TREE SPECIES FOR PLANTING AT THE SIDES AND MEDIAN OF THE ROADS IN BENGALURU

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Bengaluru / Greater Bangalore / Bruhat Bengaluru / Bangalore (77°37’19.54’’ E and 12°59’09.76’’ N) is the principal administrative, cultural, commercial, industrial, and knowledge capital of Karnataka state. Bangalore city’s population has increased enormously from 6,537,124 (in 2001) to 9,588,910 (in 2011), amounting to a decadal growth of 46.68%. With this, the population density has increased from as 10,732 (in 2001) to 13,392 (in 2011) persons per sq. km. The vegetation of Bangalore was classified as dry deciduous forest-type under the Terminalia-Anogeissus latifolia-Tectona series. The city had enjoyed salubrious climate throughout the year prior to the industrialization era. Land use analysis based on the fusion of Resourcesat-2 MSS data with Cartosat 2 shows that the spatial extent of tree vegetation in Bangalore is 100.02 sq.km (14.08%).

Urban vegetation includes trees, shrubs and herbs on public and private lands (parks, streets, backyards), all interspersed within a landscape dominated by paved surfaces. This kind of vegetation plays a vital role in moderating micro climate, sequestering greenhouse gases (CO₂, etc.) and also in aiding the percolation of water. Estimates indicate that about 6 tons of carbon is sequestered by 1 hectare of forests annually and
this averages out as the carbon sequestration of 6 kg/tree/year. Per capita respiratory carbon ranges from 192 to 328 kg/year depending on the physiology of humans. Generally, the carbon dissipated through respiration varies from 525 to 900 gm/day/person. This means 32 to 55 trees per person in a region is required to exclusively mitigate respiratory CO₂.

Maintenance of green cover is the need of the hour in urban areas with increase in paved surfaces due to urbanisation. Selection of plant species for planting at the sides and median also require utmost care. Exotic species flower greatly, but fail to stand during harsh wind and after certain age the strength of the root fails to hold the tree to the soil, and hence fall during monsoon, which creates major problem. In the past and also traditionally, native tree species were being selected for avenues and also at the fringes, which are quite strong, provides fruits and shade for the needy. These native tree species are a source of nectar, food for several species of birds and insects. In this regards, it is suggestible to plant native tree species at the sides and the median of ring roads. Median of the roads needs smaller trees that do not obstacle the movements of vehicles and do not cause problem further. Hence, selection of the plant species for median of the roads is also important. The following section, lists the tree species to be considered for planting along road sides and median.
Description of the trees suggested for planting at sides of the roads:

1. *Pongamia pinnata* (Honge Mara)

Description:

It is a deciduous tree that grows to about 15-25 meters in height with a large canopy of leaf cover that spreads equally wide. The leaves are a soft, shiny burgundy in early summer and mature to a glossy, deep green as the season progresses. Small clusters of white, purple, and pink flowers blossom on their branches throughout the year, maturing into brown seed pods. The tree is well suited to intense heat and sunlight and its dense network of lateral roots and its thick, long taproot make it drought tolerant. The dense shade it provides slows the evaporation of surface water and its root structures promote nitrogen fixation, which moves nutrients from the air into the soil.

Local names: Indian Beech, Pongam, Honge, Ponge, and Karanj

Flowers and Fruits: summer
2. *Artocarpus heterophyllus* (jackfruit)

**Description:** A tree with milky latex well suited to tropical lowlands. The leaves are dark green, leathery and shining. Its fruit is the largest, seldom less than about 25 cm (10 in) in diameter. Even a relatively thin tree, around 10 cm (4 in) diameter, can bear large fruit. The jackfruit is something of an acquired taste, but it is very popular in many parts of the world. The sweet yellow sheaths around the seeds are about 3–5 mm thick, but milder and less juicy.

**Local names:** Jack fruit; Katahal

**Flowers and fruits:** Summer
3. *Mangifera indica* (Mango trees)

**Description:**

Grows to 35-40 m in height, with a crown radius of 10 m. The leaves are dark green, alternate, simple, 15-35 cm long and 6-16 cm broad; when the leaves are young they are orange-pink, rapidly changing to a dark glossy red, then dark green as they mature. The flowers are produced in terminal clusters 10-40 cm long; each flower is small and white with five petals 5-10 mm long, with a mild sweet odor. After the flowers finish, the fruit takes from three to six months to ripen. The ripe fruit is variable in size (right image) and color, such as yellow, orange, red or purple.

**Local names:** Mango, Aam

**Flowers and fruits:** Winter to Summer
4. *Syzygium cumini* (Jamoon)

![Image of Syzygium cumini](image)

**Description:**

An evergreen tropical tree 50 to 100 ft. tall, with oblong opposite leaves that are smooth, glossy; they have a turpentine smell. The bark is scaly gray and the trunk forks into multiple trunks about 3 - 5' from the ground. Jamun has fragrant white flowers in branched clusters at stem tips and purplish-black oval edible berries. The juicy fruit-pulp contains resin, gallic acid and tannin; it tastes usually from acid to fairly sweet. The somewhat astringent, jamun fruit can be utilized for juice. This berry has only one seed.

