CULTIVATION AND MANAGEMENT OF CASUARINA

Species: *Casurina equisetifolia*

Family: Casuarinaceae

Local Name: Telugu – Saragudu, Kannada – Sarve, Tamil – Savukku, Marathi – Saru, Oriya: Jhabuke.

Trade Name: Beef wood

Origin: *Casuarina* is an exotic to mainland India. It was introduced in Karwar District in 1668. It occurs naturally in the Andaman’s, Bangladesh and Burma coast. Natural regeneration of the species is rarely seen and it has to be raised by planting only.

Description

*Casuarina* is a large fast growing evergreen tree with graceful appearance, resembles a feathery conifer. Bole is long and cylindrical. In rare cases and in the interiors, there are instances of developing thick branches. In its natural state it is gregarious, forming pure crops with little or no under growth except grass and sporadic shrubs.

The tree attains height up to 40 m with diameter of 60 cm (180 cm girth) often, buttressed at the base. It is short lived; its natural span of life seldom exceeds 50 years. In less favorable localities, it turns misshapen and hollow beyond 25 years of age. The tree flowers generally twice a year during February – April and September – October. Fruits (Cones) appear in June and December. Variations in flowering and fruiting may occur with localities.
Environmental Requirements

Temperature: Along the coastal regions, where *Casuarina* thrives, the temperature is extreme sometimes extending to 47°C. Under inland conditions it tolerated extreme temperatures, but its growth is poor.

Rainfall: It grows well in both Southwest and North East monsoons. In peninsular India, the rainfall is in between 900 to 3800 mm. Growth is poor in low rainfall areas.

Soil: *Casuarina* grows best in loose, fine coastal sands. It can grow well under inland conditions of well drained sandy soils. It tolerates lateritic and red soils and also saline, alkaline and acidic conditions. The trees have nitrogen fixing root nodules and hence dependability on nitrogen supplement is less.

Silvicultural Requirement

*Casuarina* is a fast growing, light demanding species. It is very sensitive to excess soil moisture, fire and frost. It does not tolerate water logging for long. It does not tolerate drought up to sapling stage, later with deep rooting, it can withstand drought. It tolerates low temperature and shade. As a general rule it does not coppice but can with stand pollarding. Rare instances of natural regeneration and root suckers are noticed. It improves soil fertility by virtue of its vigorous root nodulation with nitrifying bacteria.

Flowering and fruiting

The species has two flowering seasons. Male flowers by second year and females a little later. Pollination occurs through wind. Fruits are globose, woody cones and ripe cones are grey or brownish red in colour, containing a number of winged achenes, each enclosing a solitary seed.
The achene is light brown with membranous wing, seeds are minute. Fruits ripen by June and December. The light brown winged seeds are 70 to 90 per cone.

**Seed Morphology and collection**

It is pronouncedly dioecious, that is male and female populations occur at 56% and 42% approximately and 2 to 3% bisexual plants. Well grown trees of 5 to 6 years age are selected for collection of ripe cones, before they dehisce, in June or December, by lopping the branches or beating the trees and collecting the cones from ground, swept clean before hand. Cones are spread out on clean floor, in the Sun to dry for 3 to 4 days when the winged seeds are shed, which are then separated. The cleaned seeds are dried for another 2 to 3 days.

To protect the seeds from ants and other insects, it is mixed with ash and stored in earthen pots, mouth sealed with cloth. It can be stored for a few months. It should preferably be sown immediately after collection. About 15Kg of cones will yield 1/2 Kg of clean seed. A kilogram of seed has 7.5 to 10 lakhs in number. Purity 80 to 90%, moisture 7.3% and germination of 50 to 60% in 7 to 10 days.

**Artificial regeneration**

a) **Seed Propagation:** Direct sowing is not successful, as the seeds are very minute and liable to be damaged by rains, drought and insects. The only reliable method of propagating Casuarina is by planting 3 to 4 months old nursery seedlings.

b) **Clonal Propagation**

It can also be propagated vegetatively from lateral or side shoots by using IBA based powder formulated rooting hormones at the concentration ranging from 3000 – 6000 ppm. The treated cuttings should be cultured under green
house conditions with intermittent misting coupled with the humidity of 70-80%. Air layers and rooting of sprigs in mist chambers is also found very successful for mass multiplication of elite clones. Superior trees are normally propagated through this method of propagation and are called clones.

**Nursery Technique**

**Location:** The nursery should be located as close to the planting site as possible. The area should be plain, with sandy or sandy clay soils, with reliable water source.

