

The Aussies in Brazil

Eucalypts dominate Brazil's plantations. What are the issues?

**by Irene Seling¹
Peter Spathelf¹ and
Leif Nutto²**

**¹formerly Department of
Forest Sciences**

Federal University of Santa Maria,
Brazil

current fax and email:
49-7723-920 210

sei@fh-furtwangen.de
spathelf@fdtue.bwl.de

**²Institute of Forest Utilization
and Work Science**

University of Freiburg, Germany

f 49-761-203 3764

nutto@uni-freiburg.de

BRAZIL has a highly developed forest plantation estate. About 65% of the country's total roundwood production of 199 million m³ comes from approximately 7 million hectares of plantations, of which 5 million hectares are classified as industrial. These plantations are dominated, although not monopolised, by species in the Australian genus *Eucalyptus*.

Estimates of the area planted to eucalypts range from 2.96 million hectares (FAO 2000) to 3.6 million hectares (Lima et al. 1999). Similar variations can be observed in estimates of plantation yields, which range from 15–26 m³/hectare/year (FAO 2000) to 46 m³/hectare/year (Associação Brasileira Técnica de Celulose e Papel 1999). According to Nelson Barbosa, president of the Brazilian Silviculture Society, the average productivity of eucalypt plantations is about 34 m³/hectare/year.

Existing eucalypt plantations are therefore producing, on average, around 102 million m³ of stem volume per year (ie 3 million hectares of plantation growing at 34 m³/hectare/year). Expected future advances in genetics, cloning, fertilisation and management and an expanding plantation estates suggest that this volume will even increase; this is reinforced by field evidence of growth rates as high as 100 m³/hectare/year in situations where growing conditions are excellent and high-quality clonal stock is used (Barbosa personal communication).

Utilisation of Eucalyptus

Most eucalyptus wood produced in Brazil is used for pulp and charcoal production; only about 200 000 m³ of sawnwood are produced annually. But there is evidence that the sawnwood market will grow in the future. In 2000, one of the biggest wood companies working with *Eucalyptus*, Aracruz Celulose, expanded its sawmill sector to an annual capacity of 100 000 m³ (see box next page). One of the main reasons for such diversification is to make use of surplus timber and to diversify economic activities. This is aided by the fact that the technical problems of sawing young eucalypts, such as splitting and warping, can be handled much better today through genetic improvement and new milling and drying technologies.

Coupled with these factors is the expected decreasing supply of hardwood timber from natural forests over the next 20 years. Customer concerns about natural forest management and a predicted preference for wood products from certified sustainable forests will favour the development of eucalypt export markets in Europe and the United States (Flynn & Shields 1999); a well-organised eucalypt plantation sector will find the task of certification relatively easy and will be able to feed an increasing demand for certified timber on the world market.

Genetic improvement

Considerable progress has been made in the last two decades in the genetic improvement of *Eucalyptus*. Pulp and paper

producers select for maximum density and minimum lignin content, charcoal producers for maximum lignin content. The high variability in and genetic control of important tree characteristics (eg fibre orientation, basic density, cracks) support high selection intensities (Assis 2000).

Hybridisation between species such as *E. grandis* and *E. urophylla* has produced good results in terms of growth performance as well as chemical and physical-mechanical wood properties. Brazilian companies such as Klabin Riocell, Aracruz and many others have also gathered experience in tissue culture propagation, which has led to significant increases in productivity.

Pests and diseases

Beside leaf-cutting ants, *Eucalyptus* plantations are not particularly prone to pest problems in Brazil. Stem canker was a severe problem in the past, particularly in *E. saligna*, but a switch to other species overcame this problem more than 20 years ago. A lack of boron causes the brushing of *E. globulus* in the stands of Klabin Riocell. *E. globulus* is also susceptible to root deformations and subsequent stem-breaks.

Ecological impact

Due to the accelerated biomass accumulation in young stands of fast-growing trees, the export of nutrients is significant in plantation forestry employing so-called mini-rotations (Poggiani et al. 1983, Poggiani 1985, Lima 1996). Under such regimes, fertilisation is usually indispensable in order to maintain long-term site productivity. The generally high demand for calcium and potassium in *Eucalyptus* plantations can be compensated for by inputs from rainwater, the recycling of biomass components, and balanced fertilisation. Preliminary results show that careful management can prevent long-term nutrient decline.

