

The status of the domestication of African mahogany (*Khaya senegalensis*) in Australia - as documented in the CD ROM Proceedings of a 2006 Workshop

Roger UNDERWOOD¹
and D. Garth NIKLES²

¹Forestry Consultant
7 Palin Street
Palmyra WA
Australia 6157

²Associate, Horticulture and Forestry Science
Queensland Primary Industries and Fisheries
Department of Employment, Economic
Development and Innovation
80 Meiers Rd, Indooroopilly
Australia 4068



Photograph 1.

A chess table and chairs manufactured from timber obtained from some of the African mahogany logs of Photograph 2. This furniture setting won Queensland and national awards (NIKLES et al., 2008).

Photograph R. Burgess via Paragon Furniture, Brisbane.

A Workshop was held in Townsville, Queensland, Australia in May 2006 entitled: “Where to from here with R&D to underpin plantations of high-value timber species in the ‘seasonally-dry’ tropics of northern Australia?” Its focus was on African mahogany, *Khaya senegalensis*, and followed a broader-ranging Workshop with a similar theme held in Mareeba, Queensland in 2004. The 2006 Workshop comprised eight technical working sessions over two days preceded by a field trip to look at local trial plantings of African mahogany. The working sessions covered R&D in: tree improvement, nutrition, soils, silviculture, establishment, management, productivity, pests, diseases, wood properties; and R&D needs and management.

Introduction

African mahogany (*Khaya senegalensis* (Desr.) A. Juss.) was introduced in Australia in the 1950s and was planted sporadically on a small scale until the mid-1970s. Farm forestry plantings and further trials recommenced in the late 1990s, but industrial plantations did not begin until the mid-2000s, based on managed investment schemes. The area now established (to 2008) exceeds 4,000 ha and is increasing at a rate of some 2,000 ha per year, almost wholly in the Northern Territory. There are no plantings of African mahogany on this scale elsewhere in the world.



Photograph 2.

Logs from some of the better, 30- to 32-year-old African mahogany trees selected for wood studies in 2003 within provenance trials in the Northern Territory. Photograph D. Reilly.

African mahogany and other *Khaya* species are highly susceptible to *Hypsipyla* shoot borers (Lepidoptera: Pyralidae) in Africa (MALLETT, BRUNCK, 1993; OPUNI-FRIMPONG *et al.*, 2007; SOKPON, OUINSAVI, 2004). However, plantings of African mahogany in Australia and the Asian region have remained relatively free of shoot borer attack to date (GRIFFITHS, WYLIE, 2006). The reason for the low incidence of attack and damage in this region has recently become apparent. Previously it was believed that the same species, *H. robusta*, was present in Africa, Asia and the Pacific. Recent morphological and molecular work by Marianne HORAK of CSIRO, Canberra, Australia has revealed, however, that the African shoot borers in fact comprise a suite of three species, none of which is *H. robusta* (GRIFFITHS, WYLIE, 2006). The low damage in the Asia/Pacific region supports a general pattern in which *Hypsipyla* species favour endemic host species while non-endemic hosts are less attacked (CUNNINGHAM *et al.*, 2005).

H. robusta currently poses minimal threat to African mahogany in northern Australia, due to both low oviposition and poor larval survival (GRIFFITHS, WYLIE, 2006). However, it is important to consider the risks in planting large areas in regions where *H. robusta* is known to occur on native tree hosts. The risk of “host switching” must be considered. To best protect the health of African mahogany plantings in Australia it is important to identify existing and potential pest and disease issues and prepare for their containment. Means to achieve this, current knowledge of African mahogany and other aspects of its domestication were documented in the Proceedings of a timely workshop held in Townsville, Queensland in May 2006. The Proceedings have been published as a CD ROM containing an extended Summary encapsulating discussions, an inventory of perceived R&D needs, conclusions, future directions and 25 papers (BEVEGE *et al.*, 2006 – see below regarding free availability of the CD-ROM).

