# The Avon Sandalwooder

*Welcome to the 6th issue of The Sandalwooder, a newsletter produced by the Australian Sandalwood Network Inc.*

## From the Chair

**Aaron Edmonds, ASN Chairman**

**Summer 2007**

**This is the ASN's 6th issue of The Sandalwooder, but it is the first over which I am your new Chair.**

I would firstly like to wish you all a very happy new year and extend my thanks to Bruce Storer for his successive terms as president. The growth in membership numbers is a firm testament as to the success of the group under his guidance. Thank you to the members who have placed faith in my ability to lead the ASN forward. I would also like to acknowledge the work of Tim Emmott in his prior roles as Secretary and ASN extension officer. Without his tireless efforts we would not have such an efficiently run grower's group, and we still greatly value his continued support and contribution to the ASN.

The Australian Sandalwood Network is at an important juncture in its very short life. The direction my efforts will be focussed on are to further both growth in the acres established to sandalwood but also on bringing income forward through realising market opportunities for the sandalwood nut.

Market prices for sandalwood nuts are very attractive this season, driven by expanding plantation needs, although these robust prices will inevitably fall back to more realistic levels in future years. We could be facing an annual harvest of in excess of 500 tonnes in the next few years, but to put this quantity into perspective, global production of almonds was close to 2 million tonnes for the year 2006. If we do indeed see a massive ramping up in sandalwood plantings in the coming years (whether through private or publicly listed interests), it is plausible that nut prices may remain firm for at least the next two to three years. It is important to note that while nut prices remain high, potential food markets will find it hard to justify using such an expensive nut.

The financial situation of the group is strong but we need to examine ways in which we can become more profitable in the future in order to ultimately be self supported. The issues associated with this, in particular the human resource aspect, are examined in the business plan Altier Marketing completed last year. Sandalwood nut development needs to be a priority given any potential timber based revenue for the ASN could well be many years away. Nut revenue could be realised in the near term depending on what role the ASN aims to have in the future.

Our membership base is expanding as interest in the crop grows exponentially. Grower interest and even membership is expanding to well beyond the realms of the lovely Avon Basin. For this reason the Avon Sandalwood Network was officially renamed the Australian Sandalwood Network last January. It is anticipated that this will give the group far greater weight when making future funding proposals and contribution to NRM input, should it be required in policy planning by governments and non government organisations.

2007 was a more typical year with the seasons and rainfall than 2006, and fortunately so far we have not been plagued by locusts. However one concern is becoming apparent in the limited availability of Jam seed *(Acacia acuminata)* which will inevitably have some impact on the establishment of sandalwood plantations. Fingers crossed we have plentiful supply of host trees for this year's plantings and the seed availability will be higher next summer!

Good luck all!

# Mt Romance Invests in the Future of Australian Sandalwood

David Brocklehurst (successor of Andrew Brown) General Manager, Mount Romance Australia Pty Ltd, Albany

**Ph: (08) 9841 7788 Email:** David_b@mtromance.com.au **Website:** www.mtromance.com.au

***The Previous Manager of Mt Romance, Andrew Brown, spoke to the ASN last year about the developments at the Sandalwood Factory in Albany.***

Mt Romance Australia Pty Ltd is investing in the future of Australian Sandalwood by expanding and upgrading its facilities at the Sandalwood Factory in Albany. Investment, in excess of 1 million dollars, in a new boiler and new steam distillation units means that we are in a position to process more Sandalwood and produce a better quality product for our customers.

In today's market for Sandalwood Oil our customers are looking for a stable supply with consistent quality. It is this requirement that is driving the current investment at Mt Romance.

It is the intention of Mt Romance to offer a strong, stable domestic market for Sandalwood growers in Western Australia. In doing this we hope to encourage the local plantation industry to continue develop and expand as growers realise the potential of this valuable commodity.


***Sandalwood Factory, Mt Romance, Albany***

We are not only investing in new plant and equipment but through our factory outlet we are also educating the public in Sandalwood, Sandalwood Oil and its associated products.

The Sandalwood Factory in Albany is an essential tourism experience; we offer a number of activities for visitors to the Albany area. Our factory tour is very popular, during which we explain the Sandalwood story from history to growing, harvest and to Sandalwood Oil extraction and further value adding through the manufacture of perfumes, skin care and cosmetics.

***New 4MW boiler being installed at Mt Romance***

In addition to the factory tour Mt Romance also has a factory outlet where visitors can purchase, perfume, skin care and cosmetic products that are manufactured using Sandalwood Oil. Also by employing the relaxing properties of Sandalwood Oil we also have the Tribal Dreaming Relaxation Centre and the Cone, Gong and Bowl Relaxation Centre. These prove very popular with Albany locals and visitors alike.

At Mt Romance we see investment, education and continued value adding to Sandalwood as an important part of maintaining a strong and viable Sandalwood Industry in Western Australia.

## The ASN's Sandalwood Peer Mentoring Program is here!

**Are you a new grower or considering growing Sandalwood but just don't know where to start?**

Thanks to the University of Melbourne, funds are available for a limited time to trial a Sandalwood Peer Mentoring Program.

The Peer Mentors are not consultants but growers with a wealth of experience in establishing Sandalwood and are willing to share this with potential new growers.

Any landholder wishing to participate in this trial can contact AVONGRO Wheatbelt Tree Cropping for a registration form and more information.

**Contact: Monica Durcan on 08) 9291 8249**

**or Email: mdurcan@iinet.net.au**

# Sandalwood and Climate Change

**Peter Jones, Renew Environmental Services Pty Ltd**
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***Climate change is the buzzword of the moment. For those who have grown up on farms and lived in rural areas, the weather is intimately tied to the economic and social fabric of our lives.***

Variable patterns of rainfall and temperature need to be acknowledged when growing and managing crops and plantations. The same applies to native vegetation that is being "managed" for a variety of purposes.

