

EXPLOITATION OF MANGROVES IN INDIA

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INTRODUCTION / abstr

The total area of the Indian mangroves, has been estimated to be approximately 700,000ha. (Sidhu 1963.) This is about 7% of the world's mangroves. The east coast of India has about 80% of Indian mangroves, while the west coast only 20% (Untawale 1984). This is mainly because of the geomorphological characteristics of the coast. The Andaman-Nicobar Islands in the Bay of Bengal have comparatively virgin mangrove forests, because of this remoteness and less human interference. Mangroves of the west coast of India are considered as the degrading type mainly because of biotic and abiotic factors (Blasco 1975, 77; Untawale 1980).

Exploitation of mangroves for economic gains in India has continued over several centuries, based on the vast experience of the local people. The major usages in earlier times were restricted to the agriculture, fishery and energy needs.

The rapid industrial growth and increasing population pressure in India has made a tremendous impact on mangrove areas, not only reducing the mangrove forest cover, but polluting the environment and affecting other ecosystems and resources (Untawale 1984).

FACTORS RESPONSIBLE

Deforestation

Deforestation of mangrove areas is an age old practice in India. This technique has been used for various purposes such as agriculture, fish farming, firewood, housing and timber requirements. The Gangetic Sunderban forest has probably suffered the most. There are other examples like Kerala (Cochin backwater), Goa, Bombay and Gujarat. Deforestation in the Gulf of Kutch was mainly for fuel and fodder in the absence of any other vegetation.

Reclamation

The deforested areas were either left uncared for or embankments were made to protect them from salt water intrusion. In the Gangetic Sunderban the reclamation has continued until recently for agriculture, fish farming, rural and urban developments, and human settlement. In the last 200 years more than 100,000 hectares of mangrove land has been lost in the Sunderbans alone (De 1964).

Cochin backwater was mainly reclaimed for agriculture and aquaculture purposes, while seven islands of Bombay, which existed till 1780, were slowly reclaimed and connected with each other into a vast land mass purely for the purpose of urban development of the city. Much of the mangrove areas along the east and west coast suffered similarly.

EMBANKMENTS

This engineering technique has been used in India to protect the low lying areas from inundation since ancient times. Usually bunds of mangrove soil are made on which coconut trees are grown. This accretes the land and gives mechanical support to the embankments. These embankments are meant for the protection of agriculture fields, fish farms and human habitations. The embankments were initiated about 150 years ago. The length of the total embankment in the Sunderban area alone is around 5000 kms. Moreover, the economy of the local people depends mostly on these impolderings (Maitra 1964).

Along the estuaries of Goa, laterite rocks have been used to protect the low lying areas from inundation. This system was introduced during the Portuguese rule in the 17th century.

The height of the embankment depends mainly on the tidal amplitude. Therefore, it is about 3 m to 4 m in Sunderbans while along the Kerala coast, it is about .5 - 1 m and in Goa approximately 2 m.

MAJOR USES

Agriculture

The deforested and reclaimed land, protected by the embankment is initially inundated with rainwater for a long time to get rid of the salt content from the soil. Once salt is leached to the desired limit then it is cultivated mostly with paddy. Special varieties of paddy, which can tolerate brackish water, have been developed and are commonly used. Along with paddy, other crops are also planted in these areas. Some part of the reclaimed land is also used, along the west coast (particularly Kerala) for coconut cultivation.

Along the Saurashtra coast, the rainfall is so scanty that leaching of the salt from soil is practically impossible. Therefore, along the Gulf of Kutch the rate of reclamation of mangrove forests for agriculture is almost nil.

There are no data available to compare the total productivity of a virgin mangrove forest or a swamp with a reclaimed mangrove region used for any other purpose. However, Vannucci (1984) has recently given some figures on fishery yield, agriculture produce and coconut harvest.

