Lec.14 Silvicultural practices for Teak, Eucalyptus and Tamarind

1. Teak

Scientif Name :***Tectona grandis***

English Name : Thekku

Tamil Name : Teak

Hindi Name : Sagwan

Family : Verbenaceae

Distribution

Native to Southeast Asia (India, Myanmar, Thailand and Western Laos), Teak, is the most important of the three species in the genus *(T. hamiltoniana, T.phillipensis).* A Tare combination of durability, dimensional stability andstrength properties make Teak a paragon of timber and as of date faces no threat of being eclipsed by any other timber species. Its latitudinal limits are 9 N - 25° N and its longitudinal limits 70 E - *100*° E. In its natural habitat, teak occurs in mixed deciduous forests normally constituting a small number of individuals but occasionally in pure stands. Since 1840 it is raised in plantations in India and Myanmar.

Physiognomy

A large, deciduous tree, it may reach a height of 30 to 40 m under favorable conditions. On good sites, clean boles of 15 to 30 m length are obtained. Fluting and buttresses are often found at the base of the trees. Bark is thick, grey or lightish brown, fibrous with shallow longitudinal fissures, peeling off in long thin narrow flakes on older trees. Leaves are large (25 - 50cm in length and 15-35 cm in width), elliptic or obovate; upper side green to dark green in colour; underside dense has whitish to tawny matt of wooly hairs. Leaf arrangement is opposite. The flowers are small, whitish and appear in large panicles containing upto a few thousand flower buds which open only a few at a time during the flowering period of 2 to 4 weeks. The fruit is a hard, irregularly rounded drupe containing 4 seed chambers. The pericarp consists of a thin papery exocarp, a thick felty, brown mesocarp and a stony endocarp. Only rarely do all the four seed chambers contain developed seed. Generally in a sample one seeded fruits abound (42-64%); 2 seeded account for 12-25%; 3 seeded vary from 2 to6%. 4 seeded account for 1-2%.

Large numbers (11-35%) are also found to be completely seedless. The teak fruit varies from 11 to 18 mm in cross section and average 2000 in a kg.' 'Phenology Age of trees at first flowering varies markedly depending on site, climate, silvicultural management and genetic linkage. Its natural habitat it comes to flowering in 6-8 year. But under plantation conditions size or height of the trees rather than age exercises a profound influences on flower initiation. Flowering generally occurs during June - July. The fruits attain full size and mature in about four months after fertilization (i.e.during October- November). A sign of maturity is their facile fall to the ground when the tree is agitated.

Silvicultural Characters

Teak seedlings are sensitive to frost and drought. It is a strong light-demander, intolerant of suppression and weeds. It is a fire resistant; seedlings and saplings killed back by fire and frost. It coppices and pollards vigorously, up to about middle age.

Climate and Soil

The tree grows under a wide ambit of pedo climatic situations from sea level up to an altitude of 1200m and in a precipitation range of less than 900 mm to more than 2500 mm. The most suitable soil for teak is the deep, well drained alluvium having relatively high contents of calcium and phosphorus. It tolerates a pH range of6.5 to 8.0 but good growth is attained on soils of pH 6.5 and an annual rainfall or 1500 mm. Teak is a pronounced light demander and does not tolerate suppression at any period of its growth. It is also fairly fire tolerant.

Nursery Technique

The unit of sowing is the fruit (drupe) which for practical reasons is termed seed; seeds that have been stored for at least one year germinate better than fresh seed. If use of seeds of the same year is necessitated they before sowing are subjected to a process of alternate wetting and drying of 24 hr duration each for 14 days. Use of large seeds more than 14mm in diameter gives better germination. Seeds are sown @ 1 kg m-2on raised nursery beds 10m long, 1 m wide and 0.5m in height and covered with soil to a depth equivalent to the fruit diameter.