**Local names:** Java plum, jamun, black plum, Indian blackberry

**Flowers and fruits:** Winter to summer
5. *Azadirachta indica* (Neem)

**Description:**

A fast growing tree that can reach a height of 15-20 m (about 50-65 feet). The branches are wide spread. The fairly dense canopy may reach the diameter of 15-20 m in old. The trunk is relatively short, straight and may reach a diameter of 1.2 m. The bark is hard, fissured or scaly, and whitish-grey to reddish-brown. The sapwood is greyish-white and the heartwood reddish when first exposed to the air becoming reddish-brown after exposure. The root system consists of a strong taproot and well developed lateral roots. The flowers (white and fragrant) are arranged more-or-less drooping clusters which are up to 25 cm long. The fruit is a smooth drupe which varies in shape from elongate oval to nearly roundish.

**Local names:** Neem, Bevu

**Flowers and fruits:** Winter to summer
6. *Ficus bengalensis* (Banyan)

Description:

The Banyan is a tree with a huge spread with characteristic aerial roots which upon touching and entering the earth, draws sustenance from the earth, thickens/lignifies and becomes a new trunk. The vine like aerial roots plunging down from the main limbs of the tree form a network of trunks with surface roots spreading in all direction. The leaves are leathery and oval shaped with the berry or figs emerging in pairs which are globose and ripen to a red colour. Typically the flowers – male and female and gall flowers all grow radially inwards towards the centre of the hollow berry or fig. The tree is evergreen though briefly leafless at the peak of the hot season in dry localities.

**Local names:** Banyan, Nyagrodha, Bargad, Aladha mara

**Flowers and fruits:** Throughout the year
7. *Ficus religiosa* (Sacred Fig, Pipal)

**Description:**

It is a large dry season-deciduous tree up to 30 m tall and with a trunk diameter of up to 3 m. The leaves are heart shaped with a distinctive extended tip; they are 10-17cm long and 8-12cm broad, with a 6-10cm petiole. The fruit is a small fig 1-1.5cm diameter, green ripening purple. This plant is considered sacred by the followers of Hinduism, Jainism and Buddhism, and hence the name 'Sacred Fig' was given to it. Siddhartha Gautama is referred to have been sitting underneath a Bo Tree when he was enlightened (Bodhi), or "awakened" (Buddha).

**Local names:** Bodhi, Pipal (peepal, peepul, pippala, pimpal, etc.), arali or Ashvastha

**Flowers and fruits:** December to March
8. *Michelia champaca* (Champak)

**Description:**

This small tree has alternate, lanceolate leaves to over 20 cm long that are slightly curved. The flowers are fragrant, a mustard yellow colour, and in each flower the ovaries are free from one another. The central stalk or receptacle elongates and bears the developing fruits along it. When fully developed each individual fruit is about 2.5 cm long, with a reddish tinge and whitish pustules; this follicle opens to release orange-red seeds.

**Local names:** champaka, champak or champac, champa, sampige and shamba

**Flowers and fruits:** December to April
9. *Ficus racemosa* (Fig)

**Description:**

Tree growing up to 10-16m tall with grayish bark. Leaves are 7.5-10cm long, ovate or elliptic in shape, dark green. Flowers are in the form of fruit, visible when cut open. The fruit in large clusters, arising from main trunk or large branches.

**Local names:** Indian Fig, Atthi mara, Udumbara

**Flowers and fruits:** Throughout the year
10. *Butea monosperma* (Flame of the forest)

![Flame of the forest](image)

**Description:**

It is a medium sized dry season-deciduous tree, growing to 15 m tall. The leaves are pinnate, with an 8-16 cm petiole and three leaflets, each leaflet 10-20 cm long. The flowers are 2.5 cm long, bright orange-red, and produced in racemes up to 15 cm long. The fruit is a pod 15-20 cm long and 4-5 cm broad. It is said that the tree is a form of Agnidev, God of Fire. It was a punishment given to Him by Goddess Parvati for disturbing Hers and Lord Shiva's privacy.

**Local names:** Flame of the forest, Mutthuga, Kinshuk, Palash, Dhak

**Flowers and fruits:** January to May
11. *Cassia fistula* (Golden Shower Tree)

**Description:**

It is a medium-sized tree growing to 10-20 m tall with fast growth. The leaves are deciduous or semi-evergreen, 15-60 cm long, pinnate with 3-8 pairs of leaflets, each leaflet 7-21 cm long and 4-9 cm broad. The flowers are produced in pendulous racemes 20-40 cm long, each flower 4-7 cm diameter with five yellow petals of equal size and shape. The fruit is a legume is 30-60 cm long and 1.5-2.5 cm broad, with a pungent odour and containing several seeds.

**Local names:** Kakke mara, suvarnaka, bendra lathi, golden shower, Indian laburnum

**Flowers and fruits:** March to May
12. *Polyalthia longifolia*

**Description:** It is erect tree up to 4 m high. Leaves alternate, narrow-lanceolate, simple, shortly-petiole, acute, shining. Inflorescence a panicle, sometimes in a short-peduncled umbel, sepals 3, free, triangular, apex reflexed. Fruit a berry, ovoid, reddish black, seeds smooth.

