



High Yielding *Eucalyptus grandis* as a Commercial crop in Kenya

INFORMATION
BULLETIN

P.O. Oballa, M.N. Muchiri
and J.K.Cheboiwo



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Cover captions:

Top: One year old *Eucalyptus grandis*

Second: Power transmission poles

Third: Timber

Bottom: Domestic Wood

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Foreword

Eucalypts are grown in most ecological zones in Kenya and on a variety of soils including infertile sands and heavy clays. The total area under eucalypts in Kenya is distributed in gazetted forests, and land owned by large private companies, small scale farmers and local authorities. The area under Eucalyptus is likely to increase as a result of high demand for transmission poles to cater for the ongoing expansion in rural electrification, and for construction, fuelwood, carbon sequestration and mitigation of the effects of climate change.

A ready market for Eucalyptus products has motivated farmers to grow the species to improve their livelihoods through increased income. Eucalyptus grandis is the most widely cultivated Eucalyptus species in the country. The species is grown for multiple uses that enhance its popularity. To enhance benefits of growing Eucalyptus, Kenya Forestry Research Institute (KEFRI) has conducted systematic technology development involving reintroduction, selection and breeding, to develop a fast-growing straight variety of improved E. grandis. The species has improved growth and industrial characteristics. The impressive fast growth and provision of diverse products has attracted many landowners in Kenya to venture into growing improved E. grandis for commercial purposes.

The booklet therefore outlines; attributes of Eucalyptus grandis, attributes of improved E. grandis, commercial products from E. grandis, socio-economic impact of growing improved E. grandis, optimizing growing of improved E. grandis, direct beneficiaries of the improved E. grandis, and its production chain. The booklet also gives information on availability of improved E. grandis seed



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1.0 Introduction

In Kenya, diminishing natural and woodland forest resources are being compensated by expansion of planted exotic trees. Eucalyptus is among the most widely grown tree due to its species diversity and adaptability for various agro-ecological zones. Eucalyptus is also preferred because of its fast growth, straightness, coppicing ability and availability of propagation materials. Eucalyptus is mainly grown for; income generation, provision of wood energy for industrial use, and to meet domestic demand for tree products. Increased planting of Eucalyptus is contributing towards the national forest cover target of 10%.

It is estimated that there are 320 000 ha of Eucalyptus grown by Kenya Forest Service (KFS), private sector, and large and small-scale farmers. The major growers within the private sector are; Brooke Bond, James Finlays, Eastern Produce, and British American Tobacco (BAT) who use wood energy for industrial purposes. Kakuzi Ltd also grows Eucalyptus for processing into various products that include; sawn timber, power transmission poles, fencing posts, and fuelwood, which are in great demand.

The standing stock of Eucalyptus resource in Kenya is estimated at 52 million m³ on assumption of an average of 160 m³ per hectare with an estimated price of KES 2,000 per m³. Thus, the total value of Eucalyptus in the country is estimated at KES 104 billion.

To enhance benefits of growing Eucalyptus, Kenya Forestry Research Institute (KEFRI) has improved growth and industrial characteristics of *Eucalyptus grandis*, which is the most widely cultivated *Eucalyptus* species in the country. The species is grown for multiple uses that enhance its popularity. *Eucalyptus grandis* is mainly grown for; power transmission poles, pulpwood, wood-fuel, rails, building and fencing posts, plywood, and is increasingly becoming a major timber species.

2.0 Attributes of *Eucalyptus grandis*

Eucalyptus grandis is a tree species that can attain a height of 50 m and a diameter at breast height (dbh) of 2 m at the age of 30 years. The species is widely planted in the highlands at an altitude ranging from 1400 to 2200 metres above sea level (m.a.s.l) and mean annual

3.0 Attributes of improved *Eucalyptus grandis*

Through systematic technology development involving reintroduction, selection and breeding, KEFRI has developed a fast-growing straight variety of improved *E. grandis* that can attain a mean annual volume growth of $50 \text{ m}^3 \text{ ha}^{-1}$ and mean annual height increment of 5 m between the ages of 2 and 9 years. This is in contrast to the unimproved *E. grandis* with mean annual growth volume of $38 \text{ m}^3 \text{ ha}^{-1}$ and mean annual height increment of 3.8 m. The increment in volume for improved *E. grandis* is 33% higher than unimproved variety. The improved *E. grandis* provides commercial products from the age of 3 years.

