



The Australian Sandalwooder

Welcome to the 14th issue of the Australian Sandalwooder, a
produced by the Australian Sandalwood Network Inc.

Autumn 2012

From the Chair

Tim Emmott ASN Chairman

We have just heard that we have been unsuccessful in our application to Royalties for Regions for Mt Marshall Sandalwood in the NE Wheatbelt. It's disappointing because of the huge effort that went into the application, but the work done is not wasted and we will use the information to seek further funding for the future.

Meanwhile the SCIP project funded by WBNRM in Mt Marshall continues apace with the planning for these seasons on ground components well advanced. As part of this project a recent field day was held in Bencubbin which looked at sandalwood plantation establishment and management in the North East wheatbelt. We looked at Gerald Sachse newly established site from last year which looked fantastic.

Presenter included Dr Geoff Woodall, talked about making sandalwood farming more profitable by reducing subsequent management by careful design of plantations for multiple benefits. Dr Peter Ritson's talk was on carbon trading and how we can make it work with sandalwood while Jon Brand spoke about growth rates of sandalwood and host Acacia plants on wadjil soils.

ASN has also partnered with Wheatbelt NRM in an application to the Federal Government's biodiversity fund. We should hear about this by the end of March.

Those of you in the central wheatbelt we hope to see you at our day in York on 29th March at Green hills hall in York. We will look at subjects in the past and into the future such as stocking densities and marketing sandalwood. Please rsvp to Bethan by 24th March if you want attend.

2011/12 Committee

Chair: Tim Emmott (pictured below)

Treasurer: Tracey Salmond

Committee members

Connie and Marty Winch buist

Georgie Chrimes

Bruce Storer

Monica Durcan

Ben Sawyer –FPC rep

Tony Ednie Brown

Bethan Lloyd, Executive Officer, Secretary

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Where are all the people?

By Monica Durcan

A recent Indonesian delegation from the United Nations' International Tropical Tree Organisation (ITTO) visited the Wheatbelt and could not believe the space. Their project is entitled 'Improving the enabling conditions for sustainable management of sandalwood forest resources in east Nusa Tenggara Province, Indonesia'.

The 13 strong delegations came to see WA Sandalwood and meet some of our farmers and while they grow Indian sandalwood (*Santalum album*) which is quite different from our WA Sandalwood (*Santalum spicatum*) their enthusiasm for sandalwood is the same as here. 'The study tour to WA is more about how to empower the people and fostering networks like the Australian Sandalwood Network' said project coordinator Yani Septiani. The group were also keen to understand policies and land ownership.

Delegates included farmers and representatives from the Ministry of Forestry and several district forestry managers. Despite the challenges of language, the group were keen to see as much sandalwood and meet as many people as possible.

The farmers represented village communities where a special sandalwood tree provides the village focus and, like in the film 'Avatar', houses the spirit of the community. They proudly announced that they had in the realm of 400 sandalwood trees in each of their communities that they were looking after – for the benefit of their own communities.

One tour participant is a catholic pastor and keen to get village children involved in looking after the village sandalwood trees.

The tour took them from the Rangelands close to Mt Magnet through to Bencubbin and Koorda, then through Beverley/Aldersyde and Brookton to Katanning, Albany, the Stirling Ranges, Beaufort River, and then back to Perth – a massive 3,100 kilometres in 5 days!

Their main impression of WA was that we certainly have plenty of room for sandalwood but they wondered where all the people were.

Some great bonds were forged and there is talk of having a loose sister-type organisational arrangement between the Indonesian growers and the ASN.

Many thanks to those of you who so generously gave up your time to host the group.





Geoff Woodall showing the group his direct sowing equipment

Mt Marshall Field Day 2nd March, Bencubbin

Around 45 people, including 27 landholders, were treated to a day of valuable information and a chance to look at some newly established direct sown sites. Topics covered during the day included plantation establishment and management in the North East wheatbelt, how sandalwood farming can be more profitable and designing plantations for multiple benefits, i.e. sandalwood, biodiversity, grazing for stock and carbon sequestration.

