

APPENDIX 3

SANTALUM MACGREGORII IN PAPUA NEW GUINEA.

Report from a Sandalwood Workshop funded by Australian Centre for International Agricultural Research and Papua New Guinea Forest Authority conducted in Port Moresby, 11 - 14th November 1996.

INTRODUCTION

Santalum species are distributed widely, from India throughout much of Australia, Papua New Guinea and many South Pacific Islands countries. The fragrant heartwood from these species, commonly known as sandalwood, is of high commercial significance to many rural based economies. With the exception of *Santalum* species native to Australia, the global production of sandalwood occurs in developing countries. Due to the utilisation of sandalwood in both eastern and western cultures and the long period of exploitation most *Santalum* species are faced with declining population sizes. *S. macgregorii*, endemic to southern Papua New Guinea, is one of the lesser known *Santalum* species and the extent of current exploitation is unknown.

STATUS OF *SANTALUM MACGREGORII* IN SOUTHERN PNG.

S. macgregorii's former distribution extended continuously along the PNG southern savanna region and as close as 20km from Port Moresby (Department of Forests, Lae. Herbarium collections NGF 17404, 22/2/1964). *S. macgregorii* is now scarce in this area, presumably as a result of over-harvesting. Harvesting pressures, coupled with indiscriminate burning, have resulted in *S. macgregorii*'s current distribution as isolated populations in remote regions. Recent inventories have identified *S. macgregorii* as far west as the Paupala range, near Lese, in the Gulf Province (PNGFA data 1997). A complete inventory of the remaining populations is urgently required which will assist identifying areas that require germ plasm conservation measures. This inventory will greatly assist the South Pacific Regional Initiative on Forest Genetic Resources (SPRIG) project. This project has a strong interest in assisting developing countries in the South Pacific in areas of seed collection, assessment, tree improvement and conservation of priority forest genetic resources (Thomson pers. com. 1997). *Santalum* has been identified as a priority genus for the SPRIG project.

As in most areas within the Central and Gulf Provinces inaccessibility prevents *S. macgregorii* harvesting and extraction. Poor road access prevents buyers liaising with villages and impedes the transportation of sandalwood to Port Moresby for export. By virtue of remoteness remnant *S. macgregorii* populations have avoided exploitation.

It appears that two varieties of *S. macgregorii* exist in southern PNG. A coastal (eg. Manumanu) and highland (eg. Berenia) variety. The coastal variety has a broader leaf, a lighter coloured heartwood and lower scented heartwood. However, detailed morphological examination on flowers and fruits is required to determine the actual extent of this variation.

SANTALUM MACGREGORII EXPLOITATION AND UTILISATION.

It is critical that an understanding of the status of *S. macgregorii* is gained as it is currently being commercially exploited in an unregulated way. The recent resurgence in *S. macgregorii* exploitation commenced near Port Moresby with a merchant trader purchasing heartwood from coastal villagers between 1985-86. Exploitation then extended into the Central Province in 1994, into an area known as the Berenia region, 200km north west of Port Moresby and now occurs in the Gulf Province. Villages in southern PNG harvest *S. macgregorii* from traditionally owned forests, from which the lucrative large piece size stem heartwood is most sought after. The Papua New Guinea Forest Authority (PNGFA) does not regulate *S. macgregorii* harvesting, marketing and royalty payments when exploitation occurs on these lands.

Sandalwood buyers usually liaise directly with the traditional land owners and as a result harvested quantities are unknown. The consequences of the unregulated *S. macgregorii* exploitation are highlighted by the brief period of exploitation in the Manumanu and Berenia regions, from 1993 to 1995. Harvesting in these areas ceased due to resource decline and the subsequent market rejection of small heartwood material, which made it impossible to recover costs of harvesting, sapwood removal and transport.

Buyers were demanding large, defect free, solid wood for the lucrative South East Asian sandalwood carving and furniture market. The under-utilisation of *S. macgregorii* occurred in significant quantities and stockpiles of seemingly utilisable *S. macgregorii* root, branch or small stem heartwood remain as rejected heartwood within coastal PNG villages. Buyers refused to purchase *S. macgregorii* heartwood if the piece size was considered too small or if the heartwood scent was low, but if marketed appropriately this rejected heartwood may be powdered and used for joss stick manufacturing.

