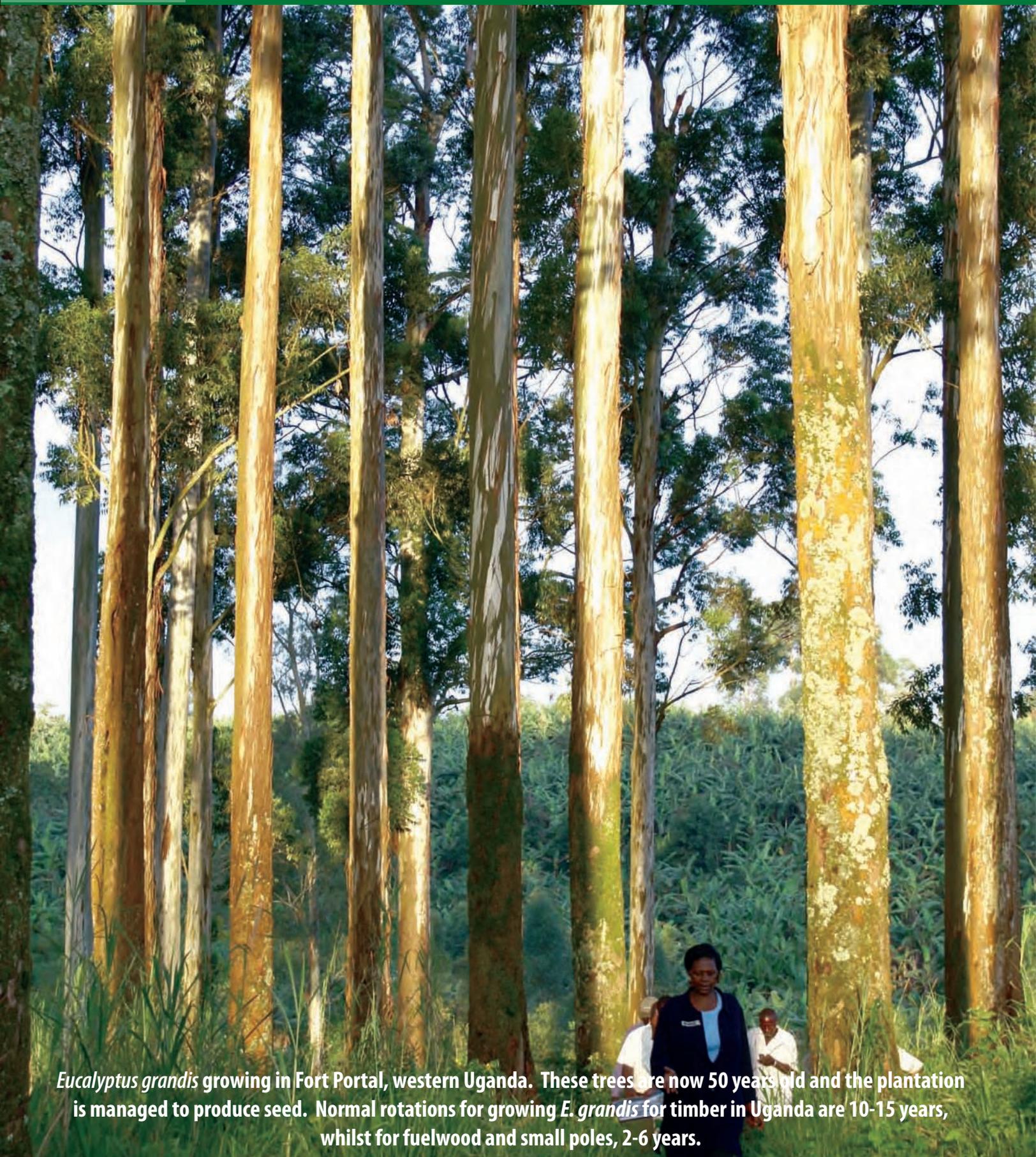


Growing Eucalypts for Timber, Poles & Fuelwood

SPGS Plantation Guidelines

Nos. 9 & 10 (v.2)



Eucalyptus grandis growing in Fort Portal, western Uganda. These trees are now 50 years old and the plantation is managed to produce seed. Normal rotations for growing *E. grandis* for timber in Uganda are 10-15 years, whilst for fuelwood and small poles, 2-6 years.