To prevent soil erosion beds are reinforced on the sides with bamboo splits or other such material. Germination commences in about 15 days, accelerates during the next 15 days, declines thereafter. Majority of germinates will have appeared in 40 days, when the germinability is around 40 per cent. The beds are watered twice daily for the first two months, once daily for the next three months and on alternate days thereafter. Super sized seedlings called "wolf' smother

others. For field planting only stumps prepared from one year old seedlings are used as these promote faster growth and ideal bole form. Stumps are prepared by cutting away from the seedling everything except 2.5 cm of the shoot and 22.5 cm of the root. The stem portion receives an oblique cut and the root portion an horizontal cut. All laterals from the tap root are pruned away. The stumps should preferably be planted within 2 to 3 days.

Planting

Stumps are flush planted (in level with the ground) at a spacing of2 x 2 m in crow bar pits. The initial plant density of 25000 ha-t is reduced in a phased manner to an ultimate 80 to 100 ha-t by an operation called thinning. A total of four thinning is given in the 5th, 10th, 18thand 28^{th} years and at each thinning the existing population is reduced by half. The first two thinning are mechanical and are done according to a rule of thumb, in the first thinning alternate diagonal rows are removed; in the second thinning alternate rows are felled. The 3rdand 4thare silvicultural thinning in that they are restricted only to diseased and malformed trees. Trees possessing clean bole, cylindrical bole, straight bole, less taper, small crown and less fluting are retained. Final felling is done at the end of60 years. A single tree will yield 1.5 m^3 of timber. Its rotation is 40-60 years'; its yield is about 6500 cu.ft of stem wood per acre.

Utilization

Teak wood is globally renowned for its strength, durability, dimensional stability, working quality and non-corrosive property when in contact with metal. The durability is attributable to the deposition of polyphenols in its heartwood. On account of these outstanding properties, Teak is sometimes hailed as the Queen of timbers. Increasingly large quantities of Teak are used by the plywood industry for high grade commercial and tea-chest categories of plywood. Lops and tops and other rejects serve as fuel wood. The seeds contain oil to the extent of 44.5% and the oil is used in soap manufacture. Teak leaves are often used as platters.

2. Eucalyptus

Scientific Name : ***Eucalyptus tereticornis***

English Name : Eucalyptus hybrid

Tamil Name : Thailam

Family : Myrtaceae

Distribution

Native to Australia, *E. tereticornis* was first introduced in the Nandi hills (Karnataka) by Tiuppu Sultan between 1782 - 1790. Now it is grown over one lakh ha in Peninsular India. Extensive plantations have been raised to meet the needs of fuel wood, small timber and pulpwood in Punjab and Haryana, where area under forest is negligible. It has been planted in strips, 3-6 rows deep along highways, canals and railways. Large scale plantations of the species were taken up in Uttar Pradesh from 1962 onwards.

Physiognomy

It is a tall tree with stout trunk, attains a height of 50 m. It is an evergreen, glabrous tree usually secreting an aromatic gum. The leaves and flowers contain conspicuous oil glands. Leaves of the saplings are generally opposite, sessile, cordate and held horizontal; those of the adult tree as a rule are alternate, petiolate and held vertical. Flowers are borne in umbels usually pedunculate. Calyx tube encloses the ovary which is covered with a deciduous operculum. The operculum is much longer than calyx and is formed by the union of the petals and falls off entire when the stamens emerge. Flowers are white in colour. Fruit consisting of the enlarged calyx-tube is usually hard and woody, full of resin sacs. Seeds are numerous but a large proportion of these is abortive and sterile seeds outnumber fertile ones. Bark is grey, exfoliating in long flakes.

Phenology

It flowers almost throughout the year. The capsules are collected six months after anthesis when they just turn dark brown. If the capsule is left for long on the tree it will burst and shatter the seeds. Hence capsules are collected and kept in trays / tarpaulins. After sun-drying for 3 or 4 days, the empty capsules are removed. Mature seeds are dark brown / black in colour. The seeds retain viability for up to 5 years.