The causes of climate change are many and while the current debate is centered on human related factors that influence climate change there are also a number of other factors including variations in solar radiation, volcanism, tectonic drift and impacts with meteorites and comets. In short climate change is inevitable with or without humans.

Sandalwood has evolved over many thousands of years within a changing climate. The problem arises when human timescales and economic desires are applied in the natural environment where change is inevitable.

By observing sandalwood in its native state and acknowledging the natural timescales in which it exists we may be able to identify some of the ways sandalwood deals with change.

These include:

- A seed designed to initiate growth once soil moisture has reached a sufficient level
- A seed that allowed a symbiotic relationship with small marsupial mammals that acted as a vector for seed dispersal and facilitated inoculation of the soil with beneficial soil organisms
- Utilising hosts that have the ability to deal with drought and local temperature regimes
- Self thinning and establishment rates that are in tune with the combined carrying capacity of the location including host species
- A growth rate that cycled nutrients on a sustainable basis suited to the site.

As growers seeking a commercial return we are constantly pushing each of these factors in a direction that best achieves our economic objectives, hopefully with due respect for our impact on the environment. The system we tend to favour is one where optimum conditions are established and held in stasis by large inputs of time energy, resources and money.

The factors above are a selection of examples that have allowed sandalwood to "cope" with climate change over the long term and variability in weather patterns in the short term. When we begin to limit or restrict the way in which these factors operate, we reduce the ability of sandalwood to "cope" with change in its environment.

Conversely the more we assist and facilitate the above factors the more robust and sustainable our system becomes. This is not to say that all things can be "managed". The range and distribution of sandalwood has altered and changed over time and will continue to do so as with any organism on the planet.

The challenge for all growers is how to best use sandalwoods natural attributes to achieve their own desired goals. Acknowledging and accepting the limits of what is possible in the Western Australian environment, including our changing climate is a good start.

# Innoculation of Acacia acuminata with Root Nodule Bacteria for *Santalum spicatum* plantations

**The Mulga Research Centre:** [1]Sacha Ruoss, [2]Todd Edwards, Liz Barbour, John Fox, Elizabeth Watkin & Lesley Mutch. [2]**Phone: (08) 9266 7872 Email:** [1]sacha.ruoss@student.curtin.edu.au

***The Mulga Research Centre (MRC) of the Department of Environmental Biology at Curtin University of Technology has been involved in Sandalwood research since the 1980s.***

Study sites include both the Bentley campus and several locations in the wheat belt. Areas of interest include factors affecting flowering and fruiting, stem growth and fruit yield in Sandalwood (*Santalum spicatum* and *Santalum album*).

Current research, initiated by the Forest Products Commission, involves investigating the effectiveness of inoculation of *Acacia acuminata* with root nodule bacteria (RNB) to enhance host growth.

The inoculation of leguminous Sandalwood hosts with RNB has so far been overlooked in the establishment of *Santalum spicatum* plantations. Many plantation sites are on former crop or pasture land that has been devoid of native vegetation for over half a century. In such areas, indigenous populations of RNB are thought to be in seriously low numbers.

RNB exist in symbiotic association with *Acacia* species and other legumes. They convert atmospheric nitrogen ($N_2$) into ammonia ($NH_3$) and nitrate ($NO_3$), which can be utilized by Sandalwood hosts.

The optimisation of this system is important for reducing nitrogen based fertiliser usage, whilst still maintaining high survival and growth rates of hosts.

Our current study is based on testing the effectiveness of different RNB strains on growth of *Acacia acuminata* (typical variant) compared with nitrogen added controls.

*Acacia acuminata* is the most popular Sandalwood host, and is therefore the focus of current research. Studies are also being completed on physiological characteristics of various RNB strains, for example their pH, salinity and temperature tolerance.

The anticipated goal of this study is to gain an understanding of RNB, which will ultimately lead to the development of a commercial innoculant for application to seedlings in the nursery or directly to *Acacia* seed.

Such a product would allow the host to have greater resistance to parasitic loading. This would allow hosts to maintain Sandalwood for longer periods and improve the supply of nutrients to the parasite, without the need for fertilisers.

Further information on this study can be obtained from Sacha Ruoss, who is conducting the research, under the supervision of Prof. John Fox (MRC), Dr. Elizabeth Watkin, Dr. Lesley Mutch (Curtin Microbiology), and Dr. Liz Barbour (Forest Products Commission).

***RNB isolated from Acacia acuminata nodules growing on lupin agar.***


***One week old Acacia acuminata seedlings growing in axenic (sterile) conditions inoculated with RNB.***

# Whole Tree Harvesting

Grant Pronk, Manager Arid Forest Section FPC
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***The Forest Products Commission (FPC) has recently introduced the concept of "Whole Tree Harvesting" in its Western Australian Sandalwood harvesting and regeneration operations in the State's Rangelands.***

Whole tree harvesting requires sandalwood trees to be fully extracted from the ground with attention to maximising root and branch recovery. The emphasis is placed on the recovery and utilisation of all woody material including the smaller branches and twig material which traditionally have had no commercial value and therefore are left in the bush. Sandalwood product development and market acceptance performed by the FPC and its processing and export contractor Wescorp Sandalwood, is now allowing for small volumes of very low grade sandalwood such as branches and twigs to be included in the export product mix.

***Western Australian Sandalwood tree lifted from the ground – all the woody material from this tree will be utilised.***

The very low grade products contain little, if any heartwood and the FPC has found it extremely difficult to sell as a stand-alone product, however, the incorporation of this material into blended sandalwood powder mixes and the end market acceptance of the final product is the key. It is the FPC's ultimate aim to utilise 100% of all sandalwood trees harvested, product and market research into the remaining sandalwood bark and the foliage has commenced.