The most significant problem being faced in such reclaimed areas is of increasing soil salinity, water logging and acidic soils. As a result vast areas of agricultural land, (which was reclaimed earlier) are being diverted either for coconuts, fish farming or lies abandoned.

Fisheries

There are two types of fisheries observed in mangrove regions of India: Capture fishery and Culture fishery. Both of them differ in the species composition, nature of fishing, types of gears used and yield.

Capture fishery

The mangrove waters are usually rich in detritus and suitable as a potential area for fishing. The major fishery sources in these waters are detritivorous species of fish, crabs, crustaceans, and molluscs. Krishnamurthy (1984) has estimated the yield of mangrove-cum-estuarine dependent fisheries of India to be of 30,000 tonnes of fish and about 130,000 tonnes of crabs and prawns per annum. Roughly

about 60% of India's coastal marine fish species are dependent on the mangrove estuarine complex. The annual landings of fish from the Hooghly-Matlah estuaries of the Gangetic Sunderbans has increased from 1800 tonnes (in 1961-62) to 7000 tonnes (in 1964-65) and recently it has reached 10,000 tonnes per annum (Choudhury 1978).

Some of the most common fish of mangrove waters in India are species of Liza, Mugil, Lates, Polynemus, Sciaena, Setipinna, Pangasium, Hilsa, Ilisha and Atroplus. Prawns are represented by the species of Penaeus and Metapenaeus while the crab resource is mainly Scylla serrata. The molluscan fishery of mangrove waters is mainly Crassostrea spp., Mytilus and clams. In the upstream regions, giant prawns like Macrobrachium rosenbergii are also found in large quantities.

The major traps used for mangrove fishing are stake nets, cast nets, and hand picking.

Culture fishery

Traditional fish farming in India is a centuries old technique. Mangrove swamps and other lowlying areas along the estuaries are generally preferred for brackish water fish farming. Until recently wild stocking, during highest high tide water, was used to get the mixture of larvae. However, recently the hatching concept has been introduced which has made tremendous impact on aquaculture. As a result, it is possible to earn RS.20,000/- or more per hectare per year by way of fish and prawn culture (Dwivedi 1982).

'Bheris' and 'Bhasabada' type of captive fisheries in the Sunderban region is one of the oldest techniques. The average yield by this type of culture varies from 700 to 1000 kg/ha. The species used for such cultures are Liza parsia, L. tade, Lates calcarifer, Mugil cephalus, Chanos chanos, Penaeus monodon, P. indicus. In 24-Pargana district alone about 35,000 ha. are used for 'Bheri' type of culture (Mandal 1982). In the Andaman-Nicobar region the same species are generally used for aquaculture. In Tamilnadu approximately 27,5000 ha. of brackish water is available for the culture of fish and prawns as well as Artemia spp. in salt pans.

Along the west coast of India, Dwivedi (1982) has suggested various schemes to boost up culture fishery. Qasim *et al.* (1977) have developed and perfected the mussel (Mytilus viridis) culture technique which is promising for mangrove swamps. Along the Goa coast, traditional fish farms have been developed along the estuaries with fringing mangroves.

Kerala is well known for brackish water prawn and fish farming known as 'Pokkali' culture. Some of the land is also used for polyculture, i.e. paddy cultivation followed by prawn culture. With this technique the average yield of fish and prawns is around 785 to 2,135 kg/ha/year.

Apart from the species of fish, prawns, and paddy used for aquaculture purposes, coconut trees also play an important role along the west coast of India. The bunds of the fish farms are used for coconut plantation. The average coconut production in Ernakulam district alone has been estimated to be 344 million nuts and the productivity per hectare is around 5,468 (Vannucci 1984).

SALT PRODUCTION

The supra littoral zones along the estuaries, where saline water reaches once or twice a month, are generally used for salt extraction. Generally operations in

these areas are started before summer when water salinity reaches a maximum, as a result of high temperature and evaporation.