**Local name:** Ulkat, Kastadaruha (Sankrit); Debdari, Ashoka (Hindi); Madras Ashoka (Kannada)

**Flower, Fruit:** March – April
13. Bauhinia variegata

**Description:** It attain moderate sized tree upto 6 m high. Leaves alternate, simple, coriaceous, cordate. Inflorescence corymbose raceme, terminal or axillary. Petals ovate-oblong, clawed, prominently nerved, usually one of them brightly coloured. Fruit a pod, flat, glabrous, prominently veined when dry dehiscent.

**Local name:** Kanchanara (Sanskrit), Kachnar (Hindi), Kempu mandara (Kannada)

**Flower, Fruit:** November – February
14. *Lagerstroemia speciosa* (Pride of India)

![Lagerstroemia speciosa](image)

**Description:** A medium size handsome deciduous tree. Leaves are simple, large, elongate, elliptic, short-stalked that turn red before falling. The rose-like flowers (about 4.5-5 cm. across) with crinkly petals and numerous stamens are most attractive and are displayed on large, erect clusters at branch ends. Fruits are woody, spherical (about 2 cm. dia.) and dehisce into a fruit-cup-like structure with five or more spreading lobes of the fruit wall. Bark is pale-brown, smooth or flaking thinly.

**Local name:** Pride of India, Queen Crape Myrtle (English), Jarul (Hindi)

**Flower, Fruit:** March-June
Description of the trees suggested for planting at median of the roads:

1. *Muntingia calabura* (Singapore cherry)

![Muntingia calabura](image)

**Description:**

It is a small tree 7-12 meters tall with tiered and slightly drooping branches. It has serrated leaves 2.5-15 cm long and 1-6.5 cm wide. The flowers are small and white, gives rise to 1-1.5 cm light red fruit. The fruit is edible, sweet and juicy, and contains a large number of tiny (0.5 mm) yellow seeds. It is a pioneer species that thrives in poor soil, able to tolerate acidic and alkaline conditions and drought. Its seeds are dispersed by birds and fruit bats. It is cultivated for its edible fruit, and has become naturalised in some other parts of the tropics, including southeastern Asia.

**Local names:** Gasgase hannu, Singapore cherry

**Flowers and fruits:** Throughout the year
2. *Gmelina arborea* (Gamhar, Shivani)

**Description:**

The tree attains moderate to large height up to 30 m with girth of 1.2 to 4.5 m with a clear bole of 9-15 m. It has a smooth whitish grey (ashy) corky bark, warty with lenticular tubercles exfoliating in regular patches when old. It is a treat to see the tree standing straight with clear bole having branches on top and thick foliage forming a conical crown on the top of the tall stem. Flowers are bright yellow coloured and attractive. The bark is light grey coloured, exfoliating in light coloured patches when old, blaze thick, a chlorophyll layer just under the outer bark, pale yellow white inside. wood is pale yellow to cream coloured or plukish-buff when fresh, turning yellowish brown on exposure and is soft to moderately hard, light to moderately heavy, lustrous when fresh, usually straight to irregular or rarely wavy grained and medium course textured.

**Local names:** gambar, khumbhari, kumbuda, kumulu, shivani

**Flowers and fruits:** February to April
3. Saraca asoca (Sita Ashoka Tree)

**Description:** The tree attain moderate height up to 7 m high. Bark pink-brown, relatively smooth, but inconspicuously and irregularly fissured. Leaves are large, compound, and alternate with strap-like leaflets. Flowers are 1.5 to 2 cm long, attractive and clustered in axillary inflorescences. Fruit is a few-seeded oblong pod.

**Local name:** Ashok, Anganapriya, kenkalimara (Kannada)

**Flower and fruit:** March to August
4. Pavetta indica (Paapate gida)

**Description:** It is an erect, nearly smooth or somewhat hairy shrub 2 to 4 meters or more in height. Bark grey, smooth and irregularly scaly when mature; blaze greenish cream. The leaves are elliptic-oblong to elliptic-lanceolate, 6-15 cm long, and pointed at both ends. The flowers are white, rather fragrant, and borne in considerable numbers in hairy terminal panicles. The sepals are very small, and toothed. The flower-tube is slender and about 1.5 cm long, with obtuse petals about half the length of the tube. The flowers attract butterflies and insects. The fruit is black when dry, and about 6 mm in diameter.

**Common name:** Indian Pavetta, Indian Pellet Shrub, Kankara, Kathachampa (Hindi), Pavati (Kannada).
5. *Ixora brachiate*

**Description:** It is a small tropical tree found in evergreen forests of southern parts of India, attain to 10 m tall. Oppositely arranged leaves, 14-16 x 3.5-6.5 cm, are elliptic-oblong or elliptic-ovate, with obtuse tip and acute base. Flowers are white, small, sessile, and fragrant, in terminal panicled cymes. The branches of the clusters are red in color and the flowers are tiny white. Flower tube is 5-6 mm long, narrow, with petals 2 mm long, oblong, bent abruptly backward. Berry, globose, 0.6 cm long, reddish when ripe.