# 2006 Australian Sandalwooder of the Year Award

Tim Emmott

**CONGRATULATION TO BERT AND NORMA WANSBROUGH, WINNERS OF THE 2006 'AUSTRALIAN SANDALWOODERS OF THE YEAR' AWARD!**

The development of the sandalwood industry in the Wheatbelt and the strength of the ASN is enhanced by the willingness of existing sandalwood growers to share information and experiences and support new growers. To acknowledge the contribution individual members have made by going out of their way to help new growers and members, and support our association, we have introduced the "Australian Sandalwooder of the Year" award. The ASN executive committee would like to award the inaugural Australian Sandalwood of the Year award for 2006 to Bert and Norma Wansbrough of Beverley. Both Bert and Norma will receive a complementary 2007 / 08 financial year membership to the ASN valued at $100.

Bert and Norma 9 of the 10 ASN field days and workshops and have allowed the ASN to visit their plantations numerous times at these events. Last summer they assisted the ASN with nut de-husking in conjunction with their neighbour Neil Murray. The ASN congratulates Bert and Norma for their contribution to this industry and for supporting the ASN. The 2007 Award is to be announced shortly!


# FPC update

Steve Ward, Senior Establishment Officer for Plantation Operations, Forest Products Commission, Bunbury.

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***The Western Australian Sandalwood tree (Santalum spicatum) has provided ongoing and sustained commercial benefits to the Western Australian economy since the early days of settlement.***

Until fairly recently, Sandalwood was generally only found and in natural stands throughout Western Australia but this has changed with this species now established as plantations and providing an exciting addition to FPC's suite of species planted in the mid rainfall agricultural areas of the South West of Western Australia.

With the Strategic Tree Fund (STF) underpinning its operational programme, the FPC has embarked on a 3 year scheme to establish commercial plantations that provide environmental benefits in areas that would not usually attract commercial investment in trees.

Sandalwood is a component of this programme and is attractive in that it is tolerant of a variety of site types, is endemic and has an established market with known returns.

***3 year old plantation Sandalwood at Esperance***

The FPC recognises that future additional yields of Sandalwood to current and future markets will require plantation sourced timber. To provide for these markets, the FPC expects to establish approximately 4000 hectares spread over 3 years of the current NAP funding round which is in place until June 2008.

FPC plantation establishment in 2006, the first year of STF funding, met targets for land acquisition across all regions with interest in the Sandalwood component of the scheme being very high. It already appears as though operational targets will be fully subscribed for the remaining 2 years of this scheme.

This level of establishment provides many operational challenges in establishing commercial plantations given that Sandalwood is a hemi-parasite that requires a host plant to provide essential nutrients to maintain growth and survival, and getting all the components working properly can sometimes be difficult.

Establishment in 2006 was not helped by nature's fickle hand with frost damage of both hosts and sandalwood common early in the year across the South West. The dry start to the year also posed problems with successful weed control and host establishment, especially where direct seeding was concerned. 2007 was less challenged by nature but survival counts in March 2008 will give a better indication of the effects of the season on plantation survival.

***Frost affected Acacia saligna near Collie in 2006***

The FPC commercial Sandalwood plantation development process is currently one of evolution rather than revolution with a focus on measured gains through breeding, host selection, establishment systems, plantation layout and silviculture. A key part of this process is the formation of a Sandalwood Technical Working Group (STWG) established within the FPC to draw together key staff involved in Sandalwood research and operational establishment.

# FPC update continued

In terms of current practice, the FPC generally establishes Sandalwood plantations using Acacia seedlings as the host with Sandalwood nuts placed next to the seedlings when they are a year or two old which is a generally accepted method for commercial plantation establishment. However the FPC is also trialling direct seedling techniques and a combination of seedling and seeding systems in a one year establishment operation with encouraging results materialising.

***Sandalwood seedling amongst direct seeded and seedling hosts***

Direct seeding is known to provide benefits for establishment by reducing the number and therefore cost of seedlings, increasing species diversity to give greater host access to the Sandalwood seedlings and providing environmental benefits by placing a number of local species back into the agricultural landscape.

While the benefits from direct seeding are recognised and results encouraging, the FPC is finding that there are many things to learn in terms of establishment techniques, weed control and species best suited as Sandalwood hosts on different site types.

Despite the challenges, this development work by the FPC highlights the fact that contemporary forestry, as conducted by the FPC, is becoming much more integrated with traditional agricultural farming systems and is successfully combining approaches to produce better results.

# Seperating husks from sandalwood nuts and the importance of moisture content

Geoff Woodall Centre of Excellence in Natural Resource Management, University of Western Australia
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***Fruits of sandalwood usually mature and fall from parent trees between October-January. Once collected the next task at hand is the removal of the husk (epicarp and mesocarp) from the nut, which is done by individual growers or by seed merchants who purchase whole fruits.***

Separating sandalwood nuts (that is the true seed and the woody endocarp) from their husk is a simple process whether the amount to be de-husked is large (tens of tons) or small (1-500kg) providing that the moisture content of the husk is low.

**Husk moisture content**

Atmospheric moisture content has a major impact on the husk moisture content (Figure 1). Husk moisture content may exceed 20% when the ambient storage atmosphere is moist (ie relative humidity greater than 80%). When stored in dry atmospheric conditions, relative humidity of less than 20%, husk moisture content is usually lower than 5%.

In comparison to the husk, the endocarp and true seed display less fluctuation in their moisture content as the relative humidity of the storage environment changes (Figure 1).

The husk moisture content is critical to the de-husking of nuts, as some physical characteristics of husks alter as the moisture content changes.

Husks of low moisture content (eg moisture content of less than 10%) are brittle and shatter into small fragments when compressed and can be easily ground into a fine brown power.

When of higher moisture content, husks are leathery and malleable and will not shatter when compressed, but tend to tear instead. Dry husks rapidly absorb moisture from the atmosphere and the nature of the husk changes from brittle to malleable as its moisture content increases.