Water use in eucalypt plantations is generally comparable with that of other fast-growing plantation tree species and natural forests. However, a significantly lower water use efficiency can be observed when roots have access to free available soil water and atmospheric demand is high (eucalypts exhibit no stomatal regulation of transpiration). In those cases, eucalypt plantations justify their reputation as 'water pumps' (Calder et al. 1992). Several studies have revealed that water use efficiency is genetically controlled, suggesting that genetic improvement might produce stock with greater drought resistance.

The low degree of diversity in monospecific *Eucalyptus* plantations can be improved by introducing a variety of shade-tolerant, naturally regenerated tree species in the understorey. To increase diversity at a landscape level, eucalyptus stand complexes should be interspersed with natural forest remnants, especially in riparian zones.

Eucalypts will continue to dominate Brazil's plantation sector for pulpwood and increasingly for sawnwood. Continued research is needed to improve quality and productivity and

to ensure that the environmental impacts of eucalypt plantations are benign.

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A longer paper on this topic prepared by the authors can be obtained by contacting Dr Seling at the address above.

Cruising with Aracruz



Eucalypt islands: the Aracruz eucalypt estate is interspersed with reserves of native vegetation. These reserves are rich in biodiversity, including more than 400 different bird species, 15 of which are endangered. *Photo courtesy Aracruz Celulose SA*

Brazil's Aracruz Celulose SA is the world's largest producer of bleached hardwood kraft market pulp. This kind of pulp is used in the manufacture of high-quality paper products, including premium tissue, printing, writing and specialty papers. It's called 'market' pulp because the company does not have integrated papermaking facilities and sells its entire production of pulp on the open market.

The company's output is based on a eucalypt plantation estate of about 144 000 hectares located in the states of Bahia and Espírito Santo on the Atlantic coast. In 2000 the company produced 1.27 million tonnes of kraft pulp, mostly for export (predominantly to North America, Europe and, to a lesser extent, Asia). Its operating revenues were US\$732 million in that year and its net income US\$201 million. This was a steep rise over 1999, when net income was US\$91 million, which itself was a dramatic improvement on the 1998 figure of only US\$3.4 million; much of the increase can be attributed to fluxes in the market price of pulp. The company paid US\$82 million in taxes in 2000, up from US\$16.7 million in 1999.

Aracruz has been criticised in the past because its plantation estate was established on the ancestral land of the Indigenous Tupinikim community. After protests in the 1990s, the community is now being supported through a 20-year financial package: by the end of 2000, Aracruz had transferred a total of R\$6.7 million (about US\$2.7 million at July 2001 exchange rates) to the Tupinikin and Guarani Indigenous communities and is committed to a total aid package of US\$12 million. This illustrates the point made by Julian Evans (page 3) that plantation developers must ensure they have unencumbered right to the land before commencing a

plantation project. Moreover, it shows the importance of stakeholder participation, or 'buy-in'; given the long-term nature of plantation forestry, an harmonious social setting is crucial.

Despite these troubles, Aracruz has a hard-won reputation as a progressive company with good environmental practices. For example, its estate includes 66 000 hectares of native forest reserves, and it also manages a large forest rehabilitation outreach program.

Although predominantly a pulp producer, Aracruz is also developing a sawnwood sector. In 1999 it commissioned a US\$52 million sawmill to process an annual 100 000 m³ of hardwood from its eucalypt plantation estate. The basic resource is called Lyptus, a registered trade name, and is derived from a hybrid of *E. grandis* and *E. urophylla* grown on a rotation of 15 years.

According to company publicity material, Lyptus is particularly suitable for high-quality furniture: "The warm colour, pleasant grain and hardness make it a welcome alternative to traditional hardwoods". It comes in at least four classes: the 'prime' grade is 10 cm wide and 1.83–4.88 m long, with clear wood on its best face. The success of Lyptus in the market will be watched closely: some wood technologists contend that fast-grown trees cannot produce high-quality timber. If Aracruz proves them wrong it will have major implications for plantation growers everywhere.

For more information contact: Mr Luiz Fernan do Brandão, Communication Manager, Aracruz Celulose; Tel 55–21–3820 8232; lfab@aracruz.com.br

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