seeding Bethan Lloyds property, East Toodyay (380mm), 18th July 2005.

Left: Direct Seeding Bob Huxley's property, Gabbin (320mm), 10th June 2005.
Right: Direct seeding Pat Butterworths property, East Beverley (400mm) 30th June 2005.

Strengthening the developing sandalwood industry

Review of Avon and Blackwood projects as at 31 October 2005.

In general the project has been very successful with most sites (70%) having a diverse mix of hosts at densities of over 1000 stems per hectare (as of 31 October 2005). Results at two sites were very disappointing, requiring remedial action in 2006. A summary of the sites, location, annual rainfall (long term average), size, establishment date, methods and post planting results can be seen in the table bellow. Results are as at the end of October 2005, and have been given a score out of 10, classified as follows;

10: Excellent (more than 1,500 hosts / ha, uniform across the site)
5: Average (approx 600 hosts / ha, somewhat patchy)
1: Total failure (0 hosts / ha)

2005 Avon Projects

Name	Location	Ann. Rainfall (mm)	Size (ha)	Estab. Date	Methods	No. Species	Results
B. Lloyd	East Toodyay	380	3	18/07/05	Direct Seed + Seedlings	16	9
B. Huxley	Gabbin	320	5	10/06/05	Direct Seed + Seedlings	18	8
B. Carter	Tammin	325	10	07/06/05	Direct Seed + Seedlings	26	5
J. Ruggles	West Beverley	500	5	19/07/05	Direct Seed + Seedlings	14	9
K. Jane	South York	450	8	01/07/05	Direct Seed + Seedlings	14	4
K. Malone	West Beverley	500	7	29/06/05	Direct Seed only	14	2
M. Edmonds	Bolgart	450	8	27/06/05	Direct Seed + Seedlings	22	9
P. Butterworth	East Beverley	400	7	30/06/05	Direct Seed only	20	10
W.Dymond	Northam	430	5	10/08/05	Direct Seed + Seedlings	16	7
TOTAL AREA			**58**				

2005 Blackwood Projects

Name	Location	Ann. Rainfall (mm)	Size (ha)	Estab. Date	Methods	No. Species	Results
G. Ball	Wagin	450	20	28/07/05	Direct Seed only	14	7
J. Cronin	North east Katanning	470	7	09/08/05	Direct Seed only	18	10
P. Kerin	East Katanning	470	3	09/08/05	Direct Seed only	12	6
P. Scott	Duranillin	600	7	04/07/05	Direct Seed only	15	10
R. Blagrove	Cuballing	460	5	29/07/05	Direct Seed only	14	10
S. Davis	Katanning	475	6	08/08/05	Direct Seed only	17	2
TOTAL AREA			**48**				

The sites will be continually monitored, to assess performance over the summer. Some in-filling of host seedlings will be required in 2006 at 3 of the 9 sites in the Avon, and at 1 of the 6 sites in the Blackwood. Between 2 and 3 kg per ha of Sandalwood seed will be established at 13 of the 15 sites in autumn 2006. It should be noted additional hosts may germinate and establish following summer and autumn rains.

Discussion of sites with a result of less than 5

Bruce Carter, Tammin, (5/10)

Site established using a combination of host seedlings (600 stems / ha) and direct seeding host seed in a one pass operation. The landowners have many years experience in direct seeding, and have achieved good successes in the past, however their main issue in their previous projects has been weed competition.

The site had a heavy weed burden, and it was decided to apply a combination of Simazine and Treflan pre establishment to provide ongoing winter weed control. The idea was to apply these herbicides directly in front of the seeding operation, so that the scalp created by the planter moved the herbicide away from the planting line, to provide inter-row weed control. The herbicide was applied the day before establishment; however 7mm of rain was recorded overnight, perhaps incorporating herbicide into the soil.

Approximately 20% of the planted seedlings died, or exhibited symptoms of post planting stress, within 8 weeks of establishment. It is assumed this has been caused by a combination of residual herbicide damage, frost damage and post planting shock. In-filling occurred in early August to bring the overall seedling stocking density back up to 600 stems / ha).