Understanding and managing the moisture content prior to de-husking is important as de-husking dry and brittle fruits is effortless in comparison to de-husking slightly moist and leathery fruits.

Prevailing conditions in the author's home town of Albany (WA) are moist in both summer and winter and it is often difficult to dry husks to a brittle state without the assistance of a hot house or drying oven.

However, in most other parts of southern Australia summer conditions are generally much warmer and the air drier. During periods when dry conditions exist (summer-autumn months in southern Australia) fruits can be spread out in a shed or in the open area until the husks become brittle.

Even during summer, husks that were brittle the day before may absorb moisture from the atmosphere over night (when the relative humidity rises) and one may find that husks take until mid morning before they become brittle again.

***Figure 1: Influence of relative humidity on sandalwood fruit moisture content. Data generated by placing the same component parts of 10 fruits in air of differing relative humidity (RH) for 48 hours prior to determining resultant changes in component mass.***

# Seperating husks from sandalwood nuts and the importance of moisture content

Geoff Woodall Centre of Excellence in Natural Resource Management, University of Western Australia

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***Mechanical de-husking equipment (left) - commercially available machine designed for macadamia fruits and (right) a sandalwood nut de-husker developed by Neil Murray and Bert Wansbrough.***

***Left: Stomping fruits. Right: Nuts and pulverized husks after first stomp and ready for sieving.***

***Left: Nuts after first stomp and sieve. Right: Nuts after second stomp and sieve.***

# Dead sandalwood on private land – a valuable resource

Tim Emmott

I regularly come across landowners & farmers who have a native sandalwood resource on their property, however quite often people do not realise they have this resource or appreciate its value and vulnerability.

Last year I assisted a number of landowner members of the ASN to apply for a licence through the Department of Environment and Conservation to "pull" and sell the dead sandalwood on their properties. I encourage landowners with a native sandalwood resource to consider obtaining a licence to pull their dead sandalwood as the income generated can be used to finance new plantation establishment on their properties or aid in enhancing the health of remnant stands of sandalwood, building the value of any remaining live trees.

If dead sandalwood is left untouched landowners risk losing this valuable resource through bush fire, decay or even theft. Green trees are probably more valuable as a seed source given current market prices however, there are situations where pulling green trees has merit. I feel this is most applicable in situations where the landowner is establishing new sandalwood plantations, and the life expectancy of the green trees is low (due to decreasing health of host resource, exposure, grazing pleasure etc). Or in areas where there has been strong sandalwood recruitment and thinning would be beneficial to the remaining population.

I encourage landowners looking to pull green trees to try to collect seed from these trees prior to pulling and re-establishing this seed around the farm to conserve the local genetics. It is also worth considering taking measures to improve the condition of natural stands, through stock exclusion, rabbit and weed control and encouraging further host and sandalwood regeneration.

For more information on licensing requirements for pulling native sandalwood, contact Wildlife Licensing, Department of Conservation and Land Management, (08) 9334 0455. There are members of the ASN have been pulling under licence from private property for several years, and are more than happy to share their experiences with anyone considering pulling dead wood from their property. For more information on how to enhance host regeneration and the health of a remnant stand of sandalwood, contact Geoff Woodall from CENRM in Albany.

***Dead sandalwood on private property. This could be lost in an instant with a severe bushfire, a very real prospect in the wheatbelt. Harvesting this resource can generate revenue to fund new plantations on private land.***

***Inspecting a dead sandalwood tree to be harvested. Estimated weight 200+ kg***

***A live tree 'on its way out'***

# ASN Field days and Workshops in 2007

Tim Emmott

Thanks to funding provided to Greening Australia by the Avon Catchment Council, and the support of our members and contributors, the ASN was able to run several successful field days during the previous year. Our field days are a useful in extending research and technical information, as well as grower's experiences.

The ASN compiles a summary of each field day, capturing the key messages discussed on the day. All members are invited to request electronic or hard copies of these field day notes following the events. Our main events held during 2007 were a follows;

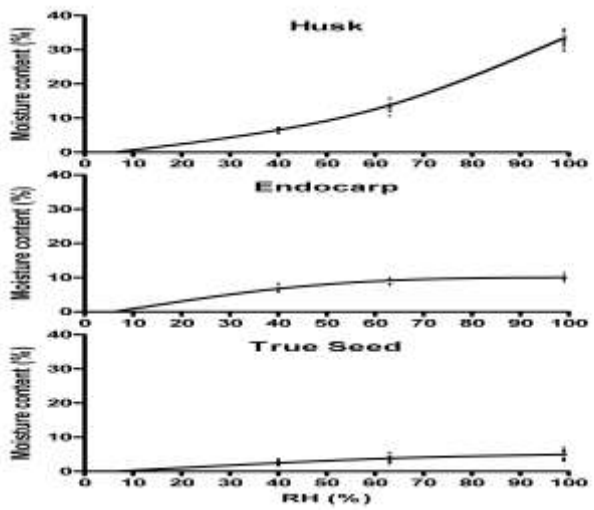
**Introduction to Sandalwood production in the Wheatbelt**

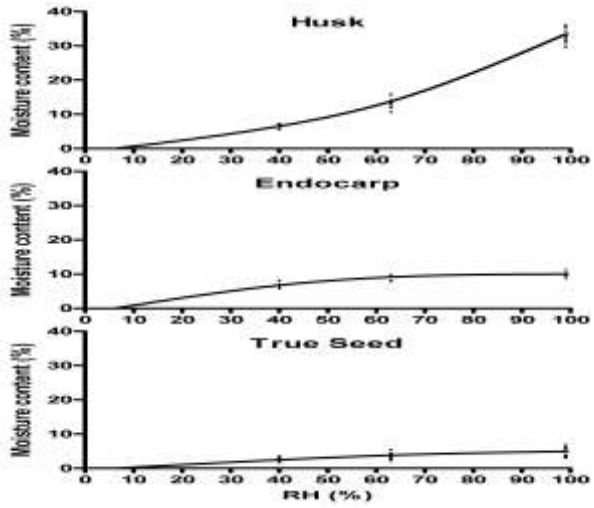
**ASN Autumn Field Day, 3rd April 2007, Toodyay**

