CHAPTER 6

FOREST PLANTATIONS

6.1 Introduction

The forest plantation (or man-made forests) sub-sector has had a mixed history in Sri Lanka. From small beginnings, it is today playing an important role in meeting the timber and fuelwood requirements of the nation, and looks set to develop further over the coming decades. This chapter looks at the historical development of the sub-sector and at current activities.

6.2 The historical development of plantation forestry

Introduction

Plantation forest of some sort was in existence centuries ago. The earliest record of a forest plantation was in the reign of King Dutugemunu, 161 - 137 B.C., recorded in the Mahavamsa (Nanayakkara, 1987). However, the need for large areas of planted forest was realised only in the latter part of the 19th century after most of the montane forests had been cut and replaced with coffee and tea plantations (Fernando, 1987). For convenience, the historical development of the forest plantation subsector since the start of the colonial period is divided below into five periods.

Early colonial plantation forestry: small-scale plantings of hardwoods predominate

The first teak tree (*Tectona grandis*) is reported to have been planted in Matale in the Central Province in 1680 by a visiting Dutchman by the name of Van Rhede on a visit to the Sinhalese kingdom at the time (Perera, 1962). Although there are no records of teak plantations having been established then, it could be safely assumed that more trees had been planted in the maritime areas, as well as possibly in the form of small blocks by about that time.

In 1880, small areas of teak plantations had been established (17 lots totalling 50 acres), in the wet zone in the south and west of the country. The earliest record of any planting technique was in Puttalam in the north-west dry zone coast when a spacing of 12ft x 12 ft was adopted. About the same time the Burmese *taungya* system of planting was tried out on *chena* or shifting cultivated lands. In 1876, some teak seed had been sown with Indian corn in the dry zone but there are no records of the results. However, subsequent plantings of teak in the dry zone were successful. Thus, although teak was first planted in the wet zone, it really gained ground in the harsher dry agro-ecological-climatic zone of the country.

Around the same time, some jak (*Artocarpus heterophyllus*), *Melia dubia* and *Cassia siamea* had been planted in the wet zone, but they were a failure. In 1888, *Eucalyptus saligna* was first planted in the montane zone. In four years the trees had assumed a height of 40 feet and a girth of 17 inches.

The beginnings of the now famous Sundapola plantation in the North Western province were in 1889. The first species planted there were jak, teak, satin (*Chloroxylon swietenia)* and Honduras mahogany (*Swietenia macrophylla).*

A form of planting in strips was introduced in 1890, and small extents of forest plantations continued to be raised using different species and planting methods. However, they were not all that successful. By 1890, there were around 900 acres (365 ha) of forest plantations, most of which were of teak. A contributory cause of failure was that every new official in charge selected a new area to plant and neglected the earlier ones.

The British colonial period: earlier over-exploitation of natural forest and their continued clearance leads to a growing need for plantations

During the British colonial period, forest plantation establishment was stepped up, mainly teak in the dry zone and eucalyptus in the montane zone. Other species introduced included *Eucalyptus microcorys, E. pilularis, Cupressus macrocarpa, Callitris*, *Tristania conferta*, *Cedrela serrata*, *Acacia decurrens*, *Pinus khasya*, and *P. caribaea* in the montane zone, mostly on the *patana* grasslands. Degraded and poor quality forests were converted to forest plantations, as were *patana* grasslands in the wet and dry montane zones. The

plantation extent had been raised, according to the records, from 570 ha at the turn of the century to 6,071 ha in 1926. Although only degraded and poor quality forests were earmarked for this conversion, in fact some well-stocked natural forests with closed canopy had also been cleared for planting.

The tea estates also started establishing blocks of plantations referred to as fuel coupes. Grassland planting done at a spacing of 6 ft x 6 ft was later enlarged to 10 ft x 10 ft. Records indicate that by 1953 there were 10,522 ha of forest plantations.

Some *Pericopsis mooniana* (Nedun) and *Casuarina equisetifolia* (kasa) were also planted in the low wet zone.