Presenter Dr Geoff Woodall has done extensive research on sandalwood plantations, including growing his own, and emphasised the importance of spending the time at the beginning to carefully choose and prepare your site, prepare the seed for planting, decide on the most appropriate host plants and ensure sandalwood and host plants are spaced at the correct distance when planting. Dr Woodall discussed his experiments with direct seeding and how using hot water treatment for varying amounts of time on the various acacia species ensures greater success when direct seeding and therefore less volume of seed needed in your operation.

A presentation that catalysed lots of questions was that of Dr Peter Ritson from the Forest Science and Industry Development arm of the Department of Agriculture and Food WA (DAFWA). Dr Ritson spoke about the Carbon Farming Initiative and how it can work with sandalwood and emphasised the need to develop methodologies for carbon sequestration in sandalwood systems and get these methodologies accepted at Federal Government level in order for sandalwood growers to make the most of the CFI.

Jon Brand, senior forester at DAFWA, spoke about growth rates of sandalwood and host acacia plants on wodjil soils and pointed out that their research has found that over-stocked plantations on wodjil soils will eventually collapse, which highlights the importance of thinning. They found relatively slow growth rates in certain hosting arrangements and pointed out the necessity of refining host and sandalwood layout for maximum growth rates. One keen group who flew over from NSW for the field day said the trip was well worth it and the feedback from other attendees was also highly positive. For more info contact Bob and Ros Huxley from the Mt Marshall Sandalwood Committee, bob_huxley@bigpond.com rosmacfarlane@gmail.com



A collaborative project between AVONGRO Wheatbelt Tree Cropping and Curtin University with funding from Lotterywest has aimed to quantify the habitat and biodiversity value of several indigenous perennial tree crop systems in the Western Australian Wheatbelt. Focal tree crops are Brushwood (*Melaleuca* spp.) and Sandalwood (*Santalum spicatum*). Focal response taxa have been birds and wasps which were chosen due to their recognised value as ecological indicators, their functional importance and relative ease of sampling. All sampling of 16 sites, which includes comparisons with woodland and crop sites, has been completed. This has included two repeated samples of insects and four repeated samples of birds. Preliminary identification of wasp species has been carried out. The project still requires that the species identification is refined, and related to ecological roles, such as pest control, and that some more sophisticated analysis of the results is carried out.

Sampling

Insect sampling A total of 16 sites: (7 sandalwood, 3 brushwood, 3 woodland and 3 crop (lupin)) were sampled, each in two time periods – Spring 2010 and Summer 2011.. Preliminary analysis suggested that wasps, along with flies were one of the most abundant and speciose groups. Given their important ecological functions and potential benefit to land management, focus has been on identifying wasp taxa in more detail. Bees were a far smaller proportion of total insect diversity, but have been considered to some extent. Sampling for each site consisted of a malaise trap and eight pan traps (200 mm diameter; 4 yellow, 4 blue). Given the abundance and diversity of wasp taxa (described below), focus has been on identifying taxa of four pan traps from each site (2 yellow, 2 blue).

More than 100 wasp species have been recorded in preliminary analysis. More than ten bee species have been recorded. These figures are likely to be modified with further advice from taxonomic experts. Currently species have been identified to family using Stevens et al (2007) and then based on morphological features, designated a morphospecies (e.g., Braconidae sp. 1)

Bird sampling All 16 sites have been visited four times in order to survey birds. On each visit the site was surveyed for forty minutes, in four 10 minute point counts. Thirty eight bird species have been recorded, 31 of which are considered woodland dependent.

Habitat complexity Based on Smith (2009) habitat complexity of each site has also been quantified. Data recorded included, vegetation density, canopy cover, litter cover and occurrence of structures such as dead wood and rocks.

Preliminary results

Insect biodiversity -The focus of the study has been the winged Hymenoptera (i.e., bees and wasps), with wasps making up far larger proportion of the samples. During spring, wasp species ranged from 5 to 31 species per site, and occupied all sites. Although there is significant variation within habitat types, all crops tended to maintain similar diversity to the woodland sites. In summer, when annual crops are reduced to stubble, wasp diversity decreases. This is generally true for all habitats, with the exception that two of the bio diverse sandalwood sites increase in species, possibly suggesting a role as climatic refugia during the summer.