**Sandalwood Mentors Workshop, 23rd July 2007, Grass Valley**

**AGM & Spring Field Day, 26th September 2007, New Norcia**

***Geoff Woodall demonstrates a nut sucker at the April field day.***




***De-husking demonstration in Northam, January 2007.***

**The next Autumn Field Day event will be held in early April!**

**The date and venue is yet to be officially confirmed.**

# Grower innovation! Purpose built nut dehusker

Tim Emmott

In 2006 Beverley sandalwood growers and ASN members Bert and Norma Wansbrough teamed up with their neighbour Neil Murray to design and construct a sandalwood nut dehusking machine, as nut production from their existing plantations was starting to increase. With much trial and error together they have developed an efficient mechanised dehusker. This machine was demonstrated at the ASN special general meeting in Northam on the 3rd of January 2007. Throughout January and February 2007, Bert and Norma dehusked numerous small batches of Sandalwood seed for the Australian Sandalwood Network, using their purpose built machine.

An interesting aspect of the dehusking Bert and Norma conducted on behalf of the ASN was the variability in the yield of clean seed compared to the husk on weight, varying from 54% up to 77%. This has obvious implications for people selling and buying sandalwood seed with the husk on.

***Table shows variability in yields of clean seed compared to their original mass with the husk on.***

# Sandalwood Market Report, 2007

Tim Coakley, Executive Chairman, Wescorp Holding Pty Ltd

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**WESCORP HOLDINGS PTY LTD**

Wescorp have been involved in the sandalwood industry since 1994 when they were appointed as the processing and marketing agent for the Department of Conservation and Land Management (CALM) in Western Australia. Wescorp continue to be the agent for Forest Products commission and during this time have processed and marketed over 25,000 tonnes of *Santalum spicatum* sandalwood.

In order to gain better knowledge of the total sandalwood industry, Wescorp started trading in other sandalwood varieties from other parts of the world from January 2005. With the gradual downturn in world supply of sandalwood, the volume of sandalwood handled by Wescorp is over 50% of the total world traded sandalwood each year. The executive chairman, Mr Tim Coakley has been actively involved since 1994 and the Wescorp Sandalwood manager, Mr Norman Butler has been involved since 1995.

Wescorp sell sandalwood products to UK; Europe; Canada; USA; Southern Africa; Middle East; India; All of South East Asia; Japan; and China. Many of the relationship with the customers actually existed before 1994 with other products the Wescorp group were selling at the time.

**SANDALWOOD PRODUCERS OF THE WORLD**

**INDIA:** Sandalwood from India has always been the benchmark to measure other sandalwood from. It is often referred to as *"Old Mountain"; "Lau Shan"; or "Mysore Sandalwood".* The botanical name is *Santalum album* and it grows from India through south East Asia, and has even been introduced into Fiji in the wild.

Where 12 years ago, it was estimated that around 12,000 tonne was being harvest from India alone, it is now down to around 1,200 tonne per annum. What is being harvested now it is immature and not a true representation of the original "*Mysore Sandalwood*".

The Indian Government have only recently set a structure where plantations can be established in India and last year the first ones were established. About 80 to 100 hectares was planted.

In the Assam area they have been planting longer with the Aquilaria but these are more a "garden plantations" than commercial ones as we know them.

**SOUTH EAST ASIA:** Most of this resource has been eradicated in the last 10 years, and is generally illegally harvested. The trees are generally the *S. album* species and there may be between 400 and 500 tonne in total from this region in any one year now. The supply is very erratic and the quality, risks and dangers vary from time to time.

Attempts to re-establish sandalwood have been tried in many areas, but have generally been discarded due to grazing pressures and security of product being stolen just before it is mature for harvest.

**PAPUA NEW GUINEA:** PNG has sandalwood, but the risks for life and quality of product are very high. We estimate about 200 tonne comes from here every year that is real sandalwood and a further 600 tonnes is harvested that is false sandalwood with little market value. The tree is *S. macgregorii* and it ranks fourth on the value scale.

Re-establishment does not exist, however trials have been carried out in northern Queensland for some time and there is enough research completed in Queensland to establish plantations of this species if they wanted to.

**PACIFIC:** This resource is poorly managed and harvesting over the centuries has always come in waves. It seems to be a 30 year circle and we are currently coming to the end of one of those circles now. The two varieties that grow in this region are *S. yasi* which is ranked second on value to *S. album* and *S. austrocaledonicum* which is third ranking.

Garden and commercial plantations are being established in this region and propagation is very popular in many of the villages throughout the region now. The oldest commercial plantations are over 10 years old now but not really very big. Larger plantings are expected in the next few years and they are using their own varieties. There are many false types of sandalwood in this region and trading has its risks. We estimate that about 400 tonne is harvested per annum from here.

# Sandalwood Market Report, 2007 continued

Tim Coakley, Executive Chairman, Wescorp Holding Pty Ltd

**Phone: (08) 9418 2888 Email:** tim@wescorp.com.au

**QUEENSLAND:** Harvesting is Government controlled, poorly, but they harvest between 300 and 500 tonne of sandalwood per annum. Six years ago they were harvesting 1,000 tonne per annum but the pressure on the diminishing resource has forced them to cut this back.

The variety harvest in Queensland is ranked sixth on the value scale and is known as *S. lanceolatum*. DPI has done many re-establishment trials and these have been very successful, but it has not been taken up for commercial plantations. There is illegal harvesting in Queensland and these figures have been included in the totals.