Planting in the montane zone was also encouraged by British foresters as it was a comfortable region to work in because of the gentle climate, unlike the steaming wet zone and the dry heat of the dry zone. Ultimately, the Nuwaraeliya Forest Division at high altitude became the most sought-after station by foresters. The main "problem" areas requiring a forester's attention were also in the montane zone. This was fortunate because the knowledge gained in planting was later utilised to advance forest establishment in critical mountain soils which had been severely degraded over a long period by the planting of tea.

The early post-Independence years: plantation forestry continues to expand at the expense of natural forest

In view of the fact that wet zone natural forests had been over-exploited over the years for various reasons (including the need for big timber during the Second World War), forest plantation activities were stepped up, including conversion of so-called "degraded" natural forests to planted forests, a strategy that gave rise to much debate in later years. After 1948, natural forests were cleared for many development programmes, starting with the Galoya Development project in the eastern dry zone. Forestry activities undertaken were:

- establishment of new nurseries with improved nursery practices;
- afforestation schemes in the montane zone;
- conversion of montane evergreen forests;

- wind-break cum improved-pasture schemes;
- *"Taungya"*, or Co-operative Reafforestation Scheme and departmental planting to raise teak, jak, and mahogany in the dry zone;
- enrichment planting in wet zone natural forests;
- forestation of sandy beaches, and arid tracts in the arid zone;
- social tree planting campaigns.

By the end of 1952, the planted area was recorded as being 10,522 ha and by 1962 the area is reported to have doubled to around 21,044 ha. Technical assistance was provided by the FAO in 1953 to place forest plantation establishment on a more scientific footing, including support for mechanised cultivation on the montane grasslands. Mechanised planting, however, was abandoned because of the high cost, the difficult hilly terrain, and some logistical problems.

1962 - 1981: further afforestation despite limited funding

The need for new timber sources increased in view of the many state sponsored development programmes and the clearing of natural forests for irrigation reservoirs, hydropower systems and associated settlements. Many dry zone natural forests that had not already been degraded were converted to forest plantations, as were many natural montane forests. The taungya system, now termed the Co-operative Reafforestation Scheme, expanded as the main form of forest plantation establishment through a conversion system, supported by departmental planting on a paid-labour basis on bare lands, grasslands, sandy shores and abandoned tea lands secured by the Forest Department (with difficulty) from the tea estate sector. Forest plantations were established on an island-wide basis in the different Forest Divisions. There was a great demand for timber from government departments including the Department of Railways, the Department of Buildings, the Electrical and Telegraph Departments and the Mahaweli Development Authority. The rapid increase in plantation forests was to some extent offset by the effects of cyclones. Particularly damaging were the 1964 and 1979 cyclones, which brought down large tracts of teak and other planted forests.

Although afforestation was an urgent need, funding inadequacy restricted forestry development activities, including plantation establishment. Foreign funds were secured from 1979 to complement government funding.

The afforestation component of a World Bank-supported National Agricultural Diversification and Settlement Authority (NADSA) project, which was successfully implemented by the Forest Department, provided funds for planting forests on hillsides in the Kandy District from 1979. (NADSA's other components were not successful). The highest recorded planting rate was in 1980, the last year of the standard Co-operative Reafforestation Scheme, when 31,236 acres (or 12,642 ha) were planted by the Forest Department.

Plantation forestry since 1981: responding to environmental concerns

1981 was a significant year as the Co-operative Reafforestation Scheme was abandoned on a government directive because of continuous agitation by environmental groups that natural forests should no longer be cleared in this way. However, in later years, the Forest Department was permitted to plant very degraded scrubland under a much-modified co-operative system with more financial incentives as an inducement to entice co-operative reafforestation by leaseholding participants (Nanayakkara, 1983; 1986b).

At this time, the variety of timber species being planted was also increased to include many indigenous species. Although this brought public support, many indigenous species fared rather poorly in practice, and the planting of proven exotics had to be continued alongside the few proven indigenous species. Among the indigenous species tried out successfully, and being planted out on a limited scale are, *Azadiracta indica* (margosa or kohomba), *Filicium decipiens* (pihimbiya), *Berrya cordifolia* (halmilla), *Chukrassia tabularis* (hulanhik), *Terminalia arjuna* (kumbuk), *Dipterocarpus zeylanicus* (hora), *Albizzia odoratissima* (suriyamara), and *Cassia fistula* (ehela).

