MANGROVES: A DWINDLING RESOURCE

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What are mangroves ?

Mangroves are the trees and bushes growing between the level of high water of spring tides and level close to, but above mean sea level i.e. the inter-tidal zone. Mangroves dominate the tropical and sub-tropical sheltered coasts and extend into the estuaries of rivers where salt water penetrates. These are the major prominent members of the community which belong permanently to the resource, are generally exclusive to it and lead to its general recognition. Mangrove lands (swamps) are often hot, fetid, mosquito-ridden and almost impenetrable. Consequently, they were held in low regard until recent years. Nevertheless they are unique.

Why are mangroves and mangrove swamps unique ?

Mangroves are unique because they are able to live successfully in the inter-tidal zone where the conditions are not at all favourable for plant growth. These areas subject to inundation by the tides and subsequent exposure. The major problems that they are faced with in this environment are, difficulties in obtaining water and air (to 'breath'); the key factors that sustain life. Although mangroves are daily flooded with water (but saline), the roots of these plants are unable to take this water in, due to the high salt concentration in this water which prevent water movements into the roots. This condition is known as 'physiological dryness'. Mangroves are variously adapted to overcome this problem by developing thick outer covers and small leaves, often fleshy, due to storage of water. In addition to the adaptations to conserve water, they have developed various physiological means to exclude the salt taken in along with water. The structures developed as adaptations to obtain atmospheric air, have given the mangroves their characteristic appearance. The 'breathing roots' or the pneumatophores are the remarkable structures developed by *Avicennia* and *Sonneratia* (locally known as Manda and Kirala respectively) to obtain air from the atmosphere. These roots originate from the underground root system and grow out of the ground surface and protrude above the level of tide water, thus providing a continuous air passage to the submerged root system. *Rhizophora*, locally known as Kadol, develop prop roots from the stem, which eventually get attached to the mud, serving a dual purpose by providing air passage and support to the mangrove to withstand the battering by the waves and the wind. 'Knee roots' developed by mangroves such as *Bruguiera* and *Lumnitzera* (the latter is locally known as Beriya) are also effective air passages.

Uniqueness of the mangrove swamps is mostly rendered by their location; margin of the land and the sea. Mangroves attract mammals, reptiles and birds from their landward periphery, in addition to the indigenous swamp animals (fauna), while prawns, crabs and fishes migrate into the swamps with tide. These animals are attracted to these

swamps for the shelter and food. Mangrove swamps are flooded by the rising tide and plant litter and decomposed particles of vegetation (detritus), which is the food base of the food chains in estuarine and coastal waters, are washed into the coastal and sometimes into the offshore areas by the ebb tides and currents. Also, they receive freshwater borne material, which include inorganic nutrients essential for plant life, from landward sources by surface and river runoff. These mangrove swamps therefore, are open ecological systems, interacting with adjoining ecosystems, thus extending their influence far beyond the limits of the inter-tidal zone.

Are the mangroves and the mangroves swamps important ?

The importance of this resource derive both from the products taken directly from them and from amenities provided by it from within and beyond its boundaries.

Products extracted from mangroves range from construction material to alcohol and honey. Firewood, poles and posts for various artisanal fishing techniques and temporary dwellings and tannin are the major products extracted from mangroves in Sri Lanka. Although Sri Lanka's mangroves have not been managed, a limited mangrove area at Negombo lagoon (Munnakkare) has been propagated and managed for their commercial value, by the villagers, for at least, two generations. Livelihood of the majority of these villagers is fishing, either in the lagoon or in the sea. A major fishing technique in the shallow lagoon waters is the 'brush park', a passive fish aggregating device, locally known as 'Mas athu'. These are circular or square in shape and vary in size. 'Mas athu' are effective in attracting fishes and prawns as they provide shelter and food for these commercially important aquatic organisms. Construction is with mangrove poles and mangrove branches are placed vertically or slightly inclined in depths less than 1.5 meters in water. Harvesting is at 10 — 15 day intervals, by surrounding the brush park with a net and collecting the catch with a hand or scoop net, after removing the twigs and branches from the 'park'. Although a good part of the catch from 'Mas athu' is comprised of juveniles, the monetary gain out of the fishery is noteworthy. Since mangroves provide an ideal source of brush, mangrove cultivation (to be extracted for twigs and branches) has become an integral part of brush park fishery. These cultivated mangroves are harvested also for tannin and small timber.