**WESTERN AUSTRALIA:** *S. spicatum* has been harvested from WA since 1845. All wild *S. spicatum* is vested in the State and harvesting is strictly controlled. This sandalwood is ranked fifth for value on the world market and the only species that is being harvested in sustainable manner in the world. Forest Products Commission (FPC) is responsible for the harvesting, re-establishment, and research for this sandalwood. Western Australia has *S. lanceolatum* sandalwood resource; however this is not being harvested.

Approximately 2,100 tonnes of sandalwood is harvested annually by FPC and private licensees. Two thirds of the product is green and the balance is dead wood. One third of the harvest is used by oil extraction processors to obtain sandalwood oil which they market independently and of the balance, 90% is processed into powder or pre-grind for markets to use in the agarbatti industry.

Re-establishment of *S. spicatum* from the wild harvested areas has been successful and strict processes have been put in place and supervised for this to continue.

Commercial plantations have been established since 1999 and WA leads the world in volume, quality, research and knowledge of sandalwood plantations.

## USES FOR SANDALWOOD

**CARVING LOGS:** This is the premium market across all sandalwood species. It is generally used as the benchmark for comparing the value of different species. It is used for religious statures, fans, beads, in-lays of furniture or ornamental show pieces.

The general specifications for this product are as follows;

***De-sapped, totally clean heartwood logs with a smooth surface, with a minimum diameter at the smallest end of 10 centimetres. The minimum length of 30 cm and be no longer than 1200 cm. Must be circular and have no hollows, cracks, knots, and be entire. All sapwood must be removed so there is only good heartwood. Ends will be sealed with a clear end sealer product.***

*S. album, S. yasi, S. austrocaledonicum* and *S. macgregorii* are the only sandalwoods that are suitable for this market at the moment, but we expect the plantation *S. spicatum* from higher rainfall wheat belt areas to develop this product in the future. About 200 tonnes of carving log is sold per annum throughout these species. The market is always finding new types of wood that they can use to substitute this product in the industry due to the short and ever decreasing supply. The potential for this market could be up to 1,000 tonnes per annum.

**SANDALWOOD OIL:** The majority of all roots, butts, and logs of green trees from all sandalwood except *S. lanceolatum* are channelled to the oil extraction in different parts of the world. It is used for parts of formulas for perfume, chewing tobacco, medicines, aromatherapy and other cosmetic products.

Due to the decreasing supply, this has become a dangerous market for synthetics, and substitutes are being utilised in the industry. A significant threat at the moment is the “East African Sandalwood” oil that they are blending with *S. album* oil. There is approximately 1,500 kg of this getting into India alone each month. This is not a *Santalum* species, but it has been around for centuries at the cheaper end of the scale. Prices reached a peak in 2005 and since then they have decreased by 50%. Recently the focus of the end users has been to consider sustainability of the particular oil before anything else. All species have suffered except *S. spicatum.* This has remained stable and demand has increased for this inferior product due to sustainability. In the last 10 years, oil production throughout the industry has moved from 300 tonne per year to about 120 tonne currently. Demand for the oil in aromatherapy is growing and this is a new industry for this product. WA currently produces about 12 tonne. The development of very good synthetics has really put a ceiling on the price of the sandalwood oil for the future. Natural will always be a premium, but not too high over the synthetic oil.

# Sandalwood Market Report, 2007 continued

Tim Coakley, Executive Chairman, Wescorp Holding Pty Ltd

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**AGARBATTI INDUSTRY:** We must understand that if you take the carving logs out of the equation, the balance of the sandalwood products all gets burnt. Even after the oil is extracted from the high quality sandalwood, the remains is mixed into powders and used in this agarbatti industry.

Agarbatti is a very large industry and involves the manufacturing of joss sticks, cones, coils and other burning products for both religious and aromatics uses. We believe there is probably 500,000 tonne of timber that goes to this industry every year and yet only 5,000 tonne of this is sandalwood. The vast majority of the timber is yellow and red cedar with synthetic oils added to the mix to produce the desired sandalwood or other aroma.

As the consumers become more affluent and move towards more natural products and more true sandalwood products become available, the size of the potential market for agarbatti is enormous. Even if we increase the production of sandalwood 10 fold to 50,000 tonne per year, it is still only 10% of the current consumption.

The price is going to always be a significant influence in the agarbatti industry, as this will always compete with synthetics and substitution. Wescorp consider agarbatti to be the lower end of the market and will always be very price sensitive, however the market is there to be supplied.

**PLANTATIONS OF SANDALWOOD IN WA**

***Santalum spicatum*:** Fortunately large areas have been planted and established in Western Australia since 1999. WA leads the world in sandalwood plantations. The single most significant advantage that WA has with *S. spicatum* over all the other sandalwood is that the wild Sandalwood is sustainable and will remain in the market place for as long as we choose.

Continuity of supply is vital so that a market remains able to recognise the *S. spicatum* to the future particularly while the plantations grow towards maturity. The jury is still out on the value of the plantation sandalwood compared to the current wildwood prices and quality, but we believe the longer it is given to mature before harvest, the better the quality and price will be.

Further development on product development of the *S. spicatum* seed is very important. WA sandalwood has this unique advantage over all other sandalwoods. Plantation owners will be able to have an income from the seed for the life of the tree while it matures to a quality harvestable age.