The State Timber Corporation also became involved in reafforestation, partly in order to address the criticism of environmentalists that the STC was only bent on over-cutting timber trees. This was not a success, however, and most of the areas planted by the STC failed.

By 1992, the extent of forest plantations, determined through the interpretation of satellite imagery, was 125,000 ha. This figure is an underestimate because some plantations do not show up well in this kind of remote-sensing interpretation if they are young, weed-ridden or fire-damaged. The 1995

planting programme of the Forest Department is 11,300 ha, which includes industrial block plantations, home garden agroforests, fuelwood plantations, protective woodlots on hilly slopes and miscellaneous plantations. A private sector planting programme was launched in 1995 with an overall target of 40,000 ha.

One of the major setbacks to the environment was the accelerated implementation of the Mahaweli project, by which the project's implementation period was reduced from thirty to eight years, without a forestry component. In the eight-year period, the country lost about 242,820 ha of forest. It was left to the Forest Department to plant up parts of the catchment with departmental funds and funds from bilateral, foreign-aided projects. The Mahaweli Authority also started raising plantations on the Mahaweli Ganga (river) upper montane catchment lands, with funds from Germany, but success was minimal.

From 1981 onwards, as a general principle, forest plantations were established only on the following land-types:

- *patana* grasslands;
- abandoned and degraded tea estates handed over to the Forest Department by the estate sector;
- degraded rubber lands;
- catchments and watersheds devoid of trees;
- highly degraded scrub land in the dry zone;
- some sandy tracts on the coastline.

This principle continues. It is still a continuing policy of Government not to clear any more natural forests for development or for conversion to plantation forests. The adverse effects of clear-cutting the remaining natural forests are now felt to be too great to risk any further clearance.

The National Conservation Strategy (NCS) for Sri Lanka also advocates:

> *"all degraded agricultural land, especially those in the mid- and up-country areas, should be converted into forests or agro-forests. Land currently under agriculture, but unsuited for it*

should be allowed to revert to forest or be brought under the agroforestry programme." (CEA, 1988).

6.3 Foreign-aided plantation projects in the Forest Department

Recent years have seen the growing involvement of, and dependence on, donor-driven forestry projects in Sri Lanka. Box 6.1 lists some of those that have contributed to the establishment of forest plantations in the country. These projects were funded by the donors with government providing counterpart support.

6.4 The future of plantation forestry: contributing to national development while addressing environmental and social concerns

The emergence of a clearer understanding of plantation forestry's potential and impacts

Given that plantation forestry is now more responsive to environmental and social concerns, many more people now appreciate the positive role that it can play in development (Box 6.2). Nevertheless, plantations are never likely to be a panacea. Professional foresters and economists are now more willing to accept that plantation forestry also has a down side (Box 6.3), which must be given the utmost consideration in the on-going debate on forestry's role in development.

Box 6.1
Some recent foreign-aided plantation forestry projects with plantation components

- USAID, from 1981: Afforestation of the Mahaweli catchment and watershed in the wet montane zone, and the establishment of block fuelwood plantations in the lower Mahaweli plains in the dry zone.

- Community Forestry Project I, funded by the AsDB in 5 Districts, from 1982: block plantations and agroforestry farmers woodlots established with people's participation were the main activities.

- Integrated Rural Development Projects (IRDP) in several districts. These bilateral projects were multidisciplinary projects with forestry components, comprising the establishment of small forest plantations in pre-selected locations. A certain amount of participatory activity was involved in these plantings. The donor countries were Netherlands, Norway and Finland.

- Industrial Wood Plantation Project, a component of the Forest Resources Development Project and its follow-up the Forest Sector Development Project. The latter project is on-going.