Overall a poor result had been achieved with the direct seeding, with reasonable germination in some patches, and other areas very poor. This could possibly be caused by either residual herbicide damage, insufficient treatment of the host seed or seed sown too deep.

This site is not considered a failure, as the planted seedlings have recovered and are very healthy, ensuring there will be enough host seedlings present to establish sandalwood seeds on in Autumn 2006, however this site will require in-filling with nursery raised seedlings in 2006 to bring the overall seedling stocking rate up to at least 1,200 stems per ha, to compensate for the poor direct seeding result.

Bruce Carter inspecting his site post establishment

Strengthening the developing sandalwood industry

Katherine Jane York (4/10)
Site established primarily by direct seeding, plus 200 seedlings per ha. At this site there has been good survival of the planted seedlings. With the direct seeding, there has been a good germination and survival of the *Allocasuarina* species (Tamma & Rock Sheoak), however a very poor germination / survival of the acacia species. This may be due to several factors;

1. Heavy infestation of cereal and green peach aphids, 4 weeks post establishment.
2. Insufficient scarification of the acacia seed

This site is not considered a failure, as there should be a sufficient number of hosts to establish sandalwood seeds on in Autumn 2006, however in-filling with mixed acacia seedlings is required to ensure the site is not dominated by *Allocasuarina* species.

Aphid infestation of newly emerging acacia seedling, 4 weeks post establishment, K. Jane south York

Kerry Malone, West Beverley (2/10).
This is the most disappointing site from the 2005 projects. The site was established by direct seeding a mixture of native host species (650 grams / ha), however there has been a very poor germination across the site. There are some patches where the host seed has germinated, however as at the end of October 2005, there does not look to be enough host plants to establish sandalwood seed on in 2006. This site will be re-planted with a mixture of nursery raised host seedlings in winter 2006.

Steve Davis, Katanning (2/10)
This site established on the 8th of August, by direct seeding 600 grams / ha of host seed using the 'Egad' direct seeding machine. Several problems have been experienced at this site, mainly damage to the newly emerging seedling by Redlegged Earth Mite. The site was sprayed with insecticide on the 20th of September, however this was too late and the damage had already occurred.

There has been a heavy germination of wireweed on the site, inhibiting the growth of the hosts that survived the insect damage. There has also been some stock damage by sheep at this site, setting back the growth of and trampling hosts. This site will be rectified in 2006 by in-filling with a mixture of nursery raised acacia seedlings.

Right: Root development, 4 month old direct seeded Acacia species, Bob Huxley's project, Gabbin.

Summary
As of the end of October 2005, positive results have been achieved at the majority of sites. Of the 15 sites, 70% are considered to have been a success, with the remaining 30% requiring some form of 'in-filling' in 2006.

These sites will be extremely valuable demonstration sites for the Avon Sandalwood Network to monitor over the coming years, to asses the performance and value of using a high density and mixture of local hosts species, compared with traditional methods using low density plantings of Jam (*Acacia acuminata)* as the sole host species. This project will also build on local knowledge of direct seeding commercial species.

By all accounts the season has been 'kind' for direct seeding, with good early and consistent rainfall throughout the growing season, although July was dry in most districts, combined with a succession of heavy frosts. We are hopeful in securing funding to continue this project in 2006, and aim to focus on less than 400 mm rainfall areas.

For many landholders and myself this has been our first experience, and mostly positive experience with direct seeding. It is not as straightforward as establishment via seedlings but the positive results speak for themselves.

If you would like more information on this project (methods, species, results etc) contact Tim Emmott on (08) 9621 2400. Thank you to all landowners who participated in the project. I would also like to acknowledge Geoff Woodall for his assistance in all aspects of this project. This is a SCRIPT activity, funded by the National Landcare Program and coordinated by Greening Australia (WA).

Above: Excellent germination of hosts from direct seeding, Ross Blagrove property, Cuballing

Ringneck Parrots – What are they up to?