# South Coast and Great Southern Sandalwood Field Days

Melinda Moule, Centre of Excellence in Natural Resource Management (CENRM)

**Phone:** (08) 9892 8585 **Email:** mmoule@agric.wa.gov.au

***The Sandalwood Investment Steering Group for the South Coast and Great Southern held two field days in March 2007. There was a great turn out with 32 in attendance for the first event held in Borden.***

The field tour included visits to a biodiverse sandalwood plantation in Ongerup and a large scale Forest Products Commission (FPC) planting north of the Stirling Ranges. Presentations covered various aspects of the sandalwood industry; Geoff Woodall (CENRM) provided an industry and resource update, and also discussed plantation management. Andrew Brown previously of Mt Romance gave an excellent insight into the company's product range and into operations at the Albany oil extraction and manufacturing facility. Penni Hewett of the FPC discussed the Strategic Tree Farming program and Melinda Moule (CENRM) provided an introduction to the Australian Sandalwood Network.

The following event held in Esperance was attended by a smaller though very enthusiastic group. Including presentations and visits to the Helms Arboretum (to inspect an impressive stand of sandalwood host *Acacia acuminata)* and a FPC plantation with 3-4 year old sandalwood, the day was also very successful. Many thanks to all involved for their participation and support.

***Participants of the Borden Field Day, inspecting a recently established site North East of the Stirling Ranges, 15th March 2007***

***The enthusiastic group at the Esperance Field Day 22nd March 2007***

# Sandalwood Productivity

Melinda Moule, Centre of Excellence in Natural Resource Management (CENRM)

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***Researchers from the University of Western Australia's Centre of Excellence in Natural Resource Management (CENRM) are currently measuring the productivity of established sandalwood plantations.***

Data collected is used to estimate potential product yield over the 20 year rotation period. Several 5-7 year old plantations on a range of soil types and rainfall zones have already been surveyed.

Results so far have highlighted large within site variation in production potential, uneven distribution of sandalwood within sites and a trend for stocking density of sandalwood to be variable and often at higher densities than the recommended 300-400 stems per hectare.

Results so far also indicate that in the 450-600 mm rainfall zone, on optimum soils, some plantations are on track to produce 3-5 tonnes per hectare over the 20 year rotation, though more data is required.

CENRM will be continuing the study and final results will be presented at subsequent grower group meetings.

***Researcher Ben Puglisi taking measurements of sandalwood stems.***

# Impact of Australian Plague Locust

Tim Emmott

***Over history troublesome locust plagues have been observed at irregular intervals throughout the south-west agricultural regions of Western Australia. The destruction caused to recently established acacia host seedlings as a result of the locust plague in November 2006 was relatively widespread throughout the western and central regions.***

Some areas were hit hard by the ravishing locusts last summer and others seem to have been particularly fortunate that the locusts by-passed their properties. Feedback we've received has generally indicated that host trees over one year of age were more resistant to attack or able to recover from any defoliation. Only minor reports of young emerging sandalwood saplings being impacted and growers have stated that both young and mature sandalwood have been relatively unaffected and if damaged, they have recovered.

However, newly established host trees that had been planted 2 or 3 months prior to the locust invasion (winter 2006), were particularly vulnerable to attack during the 2006 plague. This vulnerability has proven costly in some situations, with reports that several plantations received extensive damage to recently established acacia hosts that are now being replanted in winter 2007.

Growers have expressed varied opinions on the effectiveness of spraying their plantations with insecticide. Control measures taken before the locust swarms form, that is when the locusts are still in their 'hopping' stage, seems to have been to most effective method of dealing with them. The locust plague of 2006, combined with the especially dry conditions during winter, spring and summer has made 2006 a particularly challenging year for sandalwood host tree establishment for many growers throughout the wheatbelt. However effected growers have bounced back, in-filling this year if required and continue to drive the industry foreword.

**GROWERS' EXPERIENCES AND VIEWS**

**Ron Mulder, Beverley/ Quairading:** (The locusts) pretty much wiped out newly established host trees, anything that had only been in the ground for 2 or 3 months. No substantial damage to trees that were 1 year old or more, "minor defoliation, but not significant enough to damage the health of trees". We did spray with insecticide, a couple of applications, although this seemed to be rather ineffective- however we had to try something as part of our management responsibilities. The (locusts) kept coming from other properties after spray applications so we decided to stop and let nature take its course. There was a little damage to the new sandalwood trees as they came through, although it has stunted their growth rate and put them behind at least a year. We will be replanting hosts winter this year, as we lost up to 70% of hosts in one new plantation. This proves very costly with multiple spray applications as well as infill planting.

**Dave McMillan, Forest Products Commission (FPC Sandalwood plantations in 250km radius of Perth):** 2006 saw the worst weather and yet best survival rate in my experience. This was put down to lots of money spent on control measures (could have even been the extra water the trees received from the several insecticide applications that contributed to their survival). Spraying took the form of ground based misting and boom-spraying, also used aerial spraying. Applications were made every 10 days on some properties and this proved to be very effective. Despite the high costs of control measures, this "still works out cheaper than having to re-plant" and infill entire plantation sites. Approximately 30ha of Acacia species were damaged to the point that the trees have to be re-planted. This was primarily in the location of Mawson between York and Quairading. From our point of view, the 2006 locust plague actually turned out to be "less severe. We were expecting worse".

***Sandalwood hosts were stripped of foliage.***

# Impact of the 2006 Australian Plague Locust

**Tony Ednie-Brown, Beverley:** Amongst the jams (*A. acuminata*) planted in winter 2006 there was "quite a substantial death rate", although we are "not sure if this was due to the locusts, the drought or both". The young seedlings were stripped of leaves and left with just a single stalk and around 10% is assumed to have been lost. Casuarinas were also completely stripped of leaves, and swarming was observed over small sandalwood trees and the Acacias. In the older plantations (2 – 7 years) there were virtually no locusts or damage.

**Aaron Edmonds, Calingiri:** In summary, the Rock Sheoaks suffered the most damage and were targeted first. Host trees with the most actively growing (tender) foliage were also targeted. I sprayed my orchard three times with 500ml/ha Chlorpyrifos + 6ml/ha Regent and this seemed to minimise damage. Locusts were most damaging when they were in the early hopper stage. Good weed control led to greater locust damage as there was no weed growth to 'dilute' their hunger. Tree recovery has been good where insecticide applications limited the damage.