Eucalypts in Cultivation:

Eucalypts are planted on a massive scale worldwide for fuelwood, poles, timber and other wood products. They are grown both by small farmers for profit and subsistence and by large conglomerates for industrial wood supply. Certain species of Eucalypts yield valuable essential oils, whilst some also provide an excellent source of nectar for honey bees. An estimated 15 million hectares had been planted worldwide by 1995.

The genus has many favourable characteristics including high growth rates, wide adaptability to soils and climate, seed availability and ease of managing due to the coppicing ability of many species. Importantly for Uganda (with its looming timber supply crisis), Eucalypts can often produce utilisable wood products faster than any other species.

Eucalypts have also attracted controversy in some countries, where they have been blamed for environmental degradation - sometimes caused by other factors (especially widespread deforestation and poor agricultural practices) but at times due to the poor selection of the planting sites. More careful planning should resolve such conflicts.

Eucalypts in Uganda

Uganda has a long history of cultivating Eucalypts - dating back to 1912, when they were introduced to supply fuelwood for railways and administrative centres as well as to drain swamps (attempting to reduce malaria!). Eucalypts are now very common in many parts of the country, providing thousands of small farmers with a regular supply of fuelwood and building poles. Increasingly more commercial growers are cultivating Eucalypts for larger transmission poles and for timber (although currently recovery is poor).

Exceptionally high growth rates are achievable - particularly with *E. grandis* - in certain parts of Uganda. Although Eucalypts have been grown for a long time in Uganda, very few growers have applied the high silvicultural standards they require to obtain such high yields. Some species have been planted on unsuitable sites too, leading to stress and poor growth. Two other factors have combined to reduce the genetic quality of the Eucalypts been planted in Uganda - namely, the lack of improved seed (available from many countries planting Eucalypts on a large scale) and also the widespread hybridisation (interbreeding) between species, which means that there is virtually no pure seed available within the country.



Eucalypts are an important source of income for small farmers in many parts of Uganda, providing building poles, fuelwood and timber. Their fast growth and ability to coppice (regrow when cut) are important attributes.

This guideline focuses on the Eucalypt species grown for poles (small and large), fuelwood and timber in the main commercial tree growing regions of Uganda - especially *E. grandis*. It covers the key silvicultural issues that growers need to focus on to achieve and sustain high growth rates and yields with *E. grandis* but should be read in conjunction with other relevant SPGS Guidelines too - especially No.5 - *Tree Species for Commercial Timber Production in Uganda*; No. 22 - *Eucalyptus and the Environment* and No. 29 - *Successful Utilisation of Eucalyptus Timber*.



A healthy nursery bed containing E. grandis seedlings. For commercial planting, it is essential to use only improved seed since most local Eucalypts in Uganda have hybridized.

General Planning:

Before planting Eucalypts - whether for timber or fuelwood - it pays to plan carefully from the start. In addition to choosing a suitable site, the grower must decide on the species, seed origin, optimum spacing (which determines the plantation density or stocking) and also plan for suitable thinning and pruning regimes. Most *Eucalyptus* species (and especially *E. grandis*) are very sensitive to site conditions: to grow well (i.e. profitably), it requires deep, fertile soils (at least 750mm depth) and does not tolerate competition from weeds.

Growing *E. grandis* for Fuelwood & Small Poles:

The method of establishing *E. grandis* is virtually the same whether one is growing it on a short rotation for fuelwood or on a much longer rotation for timber and large poles. What differs is the initial spacing (often closer for fuelwood crops) and the fact that fuelwood and pole crops are often grown on a coppice management system (refer SPGS Guideline No. 21 – *Managing Eucalyptus Coppice*).

