sappi | southern africa

Sustainability FAQs

Eucalypts

There are over **700** ***Eucalyptus*** species in the world, mainly from Australia.

The **plasticity** of the ***Eucalyptus*** genus is **extraordinary** — its uses equally diverse.[1]

Eucalypts are among the **fastest growing** woody plants in the world.

At approximately **20 million ha** worldwide, the **eucalypts** are the world's **most valuable** and **most widely planted** commercial plantation tree genus.

Where do *Eucalyptus* trees (eucalypts) come from?

There are over 700 species of eucalypts[2] — most originate from Australia where they grow in a wide variety of climatic regions, ranging from deserts to swamps to mountainsides. Only four species are not Australian; these originate from Indonesia, the Southern Philippines and New Guinea.[3]

Are eucalypts indigenous to South Africa?

No, they are classified as exotic species in South Africa.

What characterises the eucalypts?

Eucalypts are generally long-living, evergreen angiosperms — plants that flower and form seeds that are enclosed in a dry or fleshy fruit, like an apple, that develop from the ovary within the flower.

The *Eucalyptus* genus includes the tallest flowering plant species in the world, *E regnans* which grows up to 99.6m tall.[4]

Many eucalypts, but not all, are known as gum trees because they exude copious amounts of sap from any break in the bark.

What value do eucalypts offer?

Economic value

Eucalypts are among the fastest growing woody plants in the world with mean annual growth rates up to 20-30m^3/ha/year. Eucalypts are the most valuable and most widely planted commercial plantation tree species in the world — approximately 20 million hectares have been planted — due to their adaptability, fast growth rate, good form and excellent wood and fibre properties.

Eucalypts are grown throughout the world and used in the establishment of industrial pulpwood plantations.[3] Worldwide, eucalypt plantations have expanded during the last 60 years because of the genus' superior fibre and pulping properties and the increased global demand for short-fibre pulp. Some eucalypts are very good for producing **kraft pulp** and **dissolving wood pulp**.

Energy

In today's carbon constrained economy, eucalypts are also receiving attention as fast-growing, short-rotation, renewable biomass crops for energy production.[4]

Medicinal

Eucalyptus oil and ingredients found in the oil are included in many commercial treatments for coughs and the common cold, mouthwash as a treatment for plaque and gingivitis (gum disease) and as an ingredient in insect repellents.

We mostly grow **7** taxa of ***Eucalyptus***.

Eucalyptus dunnii is our **most important** eucalypt species.

Our extensive collection of eucalypt genetic material, is comprised of **more than 20 individual** species.

We have **250,000**ha plantations, of which, **54%** are **eucalypts**.

What value do eucalypts offer (continued)?

Dissolving wood pulp (DWP)
Both Saiccor and Ngodwana Mills use eucalypts to manufacture DWP. Known within Sappi as Specialised Cellulose, this is a purified cellulose pulp suitable for subsequent chemical conversion into a range of products.

DWP with 91-95% cellulose content is mostly used to make viscose fibres for use in textiles. Higher cellulose content DWP is used to make rayon yarn for industrial products such as the cord used in tyres, rayon staple for high-quality fabrics, acetate and other speciality products.

Our DWP is sold globally for use in textiles, including: Viscose staple fibres (VSF) or rayon — most of our DWP is sold into this segment and solvent spun fibres (lyocell). However, products produced from DWP are also used in a wide range of other applications: • Rheological modifiers in products such as lipstick • Cigarette filters • Fillers in fat-free yoghurt, tablets and washing powders • Cellophane wrap • Micro crystalline cellulose (MCC) is used as a binder in pharmaceuticals and as a thickener in food • Ethers are used in various industries such as pharmaceuticals, food, personal care and construction and as binding agents in paints.

What success has Sappi had with tree breeding?

We have commercialised several eucalypt hybrid crosses with superior disease resistance and yield gains of about 30% compared to *Eucalyptus grandis* seedlings; two are currently deployed.