**Local name:** Gorbale (Marathi)

**Flowering:** December-February.
6. *Nyctanthes arbor-tristis* (Parijata)

**Description:** *Nyctanthes arbor-tristis* is a shrub or a small tree growing to 10 m tall, with flaky grey bark. The leaves are opposite, simple, 2–6.5 cm broad, with an entire margin. The flowers are white corolla with an orange-red centre, five to eight lobed and fragrant, they are produced in clusters of two to seven together, with individual flowers opening at dusk and finishing at dawn. The fruit is a heart-shaped to round capsule 2 cm diameter, with two sections each containing a single seed.

**Common name:** Har singar, Coral Jasmine, Tree of Sorrow, Queen of the night, Har singar, Paarijat (Hindi)
7. Gardenia gummifera

**Description:** It is a small tree which grows up to 3 meters. They are evergreen shrubs and small trees growing to 1-15 m tall. The leaves are 5-50 cm long and 3-25 cm broad, dark green and glossy with a leathery texture, opposite or in whorls of three or four, calyx up to 1 cm long, pubescent, teeth 5-6, short, triangular. Corolla-tube 2.5 – 5 cm long, white, turning yellow. Berry ellipsoid or oblong upto 4 cm long striate, crowned with the persistent calyx.

**Flower:** March – May

**Local name:** Naadihingu (Sanskrit), Dikamali (Hindi), Bukki gida (Kannada)

8. Ervatamia heyneana (Nandi batlu gida)

**Description:**

A small deciduous tree with white flowers and orange-yellow follicles, the seed arils red. Bark grey, wood white and pale grey in streaks, smooth, moderately hard. Leaves elliptic-oblong or lanceolate, shortly acuminate at apex. Corolla- tube thick 8-1 in. long dilated at top, calyx-lobes obtuse or emarginated, thick,

**Local name:** Nag kuda
### Prominent trees of Bangalore

**Bauhinia purpurea L.**  
**Common name:** Butterfly tree  
**Family:** Fabaceae  
**Description:** A medium-sized tree up to 6.5 m high. Leaves alternate, simple, broadly ovate-orbicular, cleft to middle, lobes rounded. Inflorescence a raceme. Flowers are in a panicle, rose to pink. Fruit a pod, flat, pubescent.  
**Flowering and fruits:** October and May  
**Native:** India, Burma, Vietnam  
**Location:** Malleshwaram, Mahalakshipuram, Yeshwanthpura, Jaynagar East, Jayanagar, Rajarajeshwari nagar, Sadashiva Nagar. Cultivated as avenue tree.

**Bombax malabaricum DC.**  
**Common name:** Red silk-cotton tree  
**Family:** Bombacaceae  
**Description:** A tall native with straight trunk that is covered with hard, sharp, conical prickles. Leaves are large with 3-7 lanceolate to oval leaflets having pointed apex. Flowers are large clustered at the end of branches. Fruit ovoid in shape with five partitions. Seeds are covered with silky white hairs.  
**Native:** India  
**Flowering and fruits:** February – March  
**Location:** Malleshwaram, M.G Road, Sadashiva Nagar.
**Cassia spectabilis DC.**

**Common name:** Popcorn bush cedar  
**Family:** Fabaceae  
**Description:** A medium sized tree with dense canopy. Leaves are pinnately compound. Flowers yellow in terminal corymbose panicles. Fruit is a long compressed and dehiscent pod.  
**Flowering and Fruits:** March – October  
**Native:** Tropical Southeast Asia  
**Location:** Malleshwaram, Sanjay Nagar, Sankey Road, M.G Road, Yeshwanthpur, Rajaji Nagar. Dr Rajkumar ward.

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**Cocos nucifera L.**

**Common name:** Coconut palm  
**Family:** Arecaceae  
**Description:** A monoecious palm with regular leaf scars. Leaves are pinnately compound. Flowers are in a branched spadix, male flowers are small and many. Fruit is a drupe. Endocarp is lined with hallow endosperm, which is edibe.  
**Flowering and Fruits:** Throughout the year  
**Native:** Indo-Pacific  
**Location:** Rajaji Nagar, Mahalakshmi layout, Rajajeshwari Nagar, Basveshwara Nagar, Jayanagar, Yeshwanthpur, Yelahanka. Commonly occur in residential area.
**Delonix regia** (Bojer ex Hook.) Raf.

**Common name:** Gulmohur  
**Family:** Fabaceae  
**Description:** Moderate sized tree upto 9 m high. Leaves alternate, bipinnate, upto 40 cm long. Inflorescence a corymb. Fruit a pod, long, black, when dry, upto 50 cm long, septate within.  
**Flowering and fruits:** April - June  
**Native:** Madagascar  
**Location:** Rajajeshwari Nagar, Malleshwaram, Rajaji Nagar, Shankar Mutt, Seshadripuram, Yelahanka. Cultivated as avenue tree.

| **Polyalthia longifolia** (Sonn.) Thwaites  
| **Common name:** Mast tree  
| **Family:** Annonaceae  
| **Description:** Tree up to 4 m high. Leaves alternate, simple, shortly-petioled undualate, acute, shining, membranous when young. Inflorescence a panicle, sometimes in a short-peduncled umbel. Fruits a berry, ovoid, reddish black.  
| **Flowering and Fruits:** March – April; April – May  
| **Native:** South India  
| **Location:** Yeshwanthpur, Rajajinagar, Vijaynagar, Malleshwaram, Mahalakshmipuram. Cultivated as avenue tree. |
Spathodea campanulata P. Beauv.