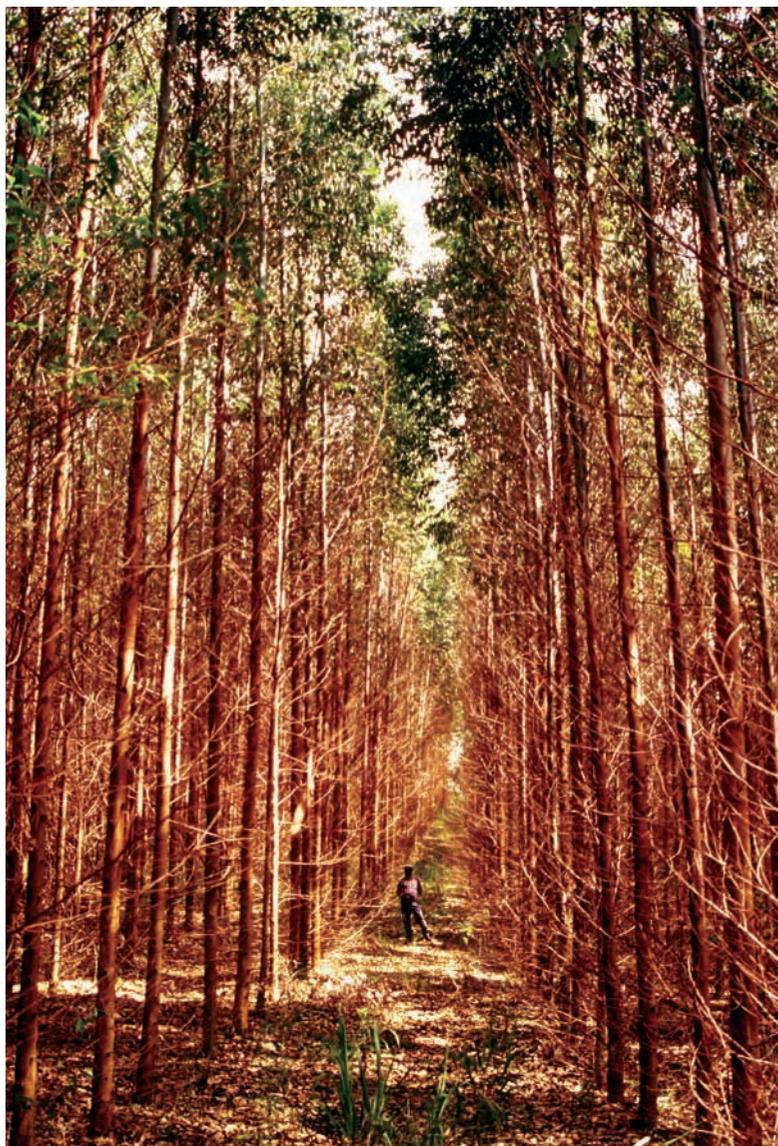
The other options to consider when growing

Eucalypts- such as the level of mechanisation and the weed method(s) employed - will depend on the scale of planting. Larger operations often mechanise the land clearance and use chemical weed control before and after planting.

As a fuelwood species, *E. grandis* is not the best (it has a fairly low density wood) but what it loses in calorific

value, it usually more than compensates in terms of high yields (growth rate). *E. grandis* also normally has a good stem form - provided improved seed has been used.

Since 1994, James Finlay (U) Ltd. have been establishing some high quality *E. grandis* fuelwood plantations on their tea estates in western Uganda, using improved seed from South Africa, Zimbabwe and Kenya. Growth rates exceeding 60m³/hectare/year have been recorded from their plantations.



36 months old *E. grandis* grown for fuelwood at James Finlay's Mwenge tea estate in western Uganda. Such high growth rates are achievable only when the optimum silvicultural practices are employed – particularly with regard to thorough land preparation, the use of improved seed and excellent weed control.

Why Grow Eucalypts for Timber and Poles?

The simple answer is because on the right sites they can produce timber quicker than anything else! With the best practices, Eucalypts can yield real rates of return of over 15% in Uganda.

This is good news for the grower who can realise returns on an investment sooner than any other tree species. Eucalypts also offer the only realistic way to bridge the looming shortfall in timber supply in Uganda and yet very few people are growing them for timber here at present. There are a number of reasons why this is so, namely:

- Growing Eucalypts well is not easy and requires

careful silvicultural practices – especially the use of improved seed, intensive land preparation and thorough weeding (both pre- and post-plant).

- The main species, *E. grandis*, will only grow well on suitable sites with good rainfall and deep, fertile soils.



Many Eucalypt plantations are poor in Uganda: here a *E. tereticornis* crop was planted on a good site in Mayuge district, eastern Uganda. The poor growth and bad form of the crop will never justify the investment.