Terry Monday, Farmer, tree grower and parrot trap supplier, Boyup Brook WA, Ph: 9767 1227, Fax: 9767 1284

Note from the ASN Secretary:

The Australian ringneck parrot can cause major economic damage to a range of tree crops in southern WA, and sandalwood, especially in the western Avon, is no exception.

Over the years ASN members have experienced problems with parrots in sandalwood plantations. For example, members from east Beverley have experienced parrots ring barking young (1 – 2 year old) sandalwood seedlings at ground level. Members from Calingiri have experienced damage in 3 – 5 year old sandalwood trees as well as hosts. Parrots have damaged branches and growing tips, retarding growth and effecting tree form.

Parrots strip the bark from portions of the stem, and then scrape the exposed cambium and phloem sap with the base of their beaks.

Note, the name 'Australian ringneck' is now the preferred usage in describing the two races of ringnek parrot found in southern WA, being the yellow bellied Port Lincoln parrot and the green bellied 'twenty-eight' and their intermediate forms. Parrots are an issue that growers need to be aware of. For more information on parrot damage and control of the Australian ringneck parrot, contact the ASN secretary or Terry Monday on the numbers above.

Terry Monday – Parrot movements during Spring

During August through to October Australian ringneck parrots are nesting, with an incubation period of 20 to 22 days. Hatching to flying is usually within 30 to 40 days. The young birds will stay with the adults for a few weeks, after which they form groups by themselves.

Control options and notes

- Shooting (when you have time)
- Trapping (after harvest in grain growing areas)
- Parrots can be trapped from December to August
- Parrots rear 5 to 8 young and can breed twice a year so if parrots are a problem now it will only get worse

Parrot numbers can be significantly reduced by trapping and shooting, however it is up to the tree grower to decide if an investment in parrot control is worth the effort.

Recent parrot damage in 4 year old plantation sandalwood in the Tammin area, September 2005

Calingiri sandalwood grower Aaron Edmonds with a purpose built parrot trap

ASN Member Photos

A selection of photos of ASN members, Spring 2005

ASN member Ron Mulder inspecting his 4 year old seed orchard trees in Chidlow

ASN member Pat Butterworth, east Beverley, inter-row weed spraying in young plantation, Sept 2005

ASN member Aaron Edmonds, demonstrating his shielded hand sprayer, for spot spraying sandalwood planting 'spots'

ASN member Jim Ruggles, Beverley, in one of his young host plantings, with recently emerging sandalwood from nuts planted in April 2005

ASN member Graham King, Northam, amongst his 5 year old Jam hosts, and 4 year old sandalwood, October 2005

Geoff Woodall (CENRM) & Mark Ochtman (GAWA) surveying native plant hosts, remnant sandalwood, Northam district

ASN Member Photos

A selection of photos of ASN members, Spring 2005

ASN Member Gordon Taylor, Quairading inspecting sandalwood growing on Acacia saligna in a FPC provenance trial on his property, October 2005

Gordon Taylor in his 5 year old plantation near Quairading. Gordon has set up an irrigation system for part of his plantation

Extracting cossid moth larvae (Family: Cossidae), from 6 year old Jam (A.acuminata) trees, Aaron Edmonds property, Calingiri, October 2005

Cossid moth larvae. Related to witchetty grubs, they can ring bark Jam trees. Trees under stress are more vulnerable to attack

ASN member Matt Edmonds amongst 12 month old mixed species hosts (Oct 05)

ASN member Geoff Woodall scaling a remnant sandalwood tree to assess mistletoe infestation

ASN Member Photos

A selection of photos of ASN members, Spring 2005

Blocks of experimental soap made from the oil extracted from sandalwood (Santalum spicatum) seeds, part of a research project conducted by Geoff Woodall, as discussed at the Cunderdin ASN workshop.

Progress to date:

- Developed an easy method to extract the viscous and sticky seed oil.
- Contracted Thurlby Herb Farm (Walpole WA) to make several trial batches of soap (ie medicated soap as per the medicated soaps that are available at pharmacists)
- Based on previous research, the soap should have strong anti fungal properties but we have not tested the product at this stage. Remember that all soaps are anti microbial but we hypothesize that residues that remain on surfaces after washing will have some residual antifungal activity.