Where does Sappi get its eucalypt seedlings from?

We grow most of our own seedlings from seed collected in our own seed orchards where the parent trees have been especially selected for their growth qualities and desirable pulping characteristics. Seed is hand-collected by skilled tree climbers. One kilogram of clean seed produces enough seedlings to establish about 500ha of plantation. Our eucalypt seedlings are produced in two nurseries; one based in Mpumalanga and one in KwaZulu-Natal. Selected trees are also propagated vegetatively, using rooted cuttings.

How does Sappi assure seedling and cutting quality?

All seedlings and cuttings leaving our nurseries are assessed using our in-house developed Plant Quality Index (PQI) to determine the quality of seedlings and cuttings. The PQI ensures that all plants dispatched from the nursery meet defined physical and physiological specifications and that acceptable survival and growth is achieved.

How does Sappi maintain genetic diversity?

Our breeding programme has an extensive collection of eucalypt genetic material, comprising more than 20 individual species from Australia and Indonesia. This valuable genetic resource gives our breeders the flexibility to identify the most suitable material for our end-uses in terms of growth and fibre properties. This gene pool will also allow for some protection against pests and diseases that could challenge the genus in the future.

Does Sappi grow genetically modified trees?

We do not grow genetically modified tree, nor do we use them in our research. However, we have taken the decision to understand the challenges and risks associated with genetically modified tree crops. While we envisage possible environmental social and reputational risks, they may be a method to adapt our plantations to a potentially changing climate.[5]

Does Sappi conduct genetic research?

We improve our planting stock using conventional breeding by selecting and crossing superior individuals much like other commercial plant crops. As part of this process, *Eucalyptus* hybrids have been developed for several reasons, including, to combine the desired traits of two different species; to exploit hybrid vigour, and to increase adaptability to areas that are marginal for either of the parent species.

We also make use of cutting edge molecular tools that allow us to better understand processes of commercial interest such as wood formation and disease resistance. Through the use of these resources we aim to select superior trees at a younger age and thus accelerate our breeding initiatives.

To this end, we were involved in the international effort to decode the *Eucalyptus* genome, which was recently published in Nature.[6] The knowledge gained from sequencing the *E grandis* genome, not only serves as an excellent reference for gene and marker discovery, but also aids our understanding of the genetic control of both wood formation and pest and disease resistance in trees.

Do eucalypts have any disadvantages?

Eucalypts are prone to growth stresses, evident in the warping and splitting of logs and boards. Such defects can limit the usefulness of the wood destined for timber products. Growth stresses can be reduced with risk management strategies such as species site-matching, maintaining genetic diversity and reducing stress caused by drought, frost, snow, pest and diseases.

Do eucalypts use more nutrients than other crops?

When compared with a range of crops, eucalypts can achieve a high biomass production on a low nutrient uptake, as little as one half to one tenth that of most agricultural and estate tree crops.

Do eucalypts use more water than pines?

Yes, at similar ages they use, on average, 15–30% more water than pines, growing under the same conditions.

This does not necessarily imply that converting a plantation of pine trees to eucalypts will reduce stream flow by 15–30% because the rotation length (the age at which trees are harvested) differs and trees take up water differently, depending on the stage they are at in their life cycle. In our plantations, eucalypts are generally harvested at 10 years while pines are harvested at 18 years.

Read more about water-use: FAQ Water and Sappi's plantations.[7]

How does eucalypts' economic use of water compare?

Economically speaking, eucalypts are more efficient users of water than many other crops when biomass produced is expressed as a function of water used.

Plant water-use efficiency[8]

	Water use per total biomass (litres/kg)	Water use per harvested biomass (litres/kg)	Harvest index
Cotton Coffee Bananas	3,200	800	0.25
Sunflower	2,400	600	0.25
Soybean	1,430	500	0.35
Potato	1,000	600	0.60
Eucalypts	**785**	**510**	**0.65**
Finger millet	592	225	0.40

Why are eucalypts good for pulp/paper production?