- Many *E. grandis* hybrids have been developed to extend the planting range of the pure species: however, they are not available commercially in Uganda.
- Eucalypts have developed a reputation in some places for excessive water use: this is partly through poor site selection but partly also through a poor understanding of the issues involved.
- Wood recovery from fast-grown *Eucalyptus* trees can be low if the logs and timber are not handled properly.

Species Selection: There are a number of suitable Eucalyptus species to grow for large-sized poles and also for timber. Where there are deep, fertile soils and Mean Annual Rainfall > 1250mm, however, *E. grandis* will usually perform the best. Provided improved seed has been used and the crop has been properly managed, *E. grandis* will produce large, straight stems and could be providing you with a good income from 2-3 years (building poles), large poles by 8 years and timber from around 12 years onwards.

Two species that grow well in hotter, drier areas – *E. camaldulensis* and *E. tereticornis* - will not produce good saw-timber: they are more suited to fuelwood production in regions where *E. grandis* is not suited. The SPGS is planning a series of species trials during 2007, which will include some other species that have potential for timber (and pole) production on specific sites – including *E. cloeziana*, *E. pellita*, *E. urophylla*, *E. dunnii*, *E. longirostrata* and *Corymbia citriodora* var. *variagata* (previously *E. citriodora*).

Various hybrid *Eucalyptus* clones (ex-Mondi, RSA) have also been tested around Uganda since 2002/03. We would not recommend these for commercial planting, however, until the results of the trials have been analysed and the timber quality tested. See the SPGS's regular Newsletters for updates, available from SPGS office and at www.sawlog.ug

Seed: Use only SPGS recommended seed origins for *Eucalyptus* spp. For *E. grandis* this is improved, seed orchard seed from South Africa and Zimbabwe. The only local seed source recommended is the NFA's Fort Portal seed stand: nearly all other local *E. grandis* seed sources have hybridised and are not pure. The South African *E. grandis* seed is usually clean (i.e. had the chaff removed) and should produce well over one million plants per kilogramme. Most other *E. grandis* seed will be uncleaned, with expected seedling yields closer to 100-150,000 per kg (NB. always check the germination rate with each batch of seed from the seed supplier).

Stocking: When growing Eucalypts for timber or large poles, the plant stocking (spacing) should not be as dense as for fuelwood and small poles. Recommended spacing for



Other species of Eucalypts need to be tested in Uganda – like *Corymbia citriodora* var. *variagata* (CCV) – growing here in a trial in Queensland, Australia (note: the CCV in the photo is 7 years old, on the left of it is *E. tereticornis* at the same age).

timber is 3.0m x 3.0m (1111 stems per hectare) or 2.7m x 2.7m (1372 sph). Closer spacing (i.e. a higher stocking) will lead to earlier canopy closure but costs more in terms of higher planting and seedling costs. The closer spacings can be used where there is a good market for small poles but with all these spacings, the thinning regime discussed later must be followed if you want to maximize the production of good quality, big trees.

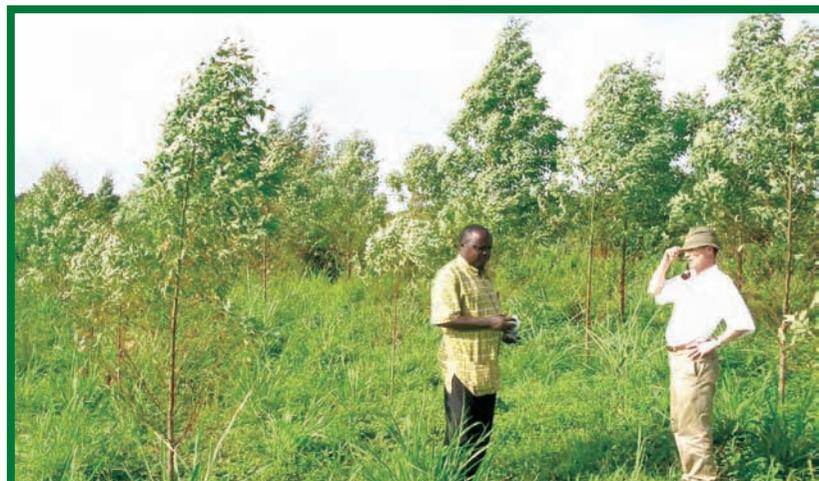
For fuelwood and small building poles, a higher stocking compared to timber crops is justified, especially as the rotation is only a few years. Common *E. grandis* stockings for fuelwood range from 1337 to 2500 sph, depending on the nature of the site and the size of poles required (NB. higher stockings will generally produce a lot of smaller poles; if larger poles are required, reduce the stocking). The following plant espacements are common for fuelwood crops: 2.7 x 2.7m (1337 sph); 2.5 x 2.5m (1600 sph); 3.0 x 2.0m (2,000 sph) or 2.0 x 2.0m (2500 sph).