Silvicultural Characters

It is a light demander. It produce good coppices freely and vigorously. It is a fast growing species and adaptability to a wide range of soil and climatic condition

Climate and Soil

It grows up to an altitude of 500 m. It is sensitive to frost. It grows in alluvial, black cotton, gravelly, lateritic, skeletal rocky and murram soils and even on shifting sand dunes. Highly calcareous, very saline and alkaline soils, clay and kantar pan is limiting. Deep, fertile and well-drained loamy soil gives best growth. Temperature range tolerated is 0-48°C. It is

suited for the plains receiving a rainfall of 800-1000 mm. The tree prefers sandy loam to loamy soils within a pH range of6.00 - 7.5.

Nursery Techniques

Seeds are sown in raised beds measuring 1 x 1 x 0.15 m. after wetting the bed, sieved seeds @ 5 g m-2 are mixed with a small quantity of sand and evenly spread on the bed. The seeds are covered with a film of soil. The nursery beds need to be kept moist by watering at least twice daily. A mulch of hay prevents soil erosion during watering. Watering is done through a fine rose. BHC 10% has to be applied on the bed to prevent ants/termites. Five and 10 days after sowing 2% copper fungicide must be applied. Germination starts on the 5thday. Since seedlings are sensitive to extreme sunlight, the bed has to be protected by a shade-screen during the first fortnight. Thirty day old seedlings are gently lifted from the bed and containerized in 200 gauge polypots measuring 20 x 10 cm. The polypots are filled with 4: 1:1 mixture of red soil, sand and FYM. After wetting the filled polybags seedling are pricked one per polypot. The pricked out seedlings should be provided shade for a week and watered twice a day. Six month old seedlings are used for planting. The containers must be shifted once every fortnight from the second month to prevent rooting.

Planting

The seedlings are field planted at a spacing of 2 x 2 m in pits measuring 30 cm3. Quality of seedlings is determined by the thickness of the root collar region than by height. The trees are felled at the end of seven years. Thereafter two coppices are taken at intervals of five year each. Coppice management is important in eucalyptus. Hundreds of new shoots develop on the margin of the cut stem. Felling of the trees prior to or immediately after the monsoon helps in rapid callus formation and thicker coppice shoots. Care should be taken to fell the trees with a gentle slope at the cut so that rainwater does not collect as a pool and cause decay of the callus tissue. Though hundreds of coppice shoots develop yet only four to five stems ultimately remain on the stump and the others are edged out in natural competition. There is no need to manually regulate the number of coppices as nature itself does the job. The health and number of coppice stems are positively related to the diameter of the stump. The productivity of coppice plantation is generally higher by 20 -25 % than the first seedling plantation. At the end of the second coppice growth it is necessary to uproot the roots. Its rotation is about 8 - 10 years. The productivity of

rainfed plantations in Tamil Nadu Plains ranges from 50 -75 t per ha at the end of seven years. The ratio of first, second and third harvests is 1:1.2:0.8.

Utilization

Eucalyptus wood is the main stay of paper industry in Tamil Nadu. Currently, it is used for making packing cases and 70% of the requirement in Himachal Pradesh for apple transport is met by this species. Leaves contain oil. Bark yields oxalic acid. It is preferred by the farmers by virtue of several desiderata like (i) fast growth; (ii) not browsed by cattle; (iii) immunity to pests and diseases; (iv) good coppicing ability.

3. Tamarind

Scientific Name : *Tamarindus indica*
Tamil Name : Puli
Hindi name : Imli
Family : Caesalpinae

Distribution

Tamarind is native to dry savanna of tropical Africa.In ancient times it was introduced to Asia by Arab traders. . In Tamil Nadu, it is being extensively cultivated in Dharmapuri, morappur, Krishnagiri, Anjatti and Hosur areas.