**Geoff Woodall, Albany:** Experienced quite widespread damage over different areas, although lots of host trees still survived. The worst affected species appeared to be *Acacia saligna* and *Allocasuarina huegeliana* species and this was seen in both seedlings and mature plants. Spraying was not shown to be effective with adult locusts, better results were seen where insecticides were used to combat 'hoppers'.

**Katherine-Jane, York:** Fortunately the locusts were not very interested in the 10cm high sandalwood seedlings that had emerged earlier in the year, however they attacked the 16 month old *Acacias* and Rock Sheoaks with vigor. It was "surprising but I was expecting the locusts to get through it in a matter of days but they were around for several weeks. (At the time it was) quite scary…you have so many acres and what if you lose the lot"? It was thought that this would not be economical; as repeated applications would have been necessary "we didn't even really consider that as an option".

**Peter Grime**: Recently established acacia host seedlings (2 – 3 months of age) near Narrogin were surprisingly the worst affected, however locusts didn't seem to cause any damage to our established plantations further north. We thought the locusts would have been attracted to the new growth of the sandalwoods in established plantations; however this was not the case. The locusts defoliated young *Acacia acuminata* seedlings, of which some recovered, however where the locusts also ate into bark and stem these young hosts did not come back. Our chemical use policy prevents us from using highly hazardous chemicals that would typically be used as a control measure".

Locusts are not the only pest threat to sandalwood and host trees. Below Bob Huxley inspects the defoliation of a young sandalwood tree on his plantation following attack by Spring Beetles in February last year.

# Sandalwooders in Action

Tim Emmott

***Left: Tim Emmott and Aaron Edmonds hand planting hosts on Aaron's property:***

***Right: Ron Mulder WA sandalwood plantation inspecting one of his young plantations east Beverley***

***Above: At the ASN field day in Cunderdin / Tammin in late 2005, the young plantation sandalwood tree on the left was pulled out at the field day, to demonstrate debarking and inspect for heartwood. I re-visited the site 6 months later to find the tree had re-shoot (coppiced) from some small remaining roots.***

***Above: ASN member and farm tree seedling supplier Lou Dimasi of WA Farm Trees establishing hosts on his Northam property***

# Sandalwooders in Action

Tim Emmott

*Above left: ASN member and sandalwood grower Bob Huxley from Gabbin was inspired by the demonstration of Geoff Woodall's 'nut sucker' at the Toodyay field day, and built one himself. Right: Bob Huxley loading up with host seedlings during his winter 2007 plantation establishment.*

*Above: Kellerberrin farmers Vaughn and Max Invererity complete the establishment of host seedlings in their 5 hectare plantation, winter 2007. Host used included typical and narrow leaf Jam, Mulga and Acacia lasiocalyx.*

*Above: It was all smiles for Jen and Garry of Doodlakine during the establishment of their 4 hectare sandalwood plantation in granite country east of Kellerberrin, until Jen experienced wild ride as the tree planter hit a rock. Slow speeds, a low hp tractor and caution required when using mechanical tree planters in rocky terrain.*

# Sandalwooders in Action

*Left: Pre-ripping a 20 hectare site in April 07, using GPS auto steer technology*
*Right: Georgie Sadler, east Wongan Hills inspecting 10 month old mixed species hosts in her 6 hectare plantation*

*Above: Locky Forsyth of north Kellerberrin trials direct seeding to establish hosts in a small plantation, June 2007*

*Above: Hosts planted (Jam) 2004, sandalwood seeded 2005, plantation on unproductive sand, Tammin central wheat belt*

# Fertiliser Trials; Scotts Australia and Richgro

Paul Canny, Scotts Australia.

**Email:** Paul.Canny@scotts.com

***Paul Canny from Scotts Australia and Roger Evans from Richgro in the first week of July started initial fertiliser trials at Aaron Edmonds property at Calingiri.***

The basis for setting up the trial work was to establish the benefits of using controlled release fertilisers (releasing by temperature), wetting agents and other Scott's products for the longevity of the plants requirements. In this case the fertiliser product used has a 12/14 month release pattern. We have been undertaking trial work and subsequent ongoing work with the Indian Sandalwood growers in the north of the state and feel that work that we have developed with those growers can also help with the Australian Sandalwood development.

The work that we have started at Aaron's property has involved putting various rates of product into the soil and having the host pant planted at the same time. We will be monitoring the growth of the trial plants against the control plants. In the trial area we have also undertaken soil analysis of the plot to have more understanding of the plants requirements and the soil type that the plants are being established in.

On behalf of Scotts and Richgro we thank Aaron and look forward to working with him over the duration of the project in identifying the specific needs of the host and Sandalwood plants. We welcome any input into the work that we are undertaking. Note from the secretary: Paul has also set up a fertiliser trial in a new plantation east of Northam belonging to ASN member Lou Dimasi. Keep posted for further information and results.


# Sandalwood in Action

Tim Emmott

## Is this the largest remnant sandalwood tree in the Wheatbelt?

Probably not, however it is an impressive specimen with a diameter of 44cm, measured at 150mm above ground level and standing over 8 metres tall!
*(Thank you to Jasper for modelling next to the tree to give us the sense of scale here).*

**Send in your pictures of impressive sandalwood trees for the next newsletter!**

***The Australian Sandalwood Network is supported by the Avon Catchment Council's 'Native Plant Industries' project. The ASN would like to acknowledge funding received from the State and Australian Governments through the "National Action Plan for Salinity and Water Quality".***

***Thank you to everyone involved in the production of the 6th edition of The Sandalwooder newsletter, and special thanks to Tim Emmott for his outstanding contribution throughout this issue.***