**Common name:** African tulip tree  
**Family:** Bignoniaceae  
**Description:** Glabrescent evergreen tree, upto 20 m high. Leaves opposite, imparipinnate, ovate-lanceolate, entire. Flowers in terminal racemes or panicles. Capsule linear-lanceolate, acuminate at both ends.  
**Flowering:** December –March  
**Fruits:** April-July  
**Native:** Tropical Africa  
**Location:** Malleshwaram, Rajajinagar, M.G Road, Sanjay Nagar, Sadashiva nagar, Raj Rajeshwari Nagar, Vijay nagar, Hebbal. Cultivated as avenue tree.

Millingtonia hortensis L.f.

**Common name:** Indian cork tree  
**Family:** Bignoniaceae  
**Description:** Tree with drooping upto 16 m high. Leaves opposite, simple, 2-3-pinnate upto 30 cm. Inflorescence a terminal corymbose panicle. Fruit an elongated capsule, flattened, dehiscent, leathery.  
**Flowering and Fruits:** April –May  
**Native:** Myanmar  
**Location:** Dr. Rajkumar ward, Malleshwaram, Yeshwanthpur, Jaynagar, Sadashiva nagar. Cultivated as avenue tree.

Pongamia pinnata

**Common name:** Indian elm  
**Family:** Fabaceae  
**Description:** Moderate sized tree upto 7 m high. Leaves alternate, pinnate, stipules small, oblong, caduous. Inflorescence a panicked raceme, axillary and terminal. Fruit a pod, oblong-obovoid, compressed, woody. Seeds solitary, reniform, brown at both ends.  
**Flowering and Fruits:** March – April  
**Native:** India  
**Location:** Malleshwaram, Mahalakshmipuram, Basaveshwara Nagar. Yelahanka.
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Species</th>
<th>Common Name</th>
<th>Flowering &amp; Fruiting</th>
<th>Root</th>
<th>Benefits to ecosystem/urban area</th>
<th>Dependent Species</th>
<th>Growth rate and requirements</th>
<th>Method of propagation</th>
<th>Rate</th>
<th>Trees/km</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pongamia pinnata</td>
<td>Indian Beech, Pongam, Honge, Ponge</td>
<td>Flower: March-April. Fruit: Summer</td>
<td>It has a good superficial thick long taproot and condensed network of lateral roots resist drought.</td>
<td>It is semi-deciduous, medium sized tree, nitrogen fixing leguminous tree. It is used as beautification, shade and tolerant to environmental stress. Helps in controlling soil erosion and binding sand due to its compressed network of rooting system.</td>
<td>It attracts bee species such as Apis dorsata, A. cerana indica, Amegilla sp., Megachile sp., Xylocopa latipes and X. pubescens.</td>
<td>Height: 9 to 12 m Spread: 9 to 12 m Growth rate: fast. Highest growth rates are observed on well drained soils with assured moisture. It can grow in any type of soil.</td>
<td>It is propagated by seeds and stem cuttings. The seeds can be sown in a pit directly. The seedlings are also raised in nursery bed and then transplanted to the field after one year. The fresh seeds are used for sowing in the month of May-June. One-year old seedling are planted in months of June-July. Young plants need water at an interval of 30-35 days at for one year depending on climatic conditions.</td>
<td>Rs.40/-, 100/-</td>
<td>83 trees/km</td>
</tr>
<tr>
<td>No</td>
<td>Species</td>
<td>Common Name</td>
<td>Season</td>
<td>Growth Pattern</td>
<td>Habitat</td>
<td>Soil Requirements</td>
<td>Pest Management</td>
<td>Production</td>
<td>Cost</td>
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<tr>
<td>2</td>
<td><em>Artocarpus heterophyllus</em></td>
<td>Jack fruit; Katahal</td>
<td>Summer</td>
<td>Fast growth in early years, slows down at maturity</td>
<td>Tolerates wind and waterlogging</td>
<td>Well-drained soils, moderate fertility</td>
<td>-</td>
<td>-</td>
<td>Rs.150/- (grafted)</td>
<td></td>
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<tr>
<td>3</td>
<td><em>Mangifera indica</em></td>
<td>Mango; Aam</td>
<td>Winter to Summer</td>
<td>Fast growth</td>
<td>Tolerates cold</td>
<td>Deep soils, well-drained</td>
<td>-</td>
<td>-</td>
<td>Rs.150/-</td>
<td></td>
</tr>
</tbody>
</table>

*It is propagated by seeds and vegetative methods.*

The small mammals such as common marmoset and coati depend on jackfruit. Also, these mammals prey opportunistically on bird's eggs and nestlings, the supply of jackfruit as source of food has allowed them to expand their populations, to the detriment of the local bird populations.

The tree canopy provides perennial cover to the soil and absorbing the impact of rain on the soil. It also increases the soil fertility and provides the shade.

The tree does not tolerate waterlogging or poor drainage.