Eucalypt fibres are relatively short and uniform with low coarseness compared to other hardwoods commonly used as pulpwood. **Low coarseness** makes eucalypt pulp highly suitable for many **tissue papers**. The low coarseness is important for **high quality coated fine papers**. Although the fibres are slender, they are relatively thick walled which gives uniform paper formation and high opacity — important characteristics for all types of fine papers.

Which tree species does Sappi grow?

The softwoods we grow are all pine species, or pine hybrids. Most of our hardwoods are eucalypt species and two eucalypt hybrid crosses. We also grow a small proportion of wattle, *Acacia mearnsii*.

Eucalyptus dunnii has a range of pulping properties suitable for both dissolving wood pulp (DWP) and kraft pulping processes. A small canopy, and the ease with which bark can be stripped make *E dunnii* especially well-suited to harvesting. Internationally this species has become increasingly popular because of its naturally good form, high wood density, adaptability to a range of site conditions and tolerance to pests and diseases. Suited to summer rainfall regions in temperate planting ranges, *E dunnii* is mildly drought tolerant but susceptible to wind, frost and snow damage from which it generally recovers well. 15.5-19°C 822–925mm

Eucalyptus grandis has historically been the South African forestry industry's most important hardwood species. It has good DWP and kraft pulping characteristics, but is prone to pest and diseases like the gall-forming wasp, *Leptocybe invasa*. Suited to humid to sub-humid conditions; not suitable for areas where frost and snow occur. >17°C >900mm

Eucalyptus nitens has good kraft pulping characteristics. The bark strips easily and the species is frost and snow tolerant, but it flowers poorly and its ability to coppice (regenerate new shoots from stumps of felled trees) decreases with age. It is also susceptible to a number of pests and diseases, including *Coryphodema tristis* (cossid moth), *Botryosphaeria* and *Phytophthora*. Suited to cooler sites in the summer rainfall regions; frost tolerant, with good snow tolerance. 15-18°C 825-899mm

Eucalyptus smithii is an ideal summer harvest tree; when it is easy to strip the bark; it is also an ideal species for second rotation coppice crops. Wood density is above average and this species has good pulping characteristics. Suited to deep well-drained soils on cool sites in summer rainfall regions; cold tolerant, but not frost hardy with moderate snow tolerance. 15–18°C 830–936mm

Eucalyptus macarthurii has very good frost tolerance but poor snow tolerance. It flowers well, is generally resistant to pests and diseases and coppices well. Suited to cool temperate zones; mostly on low productivity sites. 14.5-18°C 780 mm (minimum)

Eucalyptus grandis x *E urophylla* combines good growth with *Eucalyptus* stem canker (*Coniothyrium zuluensis*) tolerance; suitable for humid to sub-humid conditions; not suitable for areas where frost and snow occur. 18-22°C >950 mm

Eucalyptus grandis x *E nitens* combines good growth and rooting ability derived from *E grandis* with the cold tolerance of *E nitens*, resulting in moderate frost and snow tolerance and moderate coppicing ability. Unlike *E nitens*, the hybrid shows resistance to cossid moth and to *Phytophthora*. Suited predominantly to the warm and cool temperate zones. 14–18°C >800mm

Improving genetic gains

We are in the process of developing genomic selection, a DNA marker-assisted tool.

This aims at increasing selection intensity and shortening the breeding cycle to improve our genetic gains.

Working with *E dunnii*, our most important eucalypt species, we have focused on developing genomic selection models for approximately 15 growth and wood property traits.

The next step involves validating these models in related and unrelated *E dunnii* populations in order to confirm our predictions.

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5 Learn more about Sappi's position on genetically modified tree crops on page 47 of the Sappi 2015 Integrated Annual Report.
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