As the resource declined villagers commenced harvesting immature trees, excavated roots of

previously cut trees, harvested *S. macgregorii* on sacred grounds and cut trees of other species mistaking them for *S. macgregorii*. Eventually harvesting in the Western Province ceased when resource depletion occurred. Simultaneously, the PNGFA intervened by revoking export licences to prevent the excavation of root systems from previously harvested trees. From this area buyers moved to the Gulf Province.

The exploitation of sandalwood is dependent on buyers contacting remote villages. Road access is the key to *S. macgregorii* exploitation. To date road access from Berenia into the remote Gulf province is difficult, however, an extension of the unsealed Hiritano highway into this area is imminent.

SEED COLLECTION AND EX SITU CONSERVATION

Several mature *S. macgregorii* trees exist within the Port Moresby botanical gardens and attempts have been made to poach these trees. The botanical gardens may act as a valuable *S. macgregorii* seed resource and seed collection arrangements have been put in place. It appears that mature trees from natural stands produce moderate fruit crops indicating there should be reliable seed supplies for silvicultural and species introduction research, ex situ plantings and small scale plantation establishment work.

SANTALUM MACGREGORII FOR PLANTATIONS

Morphologically *S. macgregorii* appears quite close to *S. album* (native to southern India and eastern Indonesia) which produces the premium Indian sandalwood. If it is determined that *S. macgregorii* and *S. album* are similar then *S. macgregorii* should be tested as potential plantation species outside PNG.

In the early 1980's the PNGFA Forest Research Institute (PNGFRI) considered the possibility of growing *S. macgregorii* from seed for plantation establishment. It was concluded that sandalwood's silvicultural requirements were not well understood. Consequently, attempts to develop a *S. macgregorii* silvicultural system did not commence (Ross pers. com. 1996).

As with all *Santalum* species *S. macgregorii* is an obligate root hemi-parasite. This parasitic habit complicates nursery propagation and plantation silviculture. However the protocols developed for nursery and field establishment of *S. album* in India, Indonesia and Australia

and for *S. austrocaledonicum* in New Caledonia make it feasible to re-consider establishment of *S. macgregorii* as a native plantation species in PNG.

PRICING STRUCTURE OF SANTALUM MACGREGORII HEARTWOOD

In the mid-1980's traditional owners were receiving only PNG Toea 5 kg⁻¹ for *S. macgregorii* heartwood. By the peak of exploitation in 1995 the price had risen dramatically to PNG Toea 200 kg⁻¹. However significant quantities of heartwood were purchased for less than AUD\$2 kg⁻¹. (PNG Toea 100 = AUD\$1). Within PNG a price differential exists based on heartwood quality. The price for coastal *S. macgregorii* heartwood was less than half of the highland heartwood; i.e. PNG Toea 90 kg⁻¹ compared to PNG Toea 200 kg⁻¹, respectively.

A probable explanation for the low price received for *S. macgregorii* heartwood is that traditional landowners have a limited understanding of the global sandalwood industry. This allows buyers to exploit remaining *S. macgregorii* populations below their real value. For comparison purposes, *S. album* heartwood in India is sold for between AUD\$15 – 18 kg⁻¹ and the lower oil containing *S. spicatum* from Western Australia is sold for between \$6- 8 kg⁻¹.

In addition, it appears there is limited cultural attachment to *S. macgregorii* in PNG. This in contrast to the utilisation of sandalwood for medicinal, religious and commercial purposes in Indonesia, India and several South Pacific countries. Surprisingly, there is limited traditional utilisation of sandalwood in southern PNG, which is contrary to other regions within PNG where wood carving is culturally significant.

SANTALUM MACGREGORII HEARTWOOD OIL ANALYSIS

The percentage content and composition of *S. macgregorii* heartwood oil is still unknown. Oil analysis is being undertaken on a number of heartwood samples at the Department of Chemistry, University of Western Australia, Perth. This analysis will be compared with a number of exotic *Santalum* species and will assist in understanding differences between *S. album* and *S. macgregorii*.

CONCLUSION

S. macgregorii in PNG's southern savanna regions has been heavily exploited where human habitation exists. The species appears to be protected due to inaccessibility. This is likely to change in the near future with the extension of the Hiritano highway into the Gulf Province. Before buyers enter into the Gulf Province it is important that villagers are aware of the importance and value of *S. macgregorii*, and harvesting regulations need to be considered to implement sustainable harvesting levels.