- The AsDB Participatory Forestry Project or Community Forestry Project II, a follow up project to the AsDB's Community Forestry Project I. This is a broad-based, multifaceted, country-wide project including the establishment of watershed plantations, agroforests, amenity plantations, avenue and strip plantations, and shelterbelts. The project is on-going.

Box 6.2
Some current aspects of the positive role of plantation forestry

- Plantations forests in the dry zone have an economic potential from harvested timber of about 40 times that of a standard dry zone evergreen natural forest.
- Marginal lands not preferred for agriculture are now being put under forest plantations, for industrial and fuelwood, thereby adding to their value.
- Raising forest plantations is a method of raising "compensatory" forests of greater economic value in lieu of degraded forests that have been released for the Government's other urgent development projects. (However, considering the areas planted, in no way does it compensate for the areas released or taken for other projects, on an area basis.
- Forest plantations established in the Mahaweli river catchment in the wet montane zone have dramatically checked soil erosion, earthslips, landslides and rock slides, resulting in much clearer run-off into the river.
- Windswept barren countryside has been converted into flourishing vegetable garden townships by the scientific planting of shelter belts, mainly of eucalyptus.
- Coastal sandy stretches have been planted at selected sites with casuarina and eucalyptus to reduce the adverse effects of wind and to improve environmental conditions.
- Agroforestry plantations now being established are having an impact on increased food production because of the large number of crops permitted for inter-cultivation.
- Off-season, workers who are normally engaged in agricultural pursuits, are hired for forestry work on forest plantations, providing them with an added source of income. This employment impact of the forest plantation subsector is of great socio-economic importance.
- Participatory forest plantation blocks are given to participants on long lease. As a result more people are attracted to new and innovative agroforestry practices on state land.
- Private planting entrepreneurship is being encouraged in an attempt to reduce the burden on the State to plant forests. Factors that encourage this include changes to tree and land tenurial rights. Forestry's contribution to the GDP would be enhanced with the growth of private sector forestry. This activity needs to be confined to local people and restricted to difficult lands so that it would not in any way interfere with the agroforestry lots leased to farmers.
- Self-sufficiency in certain timbers could be maintained especially of fast growing hardwoods, e.g. all-purpose poles of different sizes, some special purpose industrial wood and plywood species. Important plywood species have been grown as plantations, e.g. *Albizzia*. Rubber wood is also being tried out now as a forest crop.
- One possible advantage of adopting wide spacing during planting is the possibility of raising a mixed-type of natural plus exotic plantation forest. This type of forest would provide better environmental balance and a more welcome habitat for wildlife. Currently, the forest cover is largely inadequate to meet the habitat needs of Sri Lanka's diverse wild fauna, even though 14% of the land has been specially set apart for this.
- Eucalypt plantations in the montane zone, especially *E. robusta* have given a boost to honey production, which is being developed as an economically-viable cottage industry in the mid-montane zone.

Box 6.2 contd.

- Although pine plantations were originally raised for the production of pulpwood, they have not been utilised for that purpose. A new use, that of resin-tapping, has made the pine plantations a valuable national asset, although this will only continue to be the case if some way is found to keep tapping within sustainable limits. There is also the possibility that pines and eucalypt wood could be used for paper production, especially newsprint, in the future, without resorting to imports at a colossal cost in foreign exchange.
- As changes in planting techniques evolve with the advent of participatory methodology, the socio-economic impact will become more marked and, together with the resulting overall environmental impact, the forest plantation sub-sector will have a major impact on the life of the nation. Already, the socio-economic levels and quality of life of people in the montane zone have improved as a result of the forest plantations drive.
- The tea sector in the montane zone has also reduced costs of tea production by reverting to woodfuel for tea-leaf drying, thereby using less fossil fuel. On the advice of the Forest Department in 1980, tea estates have been trying to plant 10% of their land with fuelwood plantings to meet both their factory needs and the domestic needs of their workers.
- The tobacco industry has also been induced by the Forest Department to grow its own plantations for the production of fuelwood for curing tobacco. This has reduced the irregular and often illegal trade in fuelwood coming from the natural forest.
- In the montane grasslands, forest plantations and pasture grasslands have created a multi-purpose land use between pasturing of cattle and tree growth. Cattle are thereby not ousted from their traditional grazing areas. Where pasture grass is not present between trees, there is the risk that village people will set fire to the ground flora of the plantation before rains, to get a new flush of grass with the rains so that they can graze cattle. These fires then spread into adjacent forests with dire consequences. Hence, forest plantations with managed pasture grass in between trees is a sound management practice.
- In agroforestry woodlot plantations, livestock will also gradually be introduced, along with more undercultivated crops, in a further development of agroforestry systems. Beekeeping and freshwater fishery would be included. Some agroforestry participants are already doing this.
- Species diversity is also benefited by *ex situ* conservation in plantation.
- Forests are established with mixed species. Some rare timber species and medicinal plants are conserved *ex situ* in this way.

