BENEFITS FROM THE FOREST*

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Introduction

A forest may be defined as an extensive stretch of land covered with a rather tall and dense tree growth. Forestry, in its broadest sense, is the science and art of raising and/or managing forests. The trees in a forest need not necessarily have sprung up there by natural means; in fact, many forests in the world today are either wholly man–made (called forest plantations) or are natural forests that have been modified to a greater or lesser extent by man.

In many countries, including Sri Lanka, land which has had no forest cover in the recent past is planted up with forest species. This practice is called afforestation. If the land on which a forest plantation is raised had earlier contained a forest cover, then the practice is called reforestation. Reforestation is practised extensively in Sri Lanka.

There are other terms that are used when referring to forests. "Scrub" is a type of open woodland where there are no tall trees. "Jungle" is an Indian word adapted for use in English, and it generally refers to a whole range of tree and shrub growth with a suggestion of wildness for which the term "bush" is used in Australia and throughout Africa.

We know from observations that an area which is left bare is always subject to colonisation by plants. What species of plants colonise the area will depend firstly on what propagules reach the area by dispersal from plants outside it. It will also depend on climatic and soil factors in relation to the tolerance limits of the species whose propagules reach the area. The colony of plants so established is not stable. The plants exert an influence on the habitat e.g. organic material accumulates due to the death and decay of the plants. The effect of these changes is generally to improve the soil conditions and the micro–climate. Under the changed conditions new plants which had earlier found the area inhospitable get established and the original colonisers get gradually displaced. This process of change is called plant succession. It could be observed everywhere, even in one's own garden if left unattended. Eventually, if left to nature, shrubs and, later, trees could colonise the area. The process of succession leads finally to the establishment of a stable climax community. The climax community that develops in an area is, therefore, the highest expression of the factors of climate and soil that influence vegetation. In most areas of the world the stable climax ecosystem is forest, and at one time, before modern man's drastic impact on natural vegetation, most of the land area of the world was actually covered by forest. Much of this has now been cleared for shifting cultivation, organised agriculture, providing raw materials for industry and so on.

From what has been stated above it is clear that in any area there is an interaction between the organisms on the one hand and the soil and climate on the other. A climax forest is then the stable ecosystem that develops in an area. In such an ecosystem the biotic factors (trees, shrubs, herbs, animals and micro–organisms including those in the soil) are in equilibrium with one another and with the abiotic factors, the climate and soil. If the climax ecosystem in an area is destroyed and the area left to nature, the

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process of succession will start again leading eventually, perhaps after many decades or even a few centuries, to the climax.

The widely held concept in countries like Sri Lanka two or three decades ago was that forests represent unutilised land and a storehouse of timber. If either land or timber was required the forest was cleared. The situation has changed dramatically in the past few decades, and considerable concern is now being expressed at the large scale destruction of forests that is taking place worldwide. Whereas earlier one spoke only of what one could get out of the forest by way of timber and other products, it is now recognised that forests have an equally important role to play in ameliorating the human environment. Forests therefore have two distinct functions in relation to man. These could in short be described as the productive and protective functions.

Protection and production appear to be conflicting interests; one demands that the forest be conserved and the other that it be exploited. Then again, for production to go on, on a sustained basis, one must ensure that removal does not exceed growth. All these factors and many more have to be resolved in the scientific management of forests which is an intricate exercise demanding a knowledge of numerous disciplines like botany (growth, flowering and fruiting), soil science (soil preferences of different species), zoology (effect of insects and other animals on the trees and on timber in use), engineering (forest roads and buildings), economics (many forest projects have to be justified on economic grounds), and so on. Now perhaps one understands why forestry is defined as the science and art of managing forests. The management must be done in such a way that man derives the optimum benefit on a sustained basis.