The Townsville Workshop

The Townsville workshop sought to:

- maintain the momentum and build on the outcomes of a workshop held in Mareeba, Queensland in 2004 (BEVEGE *et al.*, 2004; UNDERWOOD, 2006);
- share the current state of knowledge and identify gaps requiring further R&D;
- identify R&D priorities for each of the major components of the new industry;
- identify mechanisms for acquiring resources for R&D;
- explore collaborative arrangements among stakeholders;
- develop recommendations on actions to support the further development of the industry.

The workshop comprised eight technical working sessions over two days preceded by a field trip (ably prepared and led by Geoff DICKINSON, field notes in Proceedings) to look at some local trial plantings of African mahogany. The working sessions covered:

- the plantation estate and opportunities for expansion;
- current seed sources and the seed supply and demand situation;
- status of genetic improvement and breeding programs;
- establishment, silviculture, site, nutrition and stand management;
- pests and diseases and their risks and management;
- plantation productivity and inventory;
- log and timber quality and properties;
- identification and prioritisation of R&D needs and management.

The 25 workshop papers involved 23 authors; however all but eight papers had multiple authors. This highlights the degree of cooperation currently manifest among workers in this field in Australia. Most papers were presented in PowerPoint format; this has been carried through into the CD ROM, supplemented by extensive notes. This approach has also enabled the liberal use of coloured photographs, which provide a highly visual appreciation of the African mahogany development scene. It is also noteworthy that the workshop was followed by the publication of a further excellent summary paper in Australian Forestry (NIKLES *et al.*, 2008).

In the final session of the workshop, participants sought to reach consensus on R&D needs and priorities, and on mechanisms for future communication, collaboration and cooperation. Some 26 research needs were identified within the major fields of genetic improvement, silviculture and stand management, plantation productivity (inventory and mensuration), site suitability, soils and nutrition, log and timber quality, and pests and diseases (NIKLES *et al.*, 2008). The need for a structured approach to R&D management involving development of R&D strategies, coordination of effort, cooperation among networked researchers and intellectual property management was stressed.

Keynote Speaker Dr Ian BEVEGE provided a timely warning about the risks inherent in tropical forestry ventures in northern Australia. However, there are counterbalancing factors.



Photograph 3.

An 8-year-old pruned stand of African mahogany planted near Bowen, Queensland in 1998 at 5 m × 2.5 m (800 trees per ha) and not thinned. Trickle irrigation was applied for about 2 y after planting. The tree measured had a DBHOB of 17.1 cm. (Mean annual rainfall in the area is approximately 900 mm including 7 months with less than 40 mm each). Photograph G. Dickinson.

The world (and domestic) demand for high value hardwood timber is increasing just at the time when the Australian native forest industry is in terminal decline due to the conversion of State Forests to National Parks. Within the predicted homoclimate of African mahogany in northern Australia (ARNOLD *et al.*, 2004), there are extensive areas of cleared land potentially suitable for planting the species. Australia now has several large and well-resourced private forestry organisations with plantation experience, capable professional staff and a capacity for R&D 'in house' and/or in collaboration, and several of these are vertically integrated into sawmilling and timber marketing. These companies are all involved in new tropical hardwood ventures. Australia's political system

is stable, and private investment in forestry continues to increase. There are certainly risks involved, but there are also good prospects for success. These prospects will be further improved if the initiatives behind the Townsville workshop flow on to future gatherings of interested scientists, foresters, growers and timber processors.

Availability of the CD-ROM Proceedings

Complimentary copies of the Proceedings in CD-ROM format are available from Forestry Industry Consultant, PO Box 27 Kairi Q, Australia 4872 or via email request to wendy.petrich@bigpond.com.au

Acknowledgements

The field trip was ably prepared and led by Geoff Dickinson (field notes in Proceedings). Photographs 1-3 in this article were published in NIKLES *et al.*, 2008. The Editor of Australian Forestry has kindly given permission for their use in the present article.