Physiognomy

Tamarind is a medium large-sized evergreen tree, up to 24 m in height and 7 m in girth. The bark is brownish or dark grey and fissured longitudinally and horizontally. Leaves are paripinate and 15 cm long. Leaflets vary from 10-20 pairs; oblong and measure 8.30 x 5.10 mm. Flowers are bore in small terminal, dropping racemes on current season's growth.

Pods are 7.5 - 20 cm long, 2.5 cm broad and 1 cm thick, more or less constricted between the seeds, slightly curved, brownish - ash in colour. A tree in Urigam. Village (Dharmapuri) possesses long pods measuring 30-45 cm. There are 3 to 12 seeds in each pod which are obovate, oblong, compressed with a shallow, oblong pit on each side of the flat face, 1.5 x 0.8 cm, smooth dark brown and shining. Seeds are contained in loculi, enveloped by a tough, leathery membrane, the so-called endocarp. Outside the endocarp is the light brownish,

red sweetish, acidic, edible pulp, traversed by a number of branched, ligneous 'strands. The pod shell is fragile and easily separable.

Phenology

Tamarind flowers from April - July in most areas of South India. Peak flowering occurs during May - June. New leaves appear in May and are closely followed by the flowers and occasionally fresh leaves and flowers are seen in September in Calcutta region. Fruits nature during winter season in South India. Time and duration of anthesis varies with prevailing weather conditions in different locations. Anthesis occurs as early as 5.30 am and continues up to 8.30 am with peak anthesis at 6.30 am.

Silvicultural Characters

It is a light demander; very sensitive to frost; drought resistant. It is deep rooted and wind-firm; slow-growing. It coppices fairly well; produces root suckers freely.

Climate and Soil

It is a tree of tropical climate, tolerating temperatures up to 47^0C but is very sensitive to frost and fire. Prefers mean annual rainfall of 500 to 1500 mm and tolerates water logging. But also grows well with only 350 mm annual rainfall if watered for establishment. It can be grown under a variety of soils raging from gravelly to deep alluvial. It thrives best on deep alluvial soil with adequate supply of moisture.

Nursery Technique

Pods are collected during February - April. The fruits are dried in sun; the outer shell is removed by hand or by beating with a mallet; the seed is separated from the pulp by hand kneading and washed in water. Washed seeds are dried under shade ad stored. Seeds from crown collection are superior to those of ground collection. About 1800-2000 seeds weigh one kg.

Seeds are normally sown directly in sand medium or polybags. Germination takes place in 5-10 days and is completed in 30 days. Young plants grow fast on porous soil and a soil mixture of 1: 1: 1 red soil, sand, farmyard manure.

A low cost technology of soaking for 24 hr in a solution prepared by dissolving handful of cow dung or cow's urine (1: 1 in 10: 1 water) results in vigorous seedling to the extent of 75-80 per cent. One year old seedlings are field planted at a spacing of 10 x 10 m. A full grown tree yields 180-225 kgs of fruit and 80 kg of seeds per tree.

Planting

One year old seedlings are planted at a spacing of7m X 7m in pits. Seedlings are fit for planting out in July to August. .

Utilization

All plant parts find some use, but the most useful is the fruit which contains sweetish acidic pulp. The Tamarind of commerce which is widely used for souring curries, sauces, chutneys and certain beverages. The pulp is also employed in medicine. Leaves boiled along with gingelly oil is applied to relieve swelling caused by sprains / fractures and also to relieve pain. Pulp mixed with sugar and made into Tamarind balls is used for seasoning other food. Refreshing acid drink and syrup are also made. Leaves serve as good fodder. Tender leaves, flowers and young seedlings are used as vegetable. Seeds are eaten after roasting or boiling. Powdered seeds are used as cattle feed. Processed seed powder is used in confectionery. Kernels contain a polysaccharide having very good sizing properties and extensively employed as a source of sizing powder in cotton and jute industries. The tree yields valuable timber, hard and difficult to work. The tree is extensively used for avenue planting.