4.0 Commercial products from *Eucalyptus grandis*

The impressive fast growth (Plates 1-4) and provision of diverse products has attracted many landowners in Kenya to venture into growing improved *E. grandis* for commercial purposes. The drive in uptake of the improved *E. grandis* technology is its economic potential resulting from increased earnings from sale of tree products at a relatively young age. The commercial products derived from improved *E. grandis* are shown in Table 1 and Plates 5-10.



Plate 1: 1-year old *E. grandis* (background) and 1-year old coppices (foreground)



Plate 2: 1.6-years old *E. grandis*



Plate 3: 4-year old *E. grandis*



Plate 4: 7-year old *E. grandis*

Table 1: Commercial products from *Eucalyptus grandis*

Products	Age (years)	Diameter at ground level (cm)	Remarks
Stakes (Withies)	Less than 2	Less than 5	These are mainly removals as thinnings from coppices and densely stocked plantations
Rails, and fitos	3	5-10	Used as building materials
Fuelwood	N/A	N/A	Size and age depend on the user
Props and posts	5	10- 15	Used for construction of semi-permanent houses and greenhouses, scaffoldings for storeyed houses, fencing posts and supporting agricultural crops such as passion fruits, bananas
Pulpwood	8	N/A	Used for pulp
Electricity transmission poles	8 - 12	30-40	Used for electric power transmission poles and construction of large buildings
Logs	15	More than 40	For production of sawn timber and plywood

Note: For all the products, measurement of diameter is at ground level for consistency as trees for electricity transmission poles are measured at the ground level.



Plate 5: Rails (fitos)



Plate 6: Building, Fencing, and Scaffolding posts



Plate 7: Power transmission poles



Plate 8: Timber



Plate 9: Industrial fuelwood



Plate 10: Domestic firewood

5.0 Socio-economic impact of growing improved *Eucalyptus grandis*

Medium and high potential zones where Eucalyptus are grown have a population of approximately 27 million people consisting of about 5 million households on assumption of 5 persons per household. Currently one hectare of improved *E. grandis* at an initial stocking of 1,100 trees per ha (spacing of 3 by 3 m) and harvested for multiple products generates KES 2,000,000 at age 10 years. The internal rate of return for one hectare of improved *E. grandis* for production of transmission poles at a cutting cycle of 10 years is 36% and a Cost Benefit Ratio of 1:4.4. Commercial planting of Eucalyptus is therefore attractive from an economic perspective.

The use of Eucalyptus firewood is of economic importance in tea industry which is one of the country's major foreign exchange earners. A survey carried out in 94 tea factories in 2010 revealed that the tea industry saved KES 3.582 billion by using improved *E. grandis* firewood instead of furnace oil (Table 2) to process 398 million kg of tea.

Table 2: Comparison of processing tea using improved *E. grandis* firewood and furnace oil.

Item	KES
Cost of processing using firewood	1,990,000,000
Cost of processing using furnace oil	5,572,000,000
Savings opportunity	3,582,000,000
% Saving	64

Trade in Eucalyptus transmission poles has emerged as one of the fastest growing and profitable forestry-based enterprise in the country. Treatment plants for transmission poles have increased in number from 4 in 2005 to 18 by May 2013. These treatment plants have a capacity to process over 1,500,000 poles per year. The industry currently generates a gross income of KES 6.4 billion per year with pole growers earning 25% of this amount.

6.0 Optimizing growing of improved *E. grandis* with minimum negative impact to the environment

KEFRI and Kenya Forest Service (KFS) have developed guidelines and a draft policy specifying appropriate sites for growing various *Eucalyptus* species. The guidelines emphasize species-site matching so as to maximize on productivity and minimize adverse environmental impact. The guidelines also advise against planting of Eucalyptus along streams, rivers, and wetlands. Eucalyptus trees grown by various stakeholders have reduced exploitation pressure on natural and plantation forests.

7.0 Beneficiaries

The direct beneficiaries of the improved *E. grandis* technology include; Kenya Forest Service, large scale tea companies, Kenya Tea Development Agency, electricity transmission companies, pole treatment plants, learning institutions and small-scale commercial tree farmers. Kenya Forest Service, large scale tea companies, Kenya Tea Development Agency, electricity transmission companies, pole

treatment plants, learning institutions and small-scale commercial tree farmers.

8.0 Production chain

The main counties where *E. grandis* is grown are; Uasin Gishu, Kericho, Tran Nzoia, Kisii, Kakamega, Muranga, Kiambu and Nyeri. Approximately 540,000 people are involved in Eucalyptus species value chain from planting, harvesting, transportation, processing and distribution of products.

9.0 Availability of improved *E. grandis* seed

Improved *E. grandis* seed is currently available at the Kenya Forestry Research Institute.

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