The small mammals such as common marmoset and coati depend on jackfruit. Also, these mammals prey opportunistically on bird's eggs and nestlings, the supply of jackfruit as source of food has allowed them to expand their populations, to the detriment of the local bird populations.
<table>
<thead>
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<th>No.</th>
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<th>Planting Details</th>
<th>Cost</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Syzygium cumini</td>
<td>Java plum, jamun, black plum, Indian blackberry</td>
<td>Winter to summer</td>
<td>The taproot is strong, woody, and prominent. The tree provides good wind breaks. It also provides shelter. Frugivorous Birds are Red-Whiskered Bulbul (<em>Pycnonotus jocosus</em>), Blossom-Headed Parakeet (<em>Psittacula roseate</em>), White-Cheeked Barbet (<em>Megalaima viridis</em>), Oriental White-Eye</td>
<td>Growth rate: rapid Height: 10-30 m Diameter: 11-12 m. The tree favors moist, damp or marshy situations, where it tends to form gregarious crops.</td>
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<td><strong>5</strong></td>
<td><strong>Azadirachta indica</strong></td>
<td>Neem, Bevu</td>
<td>February – May. Fruit: winter to summer.</td>
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<td></td>
<td>It has strong root system with an extensive deep root system and</td>
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<td>The hardy Neem can grow luxuriantly even in marginal and leached soils.</td>
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<td>Birds which feeds on neem fruits are Yellow-vented Bulbul (Pycnonotus goiavier analis), Black-naped</td>
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<td>Initially it needs shade. It tolerates prolonged flooding, and once established, it can tolerate drought.</td>
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<td>Another method: The seedlings can be transplanted into the field when they reach height of 1 m or after 12 months.</td>
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<td>The spacing should be 20 m. the pit should contain red soil.</td>
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<td>The soil around the roots should be loosened during the first five years of growth.</td>
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<td>Planting is done in the beginning of rains.</td>
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<td>The seeds can be sown directly at depth of 1 cm. It grows on saline and alkaline soils</td>
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<td>Rs.40/ -, Rs.12 5/-</td>
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<td>50 trees/km</td>
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<p>|   | <strong>Ficus benghalensis</strong> | Banyan, Nyagrodha, Bargad, Aladhamara | Throughout the year | The taproot is strong and thick more than twice of the thickness of stem. | Ficus is keystone species and have large influence over their ecosystem in relation to both their | The figs are eaten by the birds and mammals. Fruit are key resource for some frugivores includes bats, | Grows well in deep sandy loam soil. It requires light for the growth. It is very hard species can come | It is propagated by branch cuttings of 2m -3m in length. Cuttings are planted in 30 cube pits filled with sand and Rs.150/- | The crown of the tree covers nearly half a kilometre, so only 2 trees |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Common Names</th>
<th>Planting Period</th>
<th>Root System</th>
<th>Height</th>
<th>Growth Rate</th>
<th>Longevity</th>
<th>Sowing Period</th>
<th>Watering</th>
<th>Suitable Time for Cutting</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td><em>Ficus religiosa</em></td>
<td>Bodhi, Pipal (peepal, peepul, pippala, pimpal, etc.), arali or Ashvastha</td>
<td>December to March</td>
<td>Well developed</td>
<td>19 m</td>
<td>0.6 m/season</td>
<td>40 to 150 years</td>
<td>March–April</td>
<td>Twice daily for first six weeks, then once daily</td>
<td>January–March</td>
<td>The tree could be shelter for various birds (Yellow-footed Green Pigeon, Jungle Myna, and Chestnut-tailed Starling) and insects. Provides food for bats.</td>
</tr>
<tr>
<td>No</td>
<td>Species</td>
<td>Common Names</td>
<td>Bloom Period</td>
<td>Characteristics</td>
<td>Growth Rate</td>
<td>Height</td>
<td>Nursery Seedling</td>
<td>Cost (Rs)</td>
<td>Notes</td>
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<td>8</td>
<td><em>Michelia champaca</em></td>
<td>champaka, champak or champac, champa, sampige</td>
<td>December to April</td>
<td>The species has deep extensive taproot system. Improves the soil fertility. It is planted in the avenue road for</td>
<td>Moderate</td>
<td>50 m</td>
<td>Nursery raised seedling either bare root or with a ball of earth can be planted.</td>
<td>150/-</td>
<td>The crown shape will be conical to</td>
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<tr>
<td></td>
<td>Species</td>
<td>Common Names</td>
<td>Season</td>
<td>Growth &amp; Habitats</td>
<td>Watering &amp; Fertilization</td>
<td>Propagation &amp; Other Uses</td>
<td>Cost/Trees</td>
<td>Forest Details</td>
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<td>9</td>
<td><em>Ficus racemosa</em></td>
<td>Indian Fig, Atthimara, Udumbara</td>
<td>Throughout the year</td>