Left: ASN Member Pat Butterworth, Beverley and Geoff Woodall discussing site establishment methods
Right: ASN Member Geoff Woodall discussing sandalwood root development, ASN workshop Sept 05

ASN Member Photos

A selection of photos of ASN members, Spring 2005

Left: ASN member Bob Huxley (Gabbin) in one of his earlier plantations, with a low cost irrigation system
Middle: ASN member Bethan Lloyd (Toodyay) hand planting mixed sandalwood hosts
Right: ASN member Matt Edmonds (Bolgart) with newly emerging sandalwood (Sept 05)

ASN member Merv Taylor (York) hand planting host seedlings on a cold July morning

ASN member Matt Edmonds (Bolgart) inspecting his mixed host species (June 05)

ASN member Jim Ruggles (Beverley) completes a 5 hectare host establishment project (July 05), combination of direct seeding and seedlings

ASN member Wendy Dymond (Northam) hand planting host seedlings as part of a creek line sandalwood project (August 05)

Variation within Jam and its close relatives

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The "jam" tree (Acacia acuminata) is one of the preferred host plants used in sandalwood plantations in the wheatbelt, WA. Jam is a good host because it is long-lived, can withstand the stress of a root-parasite, easily managed and promotes relatively fast sandalwood growth.

On suitable soil types in the 400-600 mm annual rainfall zone of the wheatbelt, sandalwood growing near jam can achieve mean stem diameter growth rates (at 150 mm) of up to 10 mm/year for the first six years.

Although jam often refers to *Acacia acuminata*, this species has two very close relatives: *A. burkittii* and *A. oldfieldii*. In 1999, Bruce Maslin from the Department of Conservation and Land Management conducted a taxonomic review of the jam group and he classified this group into seven variants. Below is Bruce Maslin's description of the jam variants, which is available on the World Wide Wattle website;

1. *Acacia acuminata* (typical variant):
Shrub or tree, 3-10 m tall, sometimes with a single stem 0.3-2 m high. The phyllodes (modified leaves) are flat, 6-18 cm long and 3-10 mm wide. The seeds are black, 3-4.5 mm long, 2.3-3 mm wide and 1.8-2.5 mm thick. Occurs in the western part of the wheatbelt from near Three Springs to Borden and Ravensthorpe.

2. *Acacia acuminata* (narrow phyllode variant):
Rounded shrub or tree, 2-7 m tall, often multi-stemmed with 2-6 main stems arising from the base. The phyllodes are flat, 7-14 cm long, 2-4 mm wide. The seeds are dark brown to black, 3-4 mm long, 1.8-3 mm wide and 1-2 mm thick. Common in the northern, central and eastern wheatbelt and into some of the semi-arid region of the Goldfields.

3. Acacia acuminata (small seed variant):
Rounded shrub or small tree, 2-5 m tall, and multi-stemmed with 3-6 main stems from the base. Phyllodes are flat, 5-10 cm long and 3-6 mm wide. The seeds are black, 2-3 mm long, 1.5-1.8 mm wide and 1-1.5 mm thick. Occurs near Kalannie to north of Yalgoo and east to Binnu. Outlier populations also south of Ongerup.

4. Acacia burkittii:
Multi-stemmed shrub or small tree, 1.5-8 m tall. The phyllodes are 5-20 cm long and 0.5 – 2 mm wide. The seeds are 3.5-6 mm long, 3-4.5 mm wide and 3-4.5 mm thick. Widespread in central Australia, from Yalgoo (W.A) to S.A. and N.S.W.

5. Acacia oldfieldii:
Multi-stemmed rounded or small tree, 2-4 m tall. The phyllodes are flat 7-13 cm long and 3-5 mm wide. The seeds are black, 3-4 mm long, 1.5-2 mm wide and 1-1.5 mm thick. Known occurrence in two populations, along the Murchison River, near Ajana.