Bird biodiversity Bird species diversity was maintained at particularly high levels in the Sandalwood sites. Host composition (single or diverse hosts) does not appear to greatly influence bird diversity. Crop age appears to be most important, with the youngest sandalwood crop supporting very few bird species. Woodland-dependent bird species represented the vast majority of species in all apart from the lupin sites, suggesting that both brushwood and particularly sandalwood provide significant habitat for woodland-dependent bird species. Many woodland dependent species were only found in a sandalwood site.

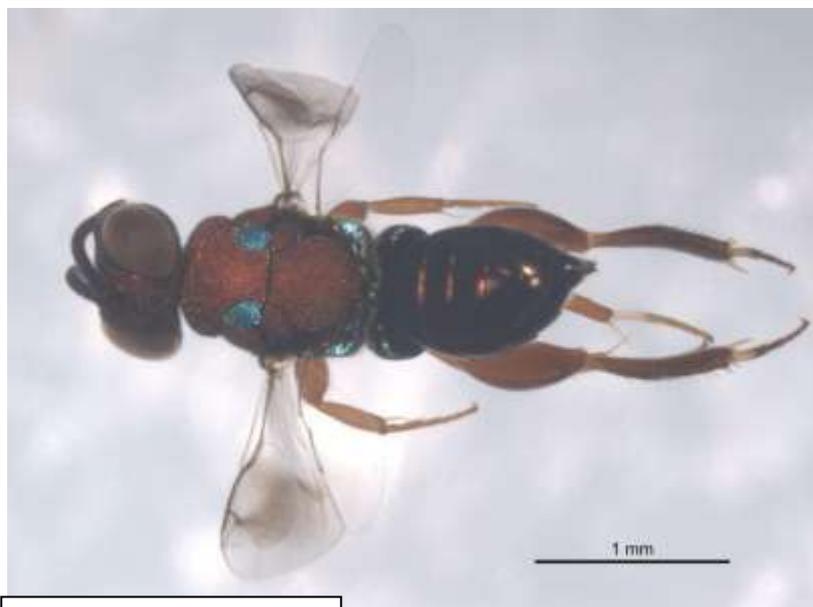
Habitat structure Quantitative comparisons of habitat structure depend greatly on the metrics used. Within the first two metres, brushwood were some of the most structurally complex crops, as were some of the most biodiverse sandalwood sites. This could provide important habitat for shrubland species (e.g., White-browed Scrubwren), which are not necessarily provided for in natural open woodlands. When other variables such as canopy cover and density of litter and woody debris is included, some of the more biodiverse sandalwood sites are most similar to natural woodlands.



Ongoing work

I am currently working with Dr. Brian Heterick, Curtin University, to refine some of the insect (wasp and bee) species identification and relate particular species more directly with ecosystem functions such as pest control. Given that spring of 2010 was such a poor season, it may be opportune to do one more bird survey in October 2011.

Once this data is refined, some more sophisticated analyses comparing species densities and species compositions across the different habitats will take place. Species which are identified as functionally important will be emphasised, and documented including photographs



Wasp 2

Photos show sampling equipment used in the field and the and some of the wasp species discovered



Wasp 1 Braconidae

Be careful when planting your sandalwood nuts

Monica Durcan

Not being an actual grower of sandalwood, I had not given much thought to the distance between a young host seedling and where the sandalwood nut is planted. Only recently when I heard Tim Coakley of Westcorp talk about where the value is in the tree did I remember something I had seen during our Caring for our Country project a few years ago. CSIRO were doing some biomass assessments including some destructive sampling.



Tammi Short of CSIRO pulls up roots of a young sandalwood entangled with its host

Obviously when the nut was planted, the young host was some good 30cm or so away, but imagine untangling the two to tease out the valuable sandalwood roots. And the plants depicted here are only about 7 year or so old!