**Land preparation:** The area should be cleared off all the debris and miscellaneous growth if any. A light ploughing should be carried out before alignment.

**Alignment of beds**

The beds should be aligned in North South direction. Beds of 10 x 1 m with about 50 cm. Space between them, should be left out and for every 50 beds a path of about 2 m should be provided. For primary and secondary beds, the same system be followed.

**Soil preparation:** The aligned beds are dug up to depth of 30cm. The cavity so formed is filled with sand, soil and organic matter in order to enrich the soil.

**Bed formation**

In deep sandy soils, the dug up earth is mixed with Farm Yard Manure at 1:1 ratio and the cavity is filled and made compact, the beds are formed either to ground level or sunken to 5 cm depth. In sandy clay soils, the beds are formed with the dug up soil mixed with sand, FYM in equal proportions filling the cavity.
The bed is formed above the ground level raised to a height of 20 to 25 cm. Parathion dust at \( \frac{1}{4} \) kg. per bed or any ant repellent is well mixed in the soil while forming the beds. This is to prevent ants carrying away the seed.

**Sowing of seed**

Each bed of ten square meters is sown with 400 to 500 g of clean seed. The seed should be mixed with fine sand and broadcasted on the beds. They should be covered lightly with hay and watered twice a day. Watering should not lead to water logging; otherwise damping off will result. In case damping off is noticed, a light spray of blitox dissolved in water should be done.

In about ten days, the germination is almost complete. Light watering twice a day be continued there after for a month or till the seedlings are of 10 cm. Height, when they are ready for planting in bags or on the secondary beds. In case of casualties due to termite attack, parathion dust or Chlorpyriphos should be applied.

**Planting stock**

Three to four months old nursery raised seedlings have to be planted. The Planting stocks are of the following types:

1. **Containerized plant**

   The seedlings from the primary beds are pricked out and planted in polythene bags of 10x20 cm filled with soil mixture and watered regularly. These seedlings have good success and establish quickly and grow well, even when there is a break in rain but the operations involved are costly.

   The shade is provided for the period of one week to ten days, to avoid casualties. The shade is removed when the seedlings are established. Shifting
of bags is done when roots start protruding. Seedlings of 45 to 50 cm height are ready for planting.

2. **Treated naked seedlings**: Seedlings raised in secondary beds are taken out and the thin roots are cut cleanly. The roots are then treated by immersion in a sticky mud puddle. These are very cheaper in cost and gives better establishment if planted during rainy season. This method is a very common practice in coastal sandy soils.

**Planting**

Normally farmers adopt 0.8 to 1 m spacing which results in thin boles. Hence a spacing of 4 x 4 to 6 x 6 feet is ideal which allows intercropping in the first year and also it gives good growing space for the trees to put on excellent girth at an early state.

For planting of bag plants in sandy soils, the soil is scooped to the depth and width of the bag, planted preferably with onset of rains.

If watering is done along with the planting, establishment will be faster. In hard clayey soils, a small pit of 30 cm is dug out and bags planted is done after removing the ploythene cover carefully, without disturbing the soil in the bag. Planting of naked seedlings or treated naked seedlings can be done in holes made with a crowbar, to depths of the root length. The seedling is placed with roots straight in the hole before planting the thin part of the root should be cut cleanly with a knife.
After care of plantation

Irrigation

Casuarina is an irrigated crop and the irrigation is required for once in every 10-15 days. It is also advisable to adopt drip irrigation in order to effectively manage the available water and to increase the yield.

Fertilization

The trees have nitrogen fixing root nodules (an actinomycetes called Frankia) and hence, dependability on nitrogen supplement is less. However, 40 - 50 kg per ha of nitrogen can be applied in four equal splits. The Super Phosphate @ 150 kg per ha and Muriate of Potash @ 100 kg per ha can be applied in four to five equal splits.

Pruning

Branches are pruned flush to the stem of up to 1/3rd of the stem height to augment height increment and to obtain clean bole during early stage (6-12 months).

Major Pest

A bark feeding caterpillar is a major problem which results in heavy damage of trees due to the cylindrical tunnels created within the wood. Control of the pest is difficult, however application of one or two ml of kerosene in to the tunnel is found effective. Monocrotophos @ 5 ml per tree as bark padding method would be also be an effective chemical control.

