

A tree for all regions

Although primarily grown at the coast, casuarina thrives in a wide range of climatic conditions

By Musingo Mbuvi

Casuarina is a genus of 17 species in the family *Casuarinaceae*, native to Australasia, Southeast Asia and many of the Pacific Island countries. It was once treated as the sole genus in the family, but has been split into four genera. Casuarina is commonly known as the she-oak, ironwood, beefwood or mvinje in Kenya. It is commonly grown in tropical and subtropical areas throughout the world.

In Kenya, different casuarina species have been introduced for planting in different dates from the early 20th century. The major introductions include: *Casuarina cunninghamia* (1908), *Casuarina glauca* (1910), *Casuarina junghuhniana* (1956) and *Casuarina torulosa* (1952). After several trials, *Casuarina equisetifolia* has emerged as the most widely planted and utilised in the country followed by *C. junghuhniana* whose planting is picking up though limited to the highlands.

Casuarina equisetifolia J. R. et G. Forst a common tropical tree known as whistling-pine is often planted as a windbreak along the ocean at the coast. Its wood is used for shingles, fencing, and is excellent firewood. The species has emerged as one of the most preferred by farmers because of its:

- Fast growth: It can attain a height of three metres in the first year.
- Adaptability to wider ecological zones
- Multiple use
- Easy availability of planting materials
- Easy planting and management

Distribution

The tree is typically found near sea level up to 1,600 metres. It does well within a rainfall range of 200mm to 5,000 mm (8–200 in). It tolerates drought well for six to seven months but is sensitive to frost. It grows on a wide range of soils from coastal and lowland lava flows, poor soil of fenland and limestone soils. It grows in poor soils because it is able to fix nitrogen.

In Kenya, *Casuarina equisetifolia* is mainly grown along the coast by both large and small-scale farmers. Small-scale farmers account for 81.8 per cent of the production. From the existing government records, *C. equisetifolia* was first raised in Jilore tree nursery in the



A *Casuarina* plantation at the coast. (Photo BGF)

late 1960s and the first planting done in Gede, Malindi District (Kilifi County) in 1971.

Though its planting has been expanding from the coast to the highlands of Mount Kenya, perceptions that the tree is a coastal species and that it is planted to produce poles have largely determined its distribution in the country. This is against a scenario where the tree can be grown in almost all parts of the country and that it has very many uses from timber to environmental rehabilitation.

Research on casuarina

There is knowledge on the species from past research and on-going work. The research work is on all aspects ranging from spacing trials to yield maximising through molecular techniques. Techniques for mass propagation have been developed to support large scale planting which is also supported by easy availability of seeds.

Biology

The tree form ranges from woody shrubs to trees over 20 metres tall. Trees start flowering after three years. Flowering and fruiting tends to occur throughout the year and seed maturity takes four to six months. In the coastal region of Kenya, seeds are mature for harvesting from October to May. The species seeds prolifically and the seeds are mature when the cones turn yellow or dark green and begin to open.

The cones are collected by cutting branchlets with mature cones or spreading a net or canvas under the tree and then climbing to handpick and drop the fruits. The cones should be dried in the sun on racks, cement floor or plastic sheet, or in ovens or kilns to open the cones to release the seeds. When drying, the seeds should be spread in a thin layer and turned regularly to avoid overheating.

At night, fold the plastic to cover the seeds or cover with canvas seeds spread on the floor. Shake off the seeds and winnow, hand sort or sieve to get clean seeds. One kilogramme of mature cone produces approximately 29 grams of seed and one kilogramme of clean seed has 600,000 to 900,000 seeds. Seed storage behaviour is orthodox. Seeds can be stored in airtight plastic containers, kiln jars and aluminium packets in a cool dry place. Farmers could store seeds up to eight months at room temperature.

Propagation methods

Propagation is usually from seed, stem cutting and air layering. Seed propagation is common because the tree seeds prolifically and germination occurs easily. If selected pure cultures of *Frankia* rhizobia are not available, it is advisable to inoculate seedlings with a suspension of crushed nodules collected from the host tree, preferably at the original collection site. The infusion is sprinkled on the seedlings

Table 1: Survival percentage, mean height and mean root collar diameter of four-year-old *Casuarina equisetifolia* woodlots at the Kenya coast at different planting distances.