Tree Crop Peer Mentoring Program

Thanks to Wheatbelt NRM, Peer Mentors are still available to help land managers within the Avon River Basin.

Peer Mentors are farmers who are keen advocates of tree crops and are willing to share their experiences with others to help them on the way to including tree crops as part of their farming systems.

The Program is funded by Wheatbelt NRM, through their Soil Conservation Incentives Program as part of the Australian Government's Caring for our Country Program.

To be put in touch with a Peer Mentor or if you are interested in being a Peer Mentor, contact AVONGRO: 9291 8249 or email mdurcan@iinet.net.au.



CARING FOR OUR COUNTRY

Great Southern field trip October 26th 2011

A few hardy souls travelled down to the Gt Southern at the end of October to view various sandalwood sites. It's a long drive and one of those storms hit as I was approaching on the evening before. The drive up to the bed and breakfast at Curlew creek resembled a river. It was a strange landscape with crops ready for a harvest but with weather more reminiscent of winter. In the morning we met at the Yongernow mallefowl centre for morning tea and a quick look at the Mallee fowl. The wet weather made it likely that some sites were going to be impossible to visit so our itinerary was altered to accommodate this.

Our first stop was at Greening Australia's Peniup property. We looked at a new approach to sandalwood establishment where the long term hosts are off-set (2m) from the sandalwood, with the short term hosts set much closer in. The aim is for the short term host to eventually die and disappear thus making it easy for harvesting.

The aim of this is to allow for mechanical harvesting of the nuts. We also looked at the positives and negatives relating to off-setting water harvesting and seeding.



Participants looking at the offset method being trialled

We also looked at 4 year old sandalwood within the 200ha biodiverse host plantation. The growth of the sandalwood within the same-season part of the plantation (host and sandalwood established in the first year) has been exceptional (some of the 4yo trees have a diameter greater than 80mm at 150mm above the ground).



Looking at the 4yr old bio diverse sandalwood plantation as part of Gondwana link

Effect of age on sandalwood oil yield and quality

Jon Brand Senior Forester, Department of Agriculture and Food, 3 Baron-Hay Court, South Perth WA 6151

Wood quality from plantation grown sandalwood (*Santalum spicatum*) appears to improve with age, with a recent study indicating that it is best to wait until the trees are aged at least 25 years before harvesting (Brand and Pronk, 2011). This study found that trees aged 8-11 years contained only low grade wood, those aged 14 years contained only 12 % high grade wood (butt wood only), while those aged 26 years contained 67 % high grade wood in the butt, roots and large stems. However, even the best quality wood from the 26-year-old trees was still below that harvested from the wild, which on average would be aged over 100 years. For the wood to be of high value, it needs to contain both a relatively high oil concentration (2-3 %) and a high santalol concentration (α - and β -santalol). The butts of trees aged 26 years had 2.6 % oil, which was comparable to wild trees (2.0-3.5 %), but had a lower mean α -santalol concentration (9 %) than wild trees (10-30 %).

Wescorp also found that wood quality in 14 year-old sandalwood trees was low, except for the butt (Coakley and Hettiarachchi, 2010). Their measurements showed that the concentration in the butt was only 1 %, but one of the trees sampled had an α -santalol concentration of 41 %, which was well above that from wild trees. However, the overall value of the 14-year-old wood was still only worth \$1,000 per tonne, de-barked and delivered to the factory. In comparison, wild wood can receive up to \$10,000 per tonne. This study also suggested that it was advisable to wait until the sandalwood trees were aged approximately 25 years before harvesting.