Important pests and their control measures

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<tr>
<th>S.No</th>
<th>Common pest</th>
<th>Control Measure</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bag worm</td>
<td>Topical application endosulfan or chlorpyriphos 2ml per litre.</td>
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<tr>
<td>2.</td>
<td>Bark feeding caterpillar</td>
<td>Remove the feeding galleries and apply insecticide soaked cotton (15ml of dichlorvos) in the bore holes.</td>
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<tr>
<td>3.</td>
<td>Stem borer</td>
<td>Inserting wire to remove feeding larvae and applying insecticide soaked cotton (15ml of dichlorvos).</td>
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<td>4.</td>
<td>Mealy bug</td>
<td>Topical application of methyl dematon or dimethoate (2ml per litre)</td>
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<td>5.</td>
<td>Termite</td>
<td>Application for chlorpyriphos 2 ml per litre</td>
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Termites also cause serious damage in young plantation by destroying the root system leading to the death of young trees. This can be arrested by soil drenching with chlorpyriphos at 0.2 per cent.

**Major disease**

The casuarina plantation are found vulnerable to various diseases viz., stem canker and die back, pink disease, root infection and die back and wilt. The stem canker and die back can be controlled by the application of Bavistan at 0.01 per cent active ingredients.

Wilt disease caused by Trichosporium is a serious disease and could be managed with proper soil and water management. Severely damaged trees have to be uprooted immediately to avoid further spreading.

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<td>1.</td>
<td>Damping off</td>
<td>Providing proper drainage</td>
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<td>Seed treatment with captan or thiram @ 4g/kg.</td>
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<td>Soil drenching with carbendazim (Bavistin) @ 0.1 %</td>
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<tr>
<td>2.</td>
<td>Stem canker</td>
<td>Spray with mancozeb @ 0.25 %</td>
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<tr>
<td>3.</td>
<td>Die back</td>
<td>Removal of infected plant parts and spray with mancozeb @ 0.25 % or copper oxy chloride @ 0.25 %</td>
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<tr>
<td>4.</td>
<td>Pink disease</td>
<td>Removal of severely affected plant parts or scrap the infected portions and apply with Bordeaux Paste.</td>
</tr>
<tr>
<td>5.</td>
<td>Wilt disease</td>
<td>Remove the infected trees immediately. Digging the trenches around the infected tree. Scrap the infected portion and spray with copper oxy chloride @ 0.25 %</td>
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**Yield**

Every part of the tree is useful, including needles as fuel. The best yield of about 125 to 150 tons per hectare is possible within three years at an espacement of 4 X 4 feet or 5 X 5 feet. It is also possible to increase the yield through quality planting material coupled with irrigation and fertilization.
Intercropping
Agricultural crops can be raised in the first year with *Casuarina* especially groundnut and melons in sandy soils, sesame in red soils and pulses in heavy soils.

Utility
**Pulp wood:** Casuarina is a good pulpwood species. Farmers are cultivating mostly this species for pulpwood. Yield and strength properties of *Casuarina* pulp are reported satisfactory for wrapping paper and duplex paper. It makes good pulp by use of neutral sulfite semi chemical process. The material with bark is used for pulping.

**Fuel wood:** Casuarina is considered to be the best firewood in the world, burns even when green. Its calorific value is 4950 Cal/Kg and hence, it can be a source of bioenergy.

**Timber:** The sapwood is pale brown, heartwood dark reddish brown. Timber is strong and heavy (average 850 kg/m$^3$). It is liable to crack and split, not easy to saw and season. It is used as poles, scaffolding, transmission lines and rafters.

**Medicinal:** Bark of *Casuarina* is a tonic and astringent useful in dysentery and diarrhea. Decoction of leaves and twigs is used in colic and powdered seed in made into a paste and applied as balm for headaches. Bark contains 6-18% tannin, which is also used for dyeing wool and silk fabrics and for toughening fishermen nets. It also yields a resin. Needles of *Casuarina* have been used for preparing activated carbon by the zinc chloride method.

**Avenue:** *Casuarina* forms a good avenue tree and most suitable for landscaping sea beaches. It forms a good hedge plant and can be shaped to desired form.

**Windbreak:** *Casuarina* with deep taproot can withstand cyclonic storms than any other species and is very useful as a windbreak and for sand dune stabilization.

**Soil Improvement**

*Casuarina* develops nitrogen fixing nodules of Frankia species on the roots. They fix considerable quantities of nitrogen in the soil and help to improve the soil nutrient status.
Contract farming

The institute has tie up programme with the following two industries and encourages contract farming through technological support.

For contract farming, the following addressee can be contacted;

1) The Head (Environment), Sheshasayee Paper Board, Erode. Mobile: 9443340236.
2) The Manager (Plantations), Tamil Nadu Newsprints and Papers Ltd, Mobile: 9442591411.

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