With regard to production, timber is the principal product of the forest. It is a material of the utmost importance to man and is today used for wide ranging purposes such as the manufacture of paper and rayon, for building construction work, and for transmission and telegraph poles. Besides timber, there are numerous other products that are derived from the forest. These include lac (an important industry in India), medicinal products (eg. Aralu, Bulu, Nelli, Weniwelgeta, etc.), turpentine (from *Pinus*), beedi leaves (from *Diospyros melanoxylon*), etc. These are collectively called minor forest produce.

Indirect Benefits

Forests exert a profound effect on the environment, generally making it more congenial to man. These are the protective benefits from the forest. Conserving forests is necessary also for preserving the indigenous gene pool represented by the natural vegetation of a country.

Forests and Rainfall

As has been stated earlier, climate and soil are important environmental factors that determine the type of forest that develops in a given area. But the forest also interacts with the climate and soil and modifies these factors.

The factors that cause the south–west and north–east monsoons which are the major determinants of the rainfall regime of the island are located far away from the country, and the presence or absence of forests can have no effect on them. However, forests could influence precipitation in the following ways :

(a) Evapotranspiration and the upward movement of a warm, moist air current occurs in the forest as a result of solar radiation. When this air rises well above the forest canopy and is cooled in the upper atmosphere it can no longer retain the water it was able to carry as vapour when it was warm, and the vapour then condenses and falls as rain. This is called convectional rain.

(b) The relative humidity in a forest is usually much higher than outside. This is due to the greater evaporation and transpiration within the forest and the restricted air movement as a result of which humid air tends to remain *in situ*. If there is a big difference between day and night temperatures as is the case in the months January and February, particularly in the Dry Zone, the moist air that is trapped in the forest

during the day cools at night and this results in the condensation of water vapour which drips from the leaves and flows down the stems to add moisture to the soil (occult precipitation).

(e) When moisture laden winds blow over mountain ranges they are deflected upwards into the cooler altitudes where moisture condenses and comes down as rain. If the mountain ranges are forest–clad, the winds are deflected to a greater height because of the presence of the forest canopy and this results in a greater cooling effect and consequent increased moisture condensation.

Forests have a profound effect in reducing wind velocity and so rendering wind–swept areas more hospitable. Hence it is a common forestry practice to raise forest plantations in the form of shelterbelts in areas devoid of forests and subjected to strong winds. Shelterbelts of Eucalyptus and other species have been raised by the Forest Department in the wind–swept Dry Patanas in Keppitipola (at one time called Palugama), between Welimada and Nuwara Eliya, and at Harasbadde (near Ragala) to serve as windbreaks. Windbreaks of forest plantations are raised in the form of belts more or less at right angles to the general wind direction. A single row of trees is inadequate to serve as an effective windbreak. At least three rows are required; the middle row consisting of trees with high crowns, and the two lateral rows of shorter, low–branching trees.

A windbreak slows down the velocity of winds on the leeward side up to a distance of about 20 times the height of the break. Over extensive areas, therefore, it is necessary to have a series of parallel windbreaks.

A forest soil generally differs appreciably in its physical features from the soil in an open area. It generally has a crumb structure and a high water–holding capacity; there is a constant input of organic matter in the form of litter and other decomposing plant and animal remains. There is also a rich microflora and microfauna. The soil of a forest generally acts as a sponge taking up rain water when available in quantity and releasing it gradually afterwards.

What happens during heavy rain in a forest ? At first the leaves and branches get wet and a fair quantity of water is used up in this. With continued rain the water reaches the ground as stem flow (down the stems of the trees) and as drip from the leaves. The impact of the rainfall on the soil surface is therefore much less severe than if the rain were to fall directly on the soil as in a deforested area. Moreover, the soil in a forest is protected by a more or less thick layer of leaf litter which is absent in an open area. Having reached the surface of the mineral soil, the water is then readily absorbed by it. As the soil gets saturated, the water percolates downwards to the water table. When there is a prolonged period of rain the water table rises, and the water in the soil, moving laterally, emerges as springs. Even in rainless periods the soil is moist because of its high water holding capacity and there is a reasonable dry weather flow in the water courses. When there is heavy rainfall in a forest, even if there is surface run off, the water is found to be clear and silt–free.