Plantation Establishment: The same golden rules for establishment of all *Eucalyptus* crops apply - namely: thorough land preparation; pre-plant weed control; planting only good quality seedlings; planting early in the rains; blanking (infilling) no later than 3 weeks after the initial planting and most importantly, regular weeding in the first few months after planting.

E. grandis, like many *Eucalyptus* species, often responds dramatically to fertiliser application too. Fertilising also promotes fast early growth, which helps the crop to capture the site more quickly (reduced weeding costs). 30 gms Single Superphosphate (SSP) per tree at the time of planting is generally recommended (NB. soil tests and fertiliser trials should really be carried out if planting large areas).

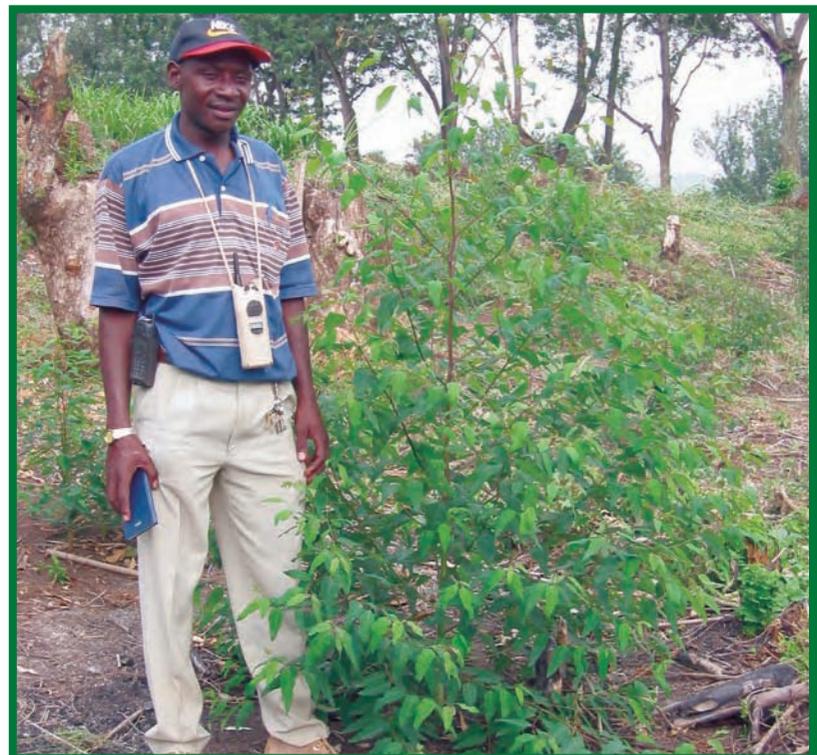
Weeding: Poor weeding is the single biggest cause of poor growth in Eucalypt plantations. Weed little and often is recommended rather than waiting until the weeds are a real problem. Unlike pines, Eucalypts do not tolerate competition: they are particularly sensitive to grasses. For commercial scale (> 25 ha) planting of Eucalypts for timber (or where labour is in short supply), the use of Glyphosate herbicide can be very cost-effective if correctly applied. Glyphosate is a non-selective herbicide, which means that it can only be used safely before planting the trees. If Glyphosate is used after planting, the trees must be protected from the spray.

Provided the weeds are well controlled before planting, focus on weeding the planting line (1m strip initially): weeding frequently (when the weeds are small) keeps the costs down and also maximizes the benefit to the trees. NB. Before using Glyphosate, read SPGS Plantation Guidelines No. 16 (v.3) – *Safe Use of Glyphosate* and No. 17 – *Post-Plant Use of Glyphosate*.