To provide the best chance for a plantation to reach 25 years, it is important not to over-stock the site with sandalwood and also to have a sufficient number of long-lived host trees, such as *Acacia acuminata* and *Acacia aneura*. Preliminary observations from a Forest Products Commission (FPC) trial near Narrogin indicate that sandalwood planted at a high density (600 trees/ha) and with a sandalwood-to-host ratio of only 1:1 were under stress between ages 5-10 years. Whereas, on the same site, sandalwood planted at a lower density (300 trees/ha) and a sandalwood to host ratio of 1:2, had higher survival and growth rates. It should be noted that these results are from only one trial, and at present there are not many mature plantations that can be assessed. However, it appears advisable to have no more than 400 sandalwood/ha in the medium average annual rainfall zone (400-600 mm), and maybe no more than 300 sandalwood/ha in the low average annual rainfall zone (300-400 mm). Each plantation should also contain an adequate number of long-lived host trees, with a sandalwood-to-host ratio of approximately 1:3, so as to maximize sandalwood growth and survival throughout its rotation.

References

Brand, J.E. and Pronk, G.M. (2011). Influence of age on sandalwood (*Santalum spicatum*) oil content within different wood grades from five plantations, in Western Australia. *Australian Forestry* **74**: 141-148.

Coakley, T. and Hettiarachchi, D.S. (2010). Quality analysis of cultivated sandalwood trees from the wheatbelt region of Western Australia for ASN by Wescorp. *The Australian Sandalwooder* 10.



Figure 1. Dean Irving (FPC) near a freshly de-barked 26-year-old sandalwood tree.

Field day in York on Thursday 29th March 2012 at the Greenhills Hall, 9:30am -2pm

Keith and Pam McQueen will speak on challenges they faced becoming licenced exporters of sandalwood. What products their clients are after and volumes. How quality is determined and therefore prices etc. Challenges they and the industry face, eg: supply, plantation readiness etc. What growers can do if we have Q's about markets or products etc?

Dr Pamela Statham Drew will present on the on the history of sandalwood in WA and what we as growers are doing for the future.

Jon Brand stocking rates, thinning your plantation, the importance of thinning to reduce stocking rates, and what the risks are if plantations are left at high stocking rates. Measuring out for stocking rates, culling (excess sandalwood), cleaning, preparation and if there any potential markets for thinnings.

Free to members, \$10 for non-members please rsvps to Bethan on 9574582 by 24th march

Morning tea and bbq lunch provided

Mt Marshall Sandalwood Field Day, Bencubbin Recreation Centre, 2 March 2012

Presentation by Jon Brand

Sandalwood growth rates on Wodjil soils in Mt Marshall Region

Jon Brand, Peter Ritson, Len Norris, Department of Agriculture and Food

During October-November 2011, permanent inventory plots were established on five separate sites in the Mt Marshall region. Four sites contained wodjil soils and the other site consisted of a hard setting clay (Gimlet country). Trees were aged between 3 and 14 years.

At each site, both sandalwood & host plants were measured for growth and tree stocking (trees/ha)

Mixture of host species were measured including *Acacia acuminata*, *A. assimilis*, *A. brumalis*, *A. burkittii*, *A. colletioides*, *A. coolgardiensis*, *A. gibbosa*, *A. hemiteles*, *A. jibberdingensis*, *A. lasiocalyx*, *A. microbotrya*, *A. multispicata*, *A. neurophylla*, *A. resinimarginea*, *A. sessilispica*, *A. yorkrakinensis*, *Allocasuarina acutivalvis*, *A. campestris* and *Hakea invaginata*

Host densities were highly variable between sites ranging from 700 to 4,200 trees/ha. Sandalwood densities were also highly variable ranging from 100 to 700 trees/ha

Sandalwood growth rates were lower than those measured in trials established in the higher rainfall areas (Narrogin – Katanning)

Previous studies indicate that sandalwood trees require approximately 25 years to produce reliable quantities of good quality wood.

Recommend planting sandalwood at low densities (perhaps only 150-250 stems/ha) in the Mt Marshall region to provide the best chance for the trees to survive and grow successfully for 25 years.

Long rotations also need a sufficient number of long-lived (> 20 years) hosts, with a sandalwood-to-host ratio of approximately 1:3, however this will vary if a lot of short-term hosts are incorporated into the planting.

Plantation design should contain some structure to know approximately how many sandalwood are established per hectare.

Picture below shows group inspecting 2011 established plantation at Gerald Sachse property just outside Bencubbin. Typical wodjil country in the back ground