Photograph 4.

A 28-month-old stand of African mahogany planted in 2006 in the Douglas and Daly Rivers basin approximately 110 km north-west of Katherine, Northern Territory. (Mean annual rainfall in the area is approximately 1,150 mm including 6 months with less than 40 mm each). Photograph D. Reilly.



Photograph 5.

A 41-month-old test of African mahogany clones (as rooted cuttings from 1.3-year-old, hedged seedlings of some of the trees that gave the logs in Photo 2 and other sources) and various seedling Controls. The test was planted at the government research station, Katherine, Northern Territory in 2006. It has a single-tree-plot design with many treatments. Hence the inferior trees surrounding the rooted cutting ramet of one of the better clones (326), highlighted beside the person shown in the photograph, are not of clone 326. At age 30 months, the superior ramet of clone 326 had: dbhob - 8 cm, height - 5.5 m, bole length - 5.5 m and straightness score - 5 (out of a highest-possible score of 6) (Mean annual rainfall in the area is approximately 900 mm including 6 months with less than 40 mm each). Photograph G. Dickinson.

References

ARNOLD R., REILLY D., DICKINSON G., JOVANOVIĆ T., 2004. Determining the climatic suitability of *Khaya senegalensis* for plantations in Australia. In Bevege et al. 2004. 10 pp.

BEVEGE D.I., BRISTOW M., NIKLES D.G., SKELTON D.J. (eds), 2004. *Prospects for high-value hardwood timber plantations in the 'dry' tropics of northern Australia*. Proceedings of a Workshop held 19-21 October 2004, Mareeba, Queensland. Published as a CD ROM by Private Forestry North Queensland Association Inc., Kairi, Queensland.

BEVEGE D.I., NIKLES D.G., DICKINSON G., SKELTON D.J. (eds), 2006. *Where to from here with R&D to underpin plantations of high-value timber species in the 'seasonally-dry' tropics of northern Australia?* Proceedings of a Workshop held 9-11 May 2006, Townsville, Queensland. Published as a CD ROM by Private Forestry North Queensland Association Inc., Kairi, Queensland.

CUNNINGHAM S.A., FLOYD R.B., GRIFFITHS M.W., WYLIE F.R., 2005. Patterns of host use by the shoot-borer *Hypsipyla robusta* (Pyralidae: Lepidoptera) comparing five Meliaceae tree species in Asia and Australia. *Forest Ecology and Management*, 205: 351-357.

GRIFFITHS M., WYLIE F.R., 2006. *Khaya* and *Hypsipyla*: findings from current research in Australia. In: Bevege et al. (eds) 2006. 25 pp.

MALLET B., BRUNCK F., 1993. Les problèmes phytosanitaires de l'acajou en Côte-d'Ivoire. *Bois et Forêts des Tropiques*, 237 : 9-29.

NIKLES D.G., BEVEGE D.I., DICKINSON G.R., GRIFFITHS M.W., REILLY D.F., LEE D. J., 2008. Developing African mahogany (*Khaya senegalensis*) germplasm and its management for a sustainable forest plantation industry in northern Australia: progress and needs. *Australian Forestry*, 71: 33-47.

OPUNI-FRIMPONG E., KARNOSKY D. F., STORER E. A., ABENEY E. A., COBBINAH J. R., 2007. Relative susceptibility of four species of African mahogany to the shoot borer *Hypsipyla robusta* (Lepidoptera: Pyralidae) in the moist semi-deciduous forest of Ghana. *Forest Ecology and Management*, 255 : 313-319.

SOKPON N., OUINSAVI C., 2004. Gestion des plantations de *Khaya senegalensis* au Bénin. *Bois et Forêts des Tropiques*, 279 : 37-46.

UNDERWOOD R., 2006. Prospects for high-value hardwood timber plantations in the 'dry' tropics of northern Australia. *Australian Forestry* 69, 2: 142-145.