Poor weed control (before and immediately after planting) is the most common reason for the failure of most Eucalypt plantations in Uganda. Here *E. grandis* from a good seed source (South African seed orchard) was planted near Jinja but the weeds were not controlled: a failed plantation.

Thinning: Timely thinning is the secret to maximizing the yield of big trees. One can only grow large, straight trees by regularly thinning out the crop, leaving the best trees to grow to a bigger size. The thinnings will, however, produce an interim crop of firewood and poles, which could be an important source of early income for the grower (if close to markets). The first thin can be selective or can remove one whole line (either every 2nd or 3rd line, depending on initial spacing);



A 3-month old *E. grandis* seedling at James Finlay's Muzizi estate: growth like this can only be achieved by applying the best silvicultural practices as outlined in this Guideline.



A 2-year old *E. grandis* plantation grown for fuelwood at James Finlay's Mwenge estate. Its standing volume is already over 120 m³ per hectare. Seed is South African seed orchard; glyphosate was used before and after planting.

later thinnings should be more selective, leaving behind the best trees but fairly evenly spaced. NB. refer to SPGS Plantation Guideline No. 26 – *Thinning Plantations to Maximise Sawlog Production*.

Suggested Thinning Regime for *Eucalyptus* Sawlogs:

Age	Thin	
	from	to
2-3	1111	750
5-6	750	500
8	500	250-350

Pruning: Plantation grown *E. grandis* exhibits good self-pruning properties but branch shedding only takes place 2-3 years after they die, which leaves knots in the timber. For fuelwood crops knots are not that important but for timber they are, since the presence of knots will reduce the value of the final product. Thus when growing *E. grandis* for timber, growers are recommended to prune all branches up to 7m (or even beyond if required) to produce clean boards or poles. The branches should be pruned before they die off naturally. As usual the pruning should be carried out in a series of stages or

'lifts' but never removing branches from more than half the tree height (refer to SPGS Plantation Guideline No. 27 – *Pruning for High Quality Timber*).

Rotation: The final crop rotation depends largely on growth rates, the thinning regime and the size (and wood quality) the markets want. On good sites in Uganda, poles and timber trees could be produced in 8 years: the wood would not be high quality but would be structurally fine for roof trusses, general construction and low-cost furniture. For better quality timber, rotations are likely to be around 12-15 years.

Chalcid Wasp: A minute gall-forming insect – *Lepocybe invasa* (known as the Blue Gum Chalcid) – has caused some concern since it was first spotted on Eucalypts in Kenya and Uganda in 2002/03. The adult wasp lays its eggs on the leaves and stems of new growth of young trees (even in nursery plants), leading to stunted growth. The incidence of the pest, however, is much greater in trees that are under stress and thus our recommendation is to ensure your plantation has the optimum silvicultural treatment and is fast growing and healthy. For more information refer SPGS Plantation Guideline No. 19 – *Common Pests and Diseases in Plantations*.



The effect of the Chalcid wasp on a Eucalypt in Nakasongola, central Uganda: the pest is much more likely to attack stressed trees.

Harvesting: *E. grandis* trees often contain very high growth stresses. Logs will often split on felling, leading to poor timber recovery. Older trees tend to develop 'brittle heart', which also results in poor quality boards. It is advisable to cut logs in the longest length that can be

handled by extraction equipment, transport and then saw them as soon as possible.

Replanting:

With *Eucalyptus* crops grown for timber or large poles, replanting will be essential when the final crop is harvested. This is because many of the stools will have been cut at various stages and regrowth will have been suppressed due to the shade from the remaining trees.

Specifications for UEB poles:

Length	Top Diameter		Diameter 5" from bottom
	min.	max.	
30'	7"	9½"	10¾"
40'	8"	10"	13"
50'	9"	10¾"	14"
60'	10"	12½"	16¼"

The Large Pole Market in Uganda: Umeme Ltd. (formerly Uganda Electricity Board) in Kampala has strict specifications for the supply of transmission poles. They must be straight; at least 8 yrs old; free from spiral grain, decayed knots and splits. Sizes are shown in box above. Nilelpy, in Jinja, also are major buyers of good *Eucalyptus* logs (but also buy standing) for peeling for veneer. Their minimum diameter (DBH – measured at 1.3m height) is 300mm and in lengths of 9' to 27'.