Box 6.3
Some negative impacts of plantation forestry

- There has been some antagonism by some village people to block the development of forest plantations, but this is mainly because they fear that they may lose lands which they have been eyeing for future settlement. There is often a political motive allied to business interests which sees forest planting as an impediment. Many rural people are apprehensive over forestry expansion, whether it is a planted forest or natural. Their eyes are on the future expansion of their agribusiness. Eucalypts and pines are the scapegoats because these are the trees that do best and grow quickly on harsh open grasslands and on the degraded soils of tea estates.
- At times there are adverse criticisms that streams dry up as a result of forest plantations being established and that there are no birds or bees in a planted forest. These really are misconceptions. It has been proved in Sri Lanka that, with correct spacing, and depending on where the plantations are raised, some fauna and flora can be established in forest plantations. Some of the tall eucalypt plantations in the high rainfall montane zone sites of Ohiya and Kikiliyamana are virtually impenetrable because of dense undergrowth.
- Even some scientists and environmentalists have protested in the past against plantation forests, especially of eucalypts and pines. However, one well-known Sri Lankan environmentalist who boasted that he could establish a natural forest on a wet montane grassland using a computerised model, failed totally in his efforts, and the Forest Department had to return to the area and plant it up with proven plantation species. This shows that it is good to provide critics a chance to prove their theories.

Expansion of private-sector planting

An afforestation drive by the private sector is being planned on a basis similar to the participatory farmers' agroforestry woodlots planting programme, on lease agreements. For a start, 500 ha were expected to be planted in 1995 in five districts. Plans are afoot to make it a countrywide campaign. This will also boost annual afforestation planting targets in the whole country.

Proposals have been made to plant 12,000 ha in 1995, but as the project is new, officials expect only about 500 ha to be planted.

Private sector planting was tried earlier in the 1980s, but it was not successful because participating lessees tried to obtain lands that had timber which they could cut and sell. As a result, they neglected the planting. Also, there was no secure land tenure as lease permits were for short periods. In the new system, the lease will initially be for a longer period of about 30 years. This will be extended for a further period if the results are good. Depending on the

economic status of the participants, other incentives may have to be considered. Food aid, as well as free planting material and fertiliser, should be considered for the poorest participants.

The land provided will be degraded scrub or "cleared" land. Problems of inducement may arise in view of the distance of the land from villages where some of the participants may reside. However, the programme will have to be monitored closely to ensure that the desired results are being achieved. Otherwise the programme will have to be scrapped and State planting with hired workers resorted to, at great cost. A long lease with government ownership retained may be the answer for distant areas that are to be planted with industrial timber species, but with a proviso in the Agreement for the Forest Department to evict the lessee in case of failure at any stage of the exercise.

Expansion of medicinal plant cultivation

Other future plans will include the expansion of the medicinal species-planting programmes started in the 1980s. Trees and other plants of medicinal value have been tried on a pilot basis in the different agro-ecological zones. Some of the problems, in the case of small medicinal plants or shrubs, is the need for careful nurture after planting.

Medicinal plants are of value in the market and they have been permitted for introduction into the participatory agroforestry woodlots programme. This, in fact, is a better method to ensure *ex situ* survival. Some medicinal plant cultivation by the Indigenous Drugs Corporation on forest land and grasslands at high elevations was a failure because of the lack of after-care. As young plants they are very susceptible to wind and frost damage.