6. Acacia acuminata / burkittii (variant 1):
Tree form variable. The phyllodes are 2-3 mm wide. The seeds are 3.5-5 mm long, 2.5-3.5 mm wide and 1.5-2.5 mm thick. Occurs from near Mullewa to near Nerren Nerren station.

7. Acacia acuminata / burkittii (variant 2):
Tree form variable. The phyllodes are 3-8 mm wide. The seeds are 4-5 mm long, 3.5-4 mm wide and 3-3.5 mm thick. Occurs from Eradu to Ajana.

The high degree of variability between the jam variants is partly due to this group growing in a wide range of climatic conditions and soils types in Western Australia. For example, the A. burkittii growing in the arid interior is more adapted to these dry conditions than A. acuminata (typical variant).

In general, when growing jam in plantations, it is best to use the local variant of jam. The local form of jam is less likely to be stressed by the local environmental conditions (e.g. annual rainfall, evaporation, soil type) which can weaken the trees and make them more vulnerable to diseases, such as gall rust fungus (*Uromycladium tepperianum*).

Figure 1 (left) Acacia acuminata (Typical variant). Photo J. Brand

Figure 2. (bellow) Acacia burkittii. Photo J. Brand

Some Notes on Sandalwood

Ben Lethbridge, Lobopogon Research, Clarendon South Australia

For those also interested in that "other Santalum" the quandong, it is possible to have the best of both worlds.

Field grafting of quandong scions onto sandalwood rootstocks is possible (see photograph 1,2,3). The technique, still under development (Lethbridge 2005), would allow harvesting of quandong fruit and nuts and valuable sandalwood timber from the trunk, butt and roots.

Good fruiting of quandong on *S. album* (personal observation) and *S. spicatum* (G. Herde, personal communication) from nursery grafted trees has already been observed.

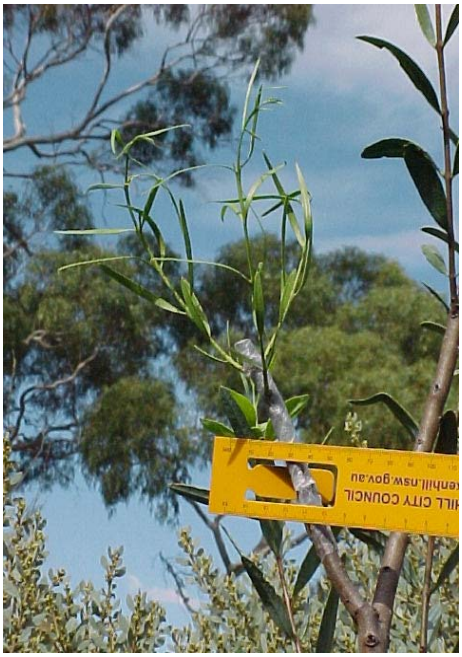
References.

Loneragan O.W. (1990) Historical review of sandalwood (*Santalum spicatum*) research in Western Australia. Research Bulletin No 4. (Department of Conservation and Land Management: Perth) p.12: Pre-sowing seed treatment.

Lethbridge B. (2005) Field Grafting of Quandong (*Santalum acuminatum*) Sandalwood Research Newsletter. Issue 20, pages 1-2

Photograph 1. Six month old quandong scion (Aug 2004 to Feb 2005, Clarendon SA) on sandalwood (S. spicatum) rootstock (graft at approximately 1.5 metres). Note the difference in leaf shape between scion and rootstock.

Photograph 2.Three month old autumn graft of quandong on sandalwood (S.spicatum) rootstock (02/03/05 to 02/0605



Photograph 3. Six month old autumn graft of quandong scion onto Sandalwood (*S. spicatum*) rootstock (02/03/05 to 02/09/05)

Not a member of the ASN? For more information, contact the secretary on the numbers bellow;
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Australian Government
Department of Agriculture, Fisheries and Forestry
National Landcare Program

AVON CATCHMENT COUNCIL

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