The *Eucalyptus* Timber Market in Uganda:

As other species become rarer, and people see the products being made locally from *Eucalyptus* wood, there is a growing demand for the timber in Uganda. *E. grandis* produces a good quality hardwood timber, which is decorative and once seasoned properly, has good working properties. Recovery of timber is very low at present as more attention needs to be paid to proper drying of the wood and also product design. Refer SPGS Plantation Guideline No. 29 – *Successful Utilisation of Eucalyptus Timber*.

Anyone can grow poor *Eucalyptus* trees but growing quality, high yielding plantations requires careful planning and budgeting. There will always be a market for quality trees—whether for timber or poles.



A load of *E. grandis* transmission poles imported into Uganda from Tanzania or South Africa by Umeme. Uganda should not have to import such poles.



An example of the use and beauty of *Eucalyptus* timber. This stunning board-room table was made from Ugandan grown *E. grandis* timber, after being properly seasoned.



E. grandis is the principle species in Uganda for fuelwood, poles and timber. Here an 8-year old commercial fuelwood plantation at James Finlay (U) Ltd. is being harvested.

Eucalypts for timber, poles and fuelwood...



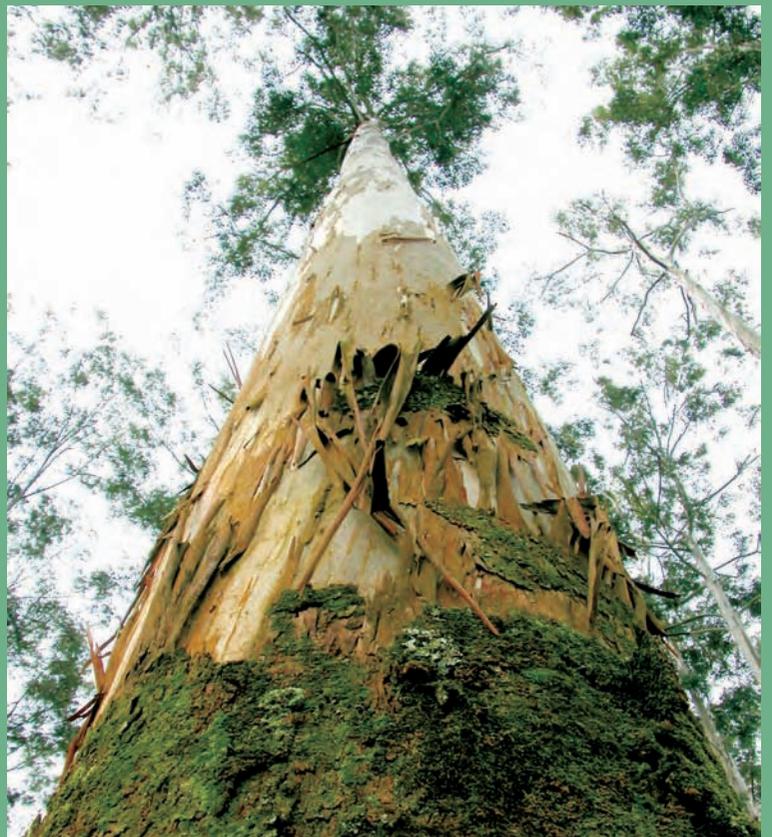
2-year old GU clones growing at SAPPI's Kwambonambi estate, KwaZulu Natal, in South Africa. GU is hybrid between E. grandis and E. urophylla and suited to hotter areas.



One of the trials established by FORRI around Uganda to test Eucalyptus hybrid clones. This plot is near Bushenyi and was 3 years old at the time of the photo. Despite showing promise, Eucalyptus clones are not yet commercially available in Uganda.



Good establishment of E. grandis requires careful planning: this 3-month old crop at James Finlay's estate in western Uganda was from South African seed orchard seed. The site was sprayed with Glyphosate immediately prior to planting and the planting line had been manually weeded twice.



One of the magnificent E. grandis trees in the Fort Portal seed stand (on the cover picture) showing why the species is desirable for timber and poles.

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