Gulf of Kutch, Maharashtra, Goa, Kerala, Tamilnadu and Sunderbans have vast areas for salt pans. However, the quality of salt from mangrove regions differs from the open sea systems. This may be as a result of high nutrients and the higher suspended load in the water.

TIMBER

Exploitation of mangrove forests for timber is limited to well managed forests like Gangetic Sunderbans, Andamna-Nicobar and deltas of Mahanadi, Godavari and Krishna. Mangroves on the west coast of India are not managed and hence do not produce timber of any significant value.

The Forest Working Plans for the east coast mangrove regions carried out for the last 50 years have resulted in rational exploitation (Blasco 1977).

Mangrove trees are used in India for house building, furniture, transmission as well as telegraph poles, and other household items. Different management techniques and felling cycles, varying from 20 to 100 years, are used for this purpose (Mathauda 1957).

It has been estimated that the mean annual increment for timber is 7 cft. per acre, and the growing stand of timber from Sunderbans mangrove forest has been calculated to be 4,032,000 tonnes. The average revenue from mangrove forests is low as compared to other forests. In this part of West Bengal approximately 4,000 to 5,000 coupe workers are engaged for timber and firewood collection (Waheed Khan 1957).

Until recently Andaman mangrove forests were unexploited. Bruguiera gymnorhiza from this region is used for transmission poles and telegraph poles. Preservation of this timber with 50% creosote and 50% kerosene increases the durability (Banerjee 1957). The approximate modulus of rupture is much higher (15,600 lbs/inch²) than other best quality wood. According to Sahni (1957) the mangrove timber yield in the Andamans is about 8000 cft. per acre. Timber from Ceriops tagal and Heritiera littoralis is used for house building.

FUEL AND FODDER

Mangrove trees have been the source of firewood in India since time immemorial. Perhaps this is one of the major exploitations which has degraded the Indian mangroves.

Taking into consideration the high specific gravity of rhizophoraceous wood, the species of Rhizophora, Kandelia, Ceriops, Bruguiera are preferred for firewood. The average yield of firewood is 10 tonnes/acre (Banerjee 1957). Total area, in the Coringa section of Andhra Pradesh, used for cutting firewood is about 1,000 acres per year.

The Gulf of Kutch, Bombay and Cochin Backwater are three glaring examples of over-exploitation of mangroves and population pressure. The Gulf of Kutch being an arid zone, does not have any other vegetation as source of energy for cooking or as a green fodder for cattle, camel and goats. As a result the entire pressure comes on the mangrove vegetation. Kulkarni (1957) has given an average of 295 tonnes/year for firewood and 138 tonnes of fodder. Till recently about 10,000 people from the Wagher community were totally dependent on this resource. A large population of camels regularly graze on the green leaves of

Avicennia marina. On the basis of personal enquiry, Untawale and Parulekar (1978) have estimated that 111,000 tonnes of mangrove trees were cut from 1948 to 1978. However, recently the Forest Department of Gujarat has declared most of this area as protected. Application of solar cookers, Biogas plants, liberal LPG connections and use of electricity are some of the steps to minimise the pressure on mangroves. High population density in the coastal states and cities like Kerala, West Bengal, Bombay and Calcutta has also been responsible for mangrove exploitation.

OTHER PRODUCTS

Although it has been observed that good quality tannin can be extracted from bark of some mangrove spp. like Rhizophora mucronata, Bruguiera gymnorrhiza and Ceriops tagal, there are no large tanneries using this resource. Moreover, recently better sources like Australian Acacia and Myrabolan are being used for tannin extraction. Indian mangrove trees have 35% tannin in their bark which is high when compared to other countries (Roy Choudhury 1964). However, mangrove bark extract is frequently used by Indian fishermen to dye fishing nets to enhance their durability.

Honey collection from mangrove forests is a promising business in India. It has been estimated that the Sunderban mangrove forest alone produces about 111 tonnes of honey annually (CIFRI 1973). There are approximately 2,000 people engaged in this trade.