Treatment parameter	0.5 m x 1.0 m	1 m x 1 m	1 m x 2 m	1.5 m x 1.5 m	2 m x 2 m	2.5 m x 2.5 m	Average
Average survival (%)	80	82.3	82.2	76.9	82.0	79.5	80.5
Average height (m)	4.0	4.4	5.4	5.6	6.7	7.3	5.6
Mean root collar diameter cm (inches)	3.9cm (1.6in)	4.4cm (1.8in)	5.4cm (2.2in)	5.6cm (2.3in)	6.7cm (2.7in)	7.3cm (3.0in)	5.7cm (2.3in)

using a watering can. This will improve seedling establishment and ensure rapid growth during the initial stages of plantation establishment.

Seeds germinate well under temperatures ranging between 20°C and 30°C and no seed pre-treatment is required. The seeds are sown on beds and germinate within seven to 14 days. *Casuarina* has a high germination rate of 80 to 90 per cent. In wet conditions, it is advisable to have raised nursery beds to avoid dumping off.

Cuttings are sometimes used instead of seeds. This has been done by air layering, which has showed limited success. Using terminal branchlets, heel cuttings or basal sprouts especially from juvenile plants treated with root-inducing hormone powder has proved more successful. Although cuttings are more labour intensive, it is the recommended propagation method when the resulting offspring are desired to be identical to some superior form of the tree.

Transplanting

The germinants are pricked out for transplanting when they have two leaves. Pricked out seedlings should be put in a container with water before transplanting to potted tubes to avoid desiccation. The nursery should be in an open area as *casuarina* demands light. The potted seedlings should be watered twice a day for three months. Periodic root pruning should

In Kenya, Casuarina equisetifolia is mainly grown along the coast by both large and small-scale farmers. Small-scale farmers account for 81.8 per cent of the production.

be done. Hardening off will start during the fourth month where watering will be reduced, starting with once a day to three or four times a week.

Field establishment

Land should be ploughed or hand dug and cleared of tree stumps and roots. If the planting is on a farmland, it should be done before crops are planted. In dry areas, micro-catchments should be constructed to retain moisture for improved tree establishment and enhanced survival. Transplanting in the evening is recommended and should be done after enough moisture build up in the soil. The area should be fenced off to control browsing by goats and wild animals.

Farmers plant *Casuarina* under different spacings. The most common spacings used in Kenya are: 0.5 m x 1.0 m, 1.0 m x 1.0 m, 1.0 m

x 2.0 m, 1.5 m x 1.5 m, 2.0 m x 2.0 m and 2.5 x 2.5 m. Each of these spacings shows negligible differences in survival but with marked difference in height and root collar diameter. Farmers use the latter to determine the selling price of poles.

Sometimes, farmers plant trees at very close spacing of even 30cm by 30cm in anticipation of getting many poles per unit area. This prompted the setting up of a "researcher-farmer" designed spacing trial in Kilifi County to test this perception by farmers. Table 1 shows the mean survival, mean height and mean root collar diameter for *C. equisetifolia* trees from four-year-old woodlots.

Wider spacing resulted in faster growth, higher mean height and wider root collar diameter but it produced conical shaped poles, which are not popular with customers. Smooth cylindrical shaped poles are preferred to roof tourist hotels. Farmers use root collar diameter and shape to determine the pole selling price. The communities use inches instead of centimetres.

Tree management

Young plantations require constant weeding to reduce competition from weeds and it is advisable to intercrop. Seedlings should be protected from browsing stock and fire during the initial stages of growth. *C. equisetifolia* hardly coppices after cutting. When the tree is introduced to new areas, inoculation of the seedlings with pure culture of effective strains of *Frankia* rhizobia is recommended to enable the species to fix atmospheric nitrogen. Alternatively, a grower can mix nursery soil with soil collected from underneath mature *casuarina* trees.

The tree itself is almost pest and disease free with isolated cases of black blister disease reported by a few farmers in the coastal region. *Casuarina* needs to be popularised as an on-farm tree species owing to the ease of establishing it, fast growth and numerous uses.

The writer is a researcher at KEFRI
Email: mtembuvi@gmail.com



The poles are used for construction in the hotel industry. (Photo KEFRI)