Although the regeneration of medicinal plants has not been considered a traditional forest activity, the Forest Department has taken it up on the suggestion of Government because it has the infrastructure to get the activity moving. By participating in this programme, the Forest Department is taking on a new field on a large scale. Progress needs to be closely monitored, as the *ex situ* planting of indigenous medicinal plants is of great importance to the large number of practitioners of indigenous medicine in the country. With the

denudation and degradation of natural forests, many medicinal plants have become rare.

Improved nursery management

Modern techniques are to be established in the Forest Department nurseries. Research is being conducted into the use of root trainers in raising seedlings for management planting. This has already been tried and should yield better results in plantation establishment. Other experimentation is in the use of polythene-potted teak seedlings for planting out, instead of the traditional bare root stumps. In these techniques, even if the cost is more, the results have been shown to be better.

Margosa planting

Azadiracta indica (Margosa, Kohomba or Neem) will be tried on a larger scale than in the past. It is a successful indigenous tree with a wide variety of desirable properties. It has been planted since the 1980s on a significant scale. One characteristic is that it is a slow starter, but picks up growth after about the 5th year. Hitherto, it has been restricted to the dry zone, but its planting is to be extended, both as departmental or state planting and in agroforestry woodlots. It is also to be planted extensively on roadsides and avenues and as ornamental trees. It is a tree with multiple uses and its bark and leaves have antiseptic properties. It is often planted near the windows of houses for good luck.

Expansion of participatory agroforestry

People's participation in the establishment of agroforestry woodlots will be extended and established as standard forestry practice in the country. The overall aim is to extend vegetative cover in the country and improve the quality of life, especially of rural people. The socio-economic benefits to rural people can be tremendous. In the late 1980s, these woodlots were restricted to the five districts of Matale, Kandy, Nuwaraeliya, Badulla and Batticaloa. In this new development, participatory forestry will be extended to cover the whole country, initially under the AsDB's Participatory Forestry Project. People's participation in agroforestry will succeed where the beneficiaries are able to earn more income and where employment prospects are bright, but it

has to be in a situation where natural forests or other natural resources are not adversely affected as a result.

Expansion of strip plantings

The planting of rows or strips along roads, canals and railway lines is to be expanded. During the last decade or so, this type of planting has been done by the Extension Branch of the Forest Department. Trees are planted in rows two or three deep instead of the usual one. Quite a large extent of land can be covered by such strip or line plantings.

Participatory approach to planting up watersheds

Earlier, watersheds and catchments in the montane zone were planted by the Forest Department, but in a recent development, a participatory approach in the planting of watersheds and critical areas is being tried. Participating lessees will plant up the areas on lease agreements under stipulated conditions. The cost of forest plantation establishment of watersheds may be reduced if this method is successful. The lease agreements will be entered into with the Forest Department.

Afforestation of "problem" areas

The main areas of the country that are in greatest need of afforestation continue to be the dry zone *chena* lands, the montane zone catchments and watersheds which are mostly in tea, Mahaweli settlements, and critical areas along sections of the coastline. The FAO has contributed specifically in the preparation of an excellent field manual for plantation establishment in the dry zone. It tackles many of the establishment problems in the field (Stevens, 1992a). Mechanised soil-working is being tried out to get better results in the dry zone's compacted *chena*ed soils (Stevens, 1992b), and the silviculture of sandy shores has been perfected, as has the artificial regeneration of coastal mangroves. However, the most urgent need is to put back the forest tree cover on the montane degraded tea lands. Here, although the planting techniques have been perfected, the political commitment to get the land for forestry is not forthcoming.

6.5 Summary

Much has to be accomplished in the forest plantations sub-sector. The land is available, the technologies are known and local expertise is available. There has been a major change in attitude amongst foresters, environmentalists and the general public that could now enable plantation forestry to be far more acceptable and successful. The problem is to find the funds to accomplish the task.