In an area that is deforested the rain drops strike the soil surface directly, and, in consequence, the spongy, crumb structure of the soil is soon destroyed. This process is accelerated because of the reduced input of organic matter. Hence, a good part of the rainfall in a deforested area flows along the surface as run off and it carries with it the top soil causing sheet and gully erosion. The silt and other soil particles that are carried by the force of the flowing water ultimately get deposited in the beds of rivers. This occurs as the carrying power of the water drops due to a slowing down of the rate of flow.

This deposition, occurring year after year, causes a raising of the river beds and consequently an increase in the incidence and intensity of floods. At the other extreme, during rainless periods, the soil which had retained only a small fraction of the rain water received during the preceding wet weather, soon dries up and the dry weather flow of springs is reduced to a trickle or disappears altogether. So with extensive deforestation, the intensity and frequency of floods increase during the rainy periods and the drought conditions become acute during the rainless months. This effect of forests on the water regime of the soil and on the environment in general is more impor-

tant than an increase in the rainfall that forests could bring about.

Conservation of the Gene Pool

Another benefit of considerable importance is the preservation of the gene pool (sum total of the genetic material) represented by the flora of a country. This is of special importance in Sri Lanka where about a quarter of the flowering plants are *endemic* to the country i.e. they are species that are found only in Sri Lanka. Unless suitable extents of natural forests are preserved without exploitation, there is the very real danger of extinction of some of the endemic species, and hence the loss forever of the genetic material (represented by these species) that has evolved over millions of years. This applies to animals too. For this reason, the Forest Department has demarcated certain natural forest areas in the major bioclimatic zones of the island and declared them as special reserves under UNESCO's Man and Biosphere Programme. One of these is the Sinharaja Reserve where timber felling which had been done in about a quarter of the 22,000 acre Reserve has now ceased.

Direct Benefits

Supply of wood which is the main product of the forest is the principal direct benefit man derives from forests. Wood is one of the oldest construction materials known to man and it still continues to be widely used. Wood is light in relation to its strength and as a result of this, quite large sizes can be handled manually. It is also comparatively easy to work with simple tools, and it can be used for virtually any construction work. Wood is also used for a variety of other purposes such as the manufacture of rayon, fibre board and particle board. It is therefore easily the most important and useful product obtained from the forest.

In Sri Lanka about five million cu. ft. of timber (fuelwood excluded) are extracted from the state forests annually. Wood is used in its natural form by sawing or by peeling into veneer or is chipped and reconstructed into particle board. Wooden poles are put to many uses ; transmission and telegraph poles, fence posts, and as a construction material in rural housing. One of the most important uses of wood in Sri Lanka as well as in other developing countries is as a domestic fuel.

Besides wood there is a host of other products that could be obtained from the forest. These are collectively called minor forest products.

Minor Forest Products

There are numerous products besides timber that are obtained from the forest, and some of these are of considerable commercial importance.

Wattle extract for tanning leather is a product obtained from *Acacia mollissima*. This species is grown in the Kandapola area, but except for some trials that were carried out, no commercial extraction has yet being done. Species of mangroves and *Cassia auriculata* (Ranawara) also produce tanning material.

Various types of essential oils are distilled from forest species like *Eucalyptus* spp., cypress, *Pinus*, etc. Oleoresins suitable for use as an incense are obtained from *Canarium zeylanicum* (Kekuna) by tapping the bark. Gums could be obtained from quite a few species. Trees of the family Dipterocarpaceae yield resins that can be used for making French Polish, varnish and similar products.

A number of products (bark, fruits, stems etc.) used in Ayurvedic medicine are collected from the forest. Beedi manufacture is an important industry in Sri Lanka. The wrappers used are the leaves of *Diospyros melanoxylon* — a species which is found in Sri Lanka but not in adequate quantity to make commercial exploitation possible.