Honey collected from Cynometra ramiflora and Aegialitis rotundifolia has a good market value and is in demand. However, honey from other species like Ceriops and Excoecaria agallocha, although common, is not highly valued (Blasco 1975).

Bark and roots from Aegiceras corniculatum and Derris heterophylla are used as fish poison. Fruits of Avicennia, Phoenix palludosa and Sonneratia caseolaris are used for human consumption and as a cattle feed. Nypa fruticans is tapped for alcoholic drinks. While leaves of Nypa palm are used for thatching Suaeda and Achrosticum leaves are used as green vegetable.

MEDICINAL USE

Different mangrove species are used by local people for medicinal purposes. Some of the uses are given below:

1. Xylocarpus spp. (bark) - astringent, fabrifuge
2. Cynometra ramiflora (leaves and oil from fruits and roots) - for leprosy
3. Excoecaria agallocha (latex, leaves, bark) - several ailments
4. Acanthus ilicifolius (leaves) - rheumatic disorders
5. Bruguiera spp. (leaves) - blood pressure
6. Caesalpinia nuga (pods, roots, leaves) - medicinal
7. Carapa obovata (gum, resin) - native medicinal.

POLLUTION

This is one of the major problems of the rapid industrial development in India. Almost all the estuaries with fringing mangroves are being used for releasing

toxic and non toxic effluents, solid wastes and sewage from the cities. As a result of this the general productivity level of mangrove swamps has been disturbed.

Although the mangrove trees are supposed to reduce pollution levels by absorbing various pollutants, the associated microbial organisms and larvae of economically important species suffer adversely. This sudden disturbance breaks the food chain and ultimately affects the coastal fishery.

Cities like Bombay, Calcutta, Madras and several other cities have become heavily polluted spots in India. However, Central and State Water Pollution Control Boards are making efforts to minimize this pollution.

URBAN DEVELOPMENT

Rural and urban development has also greatly contributed to the destruction of mangroves in India. Activities like housing schemes, roads, ports, jetties, minor harbours, mining operations in the hinterland and dredging for navigational purposes are some of the factors responsible for reclamation of mangrove regions. In the Gangetic Sunderban, Bombay and Kerala this is easily observed.

In the Sunderbans and Andaman-Nicobar forests, huge mangrove areas have been cleared to settle refugees.

CONSERVATION

Conservation of mangrove forests is a recent concept in India. Perhaps, it started with the dwindling famous Royal Bengal Tiger population, in the Gangetic Sunderbans. However, historical records show that some mangrove forests, selected on the basis of the available wildlife, were preserved by the Kings and other royal families for purely hunting purposes. This practice was discontinued after 1947.

There are sanctuaries inside the mangrove forests of the Gangetic Sunderbans for the Royal Bengal Tiger and birds. The 'Project Tiger' area occupies about 200 sq. km. mainly in 24-Pargana district. Sajankhali sanctuary is famous for birds.

The mangrove forests of Mahanadi delta and Andaman-Nicobar Islands are famous for the estuarine crocodile - Crocodilus porosus. Bitakanka estuarine sanctuary is well known for crocodiles and Pacific Ridley Turtles.

Gulf of Kutch mangroves along with its famous 'Flamingo City' have recently been declared as a protected area. Andaman-Nicobar Islands with 115,000 ha. of undisturbed mangrove forest is being considered for a 'Biosphere Reserve'.

RESEARCH AND EDUCATION

Recently the mangrove forests along the Indian coast have become active centres of research and education. Until recently these areas were neglected, but now several research institutions and universities along the east and west coast take a keen interest in understanding this specialised ecosystem.

Several social organizations, like World Wildlife Fund-India, and local environmental bodies such as VIKSAT (Gujarat) have shown interest in this ecosystem and as a result some sort of awareness has been created among the people at different levels. A Wasteland Development Board has been set up by the Government of India for this purpose.

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