<td>It has a very strong taproot system which traveling far beyond the tree canopy.</td>
<td>Watering can be reduced after establishment. A general fertilizer has to provide before new growth begins in spring.</td>
<td>The spacing should be 10-15 cm. It prefers shade during hot months hence it should be raised in gap-regeneration and under-planting areas. A regular watering is required during the first growing season. Propagation is commonly done by branch/stem cuttings. Cuttings of 2 m in length are planted in July. Cuttings are planted 50-60 cm deep.</td>
<td>Rs.12 5/-</td>
<td>The diameter of the crown is 40 to 45 m. Around 22 trees can be planted in 1 km.</td>
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<td>10</td>
<td><em>Butea monosperma</em></td>
<td>Flame of the forest, Mutthuga, Kinshuk, Palash, Dhak</td>
<td>January to May</td>
<td>The tree is very drought resistant and frost hardy.</td>
<td></td>
<td>It is propagated by seeds and through suckers. The seeds are sown in the</td>
<td>Rs.12 5/-</td>
<td>The crown size is 10 m. About 100 trees/km.</td>
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<tr>
<td>No.</td>
<td>Tree Species</td>
<td>Common Names</td>
<td>Season</td>
<td>Tap Root Development</td>
<td>Quality of Soil</td>
<td>Hummingbirds and Babblers</td>
<td>Water Requirement</td>
<td>Nursery Time</td>
<td>Spacing</td>
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<td>11</td>
<td><em>Cassia fistula</em></td>
<td>Kakke mara, suvarnaka, benda lathi, golden shower, Indian laburnum</td>
<td>March to May</td>
<td>The tap root develops like a tuber up to some length. It is thicker than the shoot.</td>
<td>It improves the quality of soil.</td>
<td>hummingbirds and babblers.</td>
<td>Water Requirement: Average Water Soil type: Loam, Sand Tolerances: Drought Seasonal Interest: Spring, Winter. Soil pH should be Acidic, Neutral and Well drained soil Drained.</td>
<td>nursery in the month June-July.</td>
<td>The spacing between saplings should be 20 m apart.</td>
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<table>
<thead>
<tr>
<th>No.</th>
<th>Species</th>
<th>Local Names</th>
<th>Season</th>
<th>Root Characteristics</th>
<th>Vegetation Characteristics</th>
<th>Height</th>
<th>Growth Rate</th>
<th>Propagation Method</th>
<th>Other Maintenance Requirements</th>
<th>Cost (in Rs.)</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td><em>Polyalthia longifolia</em></td>
<td>Ulkat, Kastadaruha (S);</td>
<td>March - April</td>
<td>It has a single taproot that</td>
<td>It is planted due to its effectiveness in alleviating noise pollution. Fresh seeds are</td>
<td>30 m</td>
<td>Very fast</td>
<td>Seeds</td>
<td>The crown is conical in shape. The crown size is 2m. 333 trees can be planted in 1 km.</td>
<td>10/-</td>
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<td>Debdari, Ashoka (H);</td>
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<td>goes down till it hits water.</td>
<td>are eaten by birds or monkeys.</td>
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<td>Madras Ashoka (K)</td>
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<td>13</td>
<td><em>Bauhinia variegata</em></td>
<td>Kanchaval, Kachnar</td>
<td>November - February</td>
<td>The taproot is strong.</td>
<td>The flowers are fragrant, attractive to butterflies, bees and birds.</td>
<td>6 m</td>
<td></td>
<td>Seeds</td>
<td>Direct sowing: The seeds are sown 3m apart, before commencement of the monsoon. Weeding and watering is essential during the first three months of growth. If the seeds are sown in raised nursery beds. After 12 months, seedlings can be transplanted into the fields.</td>
<td>10/-</td>
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<tr>
<td>No.</td>
<td>Species</td>
<td>Description</td>
<td>Details</td>
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<td>14</td>
<td><em>Lagerstroemia speciosa</em></td>
<td>Pride of India, March - June, It has wide spreading taproot system, It provides shade for pedestrians, It is tolerant to drought, It is grown for ornamental purpose, It prevent soil erosion, Height: 20 m, It grows in drained soil with full sunlight, The seedlings are raised in nursery bed and/or containers, One year old seedlings are suitable for planting, It gives better success from root and shoot cuttings when planted just before the onset of monsoon than during monsoon, The crown diameter is 5 to 10 m, 100 trees/km</td>
<td>Rs.12 5/-</td>
<td>The plant is propagated by cutting, The saplings should be planted 6-8 m apart, in a pit prepared with mixture of sil and decomposed</td>
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<td>No.</td>
<td>Species</td>
<td>Common Names</td>
<td>Flowering Period</td>
<td>Fruiting Period</td>
<td>Root System</td>
<td>Growth Habits</td>
<td>Environmental Tolerance</td>
<td>Logistics</td>
<td>Cost</td>
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<td>2</td>
<td><em>Gmelina arborea</em></td>
<td>gambhar, khumbhari, kumbuda, kumulu, shivani</td>
<td>April – May</td>
<td>Fruit: May – June</td>
<td>The roots are strong which are situated within 3 m below soil surface. Helps to conserve soil. It is resistant to drought, fire, wind damage, and high intense heat.</td>
<td>The fruit of is edible, attract birds, bats and other mammals.</td>
<td>Height: 35m Diameter: more than 3 m Growth rate: Fast It grow well in wild sands on deep clay loams. Requires regular watering. It takes 2-3 months to raise Gmelina seedling in nursery. It does not grow in sandy soils.</td>