Propagules (seeds) of mangroves, mainly Kadol, are collected from the wild, mostly by children, at their leisure, and are planted in the mud flats during low tide. Some of these 'mangrove farms' are large as 5 — 7 acres, while some others, the ones that are at their homesteads, are very small; 10 to 15 square meters in area. Most of the homesteads in this area (bordering the lagoon) have such mangrove woodlots at the lagoonward edge, as a barrier for wind, tide and as a mean of stabilising the sediments (mud) in the mud flats, which they finally claim (although illegal) as a part of their homestead. Mangroves (especially, *Rhizophoras*, which possess straight boles) less than 6 meters in height and 3 cm in diameter are not harvested from these woodlots. Selective felling, therefore is the common practice. *Rhizophora*, the dominant mangrove in the wild mangrove swamps in this area as well as in these cultivated woodlots, is grown and harvested for its timber (poles) and the prop roots are used as firewood. *Ceriops*, another mangrove cultivated in these 'farms' is the main tanbark source other than *Rhizophora*. These bushes are harvested mainly for its tannin-rich bark. Stems and branches of *Lumnitzera* (locally known as Beriya), the mangrove that provides most of the twigs and branches for Mas Athu, are harvested periodically leaving the root system and the lower half of the stem to coppice. *Bruguiera* is also grown in these woodlots for poles, posts and tannin.

This generation old cultivation and management practice is a marvellous example for conservation oriented management and utilization of a resource, which could be adopted through community participation in other areas where the mangroves need rehabilitation.

Mangroves are also used as an important fuelwood source by the inhabitants in or more correctly near the mangrove swamps. Uncontrolled exploitation of mangroves as firewood is one among other causative factors for the rapid depletion of mangrove resource of Sri Lanka. Manufacturing charcoal out of mangrove wood, is a well established and a lucrative industry, although not in Sri Lanka, in Thailand, Malaysia, the Philippines and several other South East Asian countries. The standing stock of the Sri Lankan mangrove resource is inadequate to sustain any industry, based on their products. Relatively narrow inter-tidal zone (due to the small inter-tidal range); the mangrove habitat and the destruction of mangroves by human activities, may be the reasons for this.

Nypa palm is another attractive mangrove, which resembles a stemless coconut palm, thrives along rivers which subject to tidal influence. The sap obtained by cutting the stalk of the inflorescence, once fermented, produce alcohol, which could be converted to a transport fuel. The plaited Nypa leaves (fronds) had been the only thatching material available for the mangrove dwellers in most mangrove lands in the South East Asia. Nypa shows a sporadic distribution along the west coast of Sri Lanka.

Currently mangroves in developing countries are being harvested and chipped for paper pulp and particle boards (especially *Excoecaria*, locally known as Thela) on a very large scale by the companies from the developed countries.

Apart from the endless variety of derived products, mangrove swamps supply food for man. Fishes such as mullets, milk fish and prawns from their water ways, crabs, oysters, mussels and cockles from their seaward margin, bird's eggs, honey and edible fruits such as Kirala are some of them.

Among the amenities provided by mangroves, their function as barriers for coastal erosion (a major environmental hazard in Sri Lanka) and wind is remarkable. Unlike the man-made coastal protection barriers, mangroves' ability to self-repair, even if they are damaged during a severe storm, is incomparable.

Mangrove swamps are the nursery grounds of many kinds of prawns and food fishes. These aquatic animals breed in the sea and the juveniles migrate into the mangrove swamps for food and refuge. Mangroves are very productive. A large part of the materials that they produce by photosynthesis is incorporated into their leaves and stems. Once these leaves detach from the mother tree and fall onto the swamp floor, they decompose by the action of numerous microorganisms in and on the swamp soil, and end up as protein rich particles, the detritus. These detritus particles are flushed into the coastal and sometimes into the offshore waters where they are taken as food by tiny aquatic animals which form the basic component of the food chains in these waters. These aquatic animals, on which the other commercially important fishes (food fishes) are fed, are being deprived of their food when the mangroves are destroyed, thus affecting valuable fisheries.

The unique flora and fauna of the mangrove swamps, especially the birds, provide valuable opportunities for tourism, as well as for education and research. For instance, Trinidad's Caroni mangrove swamp is a tourist attraction for the great numbers (as many as 20,000 birds) of Scarlet ibis birds inhabiting this swamp.

Mangroves therefore, define an economic resource. This resource has been widely and variously used by coastal people of the tropics for thousands of years. Nevertheless, increased rate and variety of man-induced influences, in the recent years, has become a threat to the existence of mangroves and mangrove lands throughout the tropics. Sri Lanka is not exceptional. Majority of Sri Lanka's mangrove swamps have been converted into other uses such as coconut plantations, human settlements, urban areas and tourist resorts. River damming, also will bring about undesirable changes in the downstream mangrove swamps, by diminishing the the freshwater inflow, hence increased salt concentrations in mangrove soils (deleterious

to mangroves) and decreased nutrient supply.

However, for Sri Lanka, a developing country which experiences rapid population growth with dwindling resources, conservation of mangroves and mangrove lands may be an unjustifiable luxury. Anyhow, conservation oriented management and utilization of mangroves and mangrove lands are crucial, because of their eminent economic importance.