<td>The seedlings do not tolerate shade. Water is provided in spring winter. Annual pruning has to be done to shorten branches to avoid breakage.</td>
<td>The seedlings can be grown along the 1 km.</td>
<td>Rs.100/-</td>
<td>It is propagated by seeds. The fresh seeds are sown directly in the permanent place. The crown size is 5m. 200 trees/km.</td>
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<td>3</td>
<td><em>Saraca asoca</em></td>
<td>Sita Ashok, Achenge</td>
<td>March – August</td>
<td>Fruit: August-September</td>
<td>It has well branched taproot system. It is evergreen perennial tree. Air pollution tolerant species.</td>
<td>Tree produces large bunch of sweet smelling flowers throughout the year which attracts butterflies and birds. Bats disperse the fruits.</td>
<td>Height: 8.5m - 15.2m Growth Rate: Slow Soil pH: Acidic, Neutral Soil Drainage: Well Drained Soil type: Loam, Sand</td>
<td>The seedlings can be transplanted into the fields after they are one year old, during the monsoon season. It should be planted in 60</td>
<td>Rs.150/-</td>
<td>The crown size is 5-8 m. Along the 1 km road 125 trees can be grown.</td>
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<td>4</td>
<td><strong>Pavetta indica</strong></td>
<td>Indian Pavetta, Indian Pellet Shrub, Pavati</td>
<td>April - June</td>
<td>It has much branched taproot system.</td>
<td>It is evergreen shrub. Improve the fertility of soil. It is used as ornamental plant.</td>
<td>The flowers are white, sweetly scented flowers attract many pollinators such as birds, bees, wasps, beetles, ants and butterflies. These in turn attract birds and other predators. Birds love the fruits and these are obviously distributed by birds.</td>
<td>Height: 2-5 m</td>
<td>Pavetta is propagated by seed, and vegetatively by cuttings. Seeds of Pavetta indica are sown in a fibrous, loam-based medium, with added sharp sand and charcoal. Fertilizer can be added, but the presence of nitrogen-fixating bacteria enables Pavetta</td>
<td>Rs 50/- The crown size is 5-8 m. 125 trees/km</td>
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<td>No.</td>
<td>Species</td>
<td>Common Names</td>
<td>Season 1</td>
<td>Season 2</td>
<td>Description</td>
<td>Height</td>
<td>Requirements</td>
<td>Cost 1</td>
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<td>5</td>
<td><em>Isora brachiata</em></td>
<td>Gorbale (Marathi), Gurani, Kurati (Konkani)</td>
<td>December - February</td>
<td>It has strong taproot system</td>
<td>A medium sized evergreen tree. It is endemic to Western Ghats. It is used for ornamental purpose.</td>
<td>10 m</td>
<td>Flowers are white, scented and fruit is edible which attracts birds and butterflies.</td>
<td>Rs.40/-</td>
<td>The crown size is 5m. 200 trees/km.</td>
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<td>6</td>
<td><em>Nyctanthes arbor-tristis</em></td>
<td>Har singar, Coral Jasmine, Tree of Sorrow, Queen of the night</td>
<td>August, September - October</td>
<td>The taproot is strong.</td>
<td><em>Nyctanthes arbor-tristis</em> is a shrub or a small tree. It is used for ornamental purpose.</td>
<td>10 m</td>
<td>Flowers are small, delightful fragrant which attracts bees and butterflies.</td>
<td>Rs.40/-</td>
<td>The crown size is 5 m. About 200 trees can be grown along the 1 km.</td>
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<td>7</td>
<td><em>Gardenia gummosa</em></td>
<td>Gummy gardenia, Cambi gum tree, Kad Bikke</td>
<td>February - October</td>
<td>The root system is strong and deep.</td>
<td>It is evergreen shrub. It is used for ornamental purpose.</td>
<td>3 m</td>
<td>It produces a small, sweet fruit.</td>
<td>Rs 40/-</td>
<td>The crown size is 5-6 m. 166 shrubs/km.</td>
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<td>8</td>
<td><em>Ervatamia heyneana</em></td>
<td>Nagarkuda</td>
<td>March - April</td>
<td>Endemic to the Western Ghats.</td>
<td>Night-flying moths are</td>
<td>2-5 m</td>
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<td>Rs 40/-</td>
<td>The crown size</td>
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Pandrakura

It is used for ornamental purpose. attracted to the flowers.

size is 5-8 m. 125 trees/km.

Maintenance cost:

1) Each sapling need 2ft X 2ft width, 2ft depth pit.
2) Distance between 2 saplings is 15 to 20 feet.
3) Digging pits, Manuring, planting and closing the pit costs: Rs 200 per plant
4) Tree guard using natural material like bamboo and thorns costs: Rs 100 per plant; Using metal tree guard for 5 feet eight costs: Rs 1,000 per plants.
5) Maintenance for 3 years costs Rs 400 per plant.
6) Daily water during the first year
7) 2-3 days once watering in the 2nd and 3rd years

<table>
<thead>
<tr>
<th>Sapling</th>
<th>200-400 Rs per sapling</th>
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<tbody>
<tr>
<td>Digging and planting</td>
<td>Rs 200 per sapling</td>
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<tr>
<td>Tree guard</td>
<td>Rs 100</td>
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<tr>
<td>Number of avenue trees</td>
<td>40-50 trees per km per side</td>
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<tr>
<td>Maintenance cost (watering, labour, etc.)</td>
<td>Rs. 150 per sapling during the first year Rs. 100 per sapling during the next year</td>
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