

# MANGROVE ECOSYSTEMS

**A MANUAL FOR THE ASSESSMENT  
OF BIODIVERSITY**

**A follow up of the  
National Agricultural Technology Project  
(NATP.), ICAR.**

*Mangrove Ecosystem Biodiversity :  
Its Influence on the Natural Recruitment of  
Selected Commercially Important Finfish and Shellfish  
Species in Fisheries*

*Edited by :*  
**Dr. George J. Parayannilam**



**Central Marine Fisheries Research Institute**  
(Indian Council of Agricultural Research)  
P.B. No. 1603, Ernakulam North P.O; Cochin – 682 018, Kerala, India







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## **A Manual for the Assessment of Biodiversity**

*Published by :*

**Prof. Dr. Mohan Joseph Modayil**

Director

Central Marine Fisheries Research Institute, Cochin - 18, Kerala, India

Telephone : + 91-484-2394798

Fax : + 91-484-2394909

E-mail : [mcmfri@md2.vsnl.net.in](mailto:mcmfri@md2.vsnl.net.in)

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*Edited by :*

**Dr. George J. Parayannilam**

*Editorial assistance :*

**Mr. P. K. Jayasurya**

**Dr. Ansy Mathew**

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**Sreejith K. L.**

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## Economic Importance of Mangroves, Afforestation and Reclamation

R. Sathiadhas and George J. P., P. K. Jayasurya and Ansy Mathew

Reclamation/restoration of degraded mangroves by participatory afforestation will give life to an unique environment and form a part of national wealth. Afforestation with a single species of plant suitable for the location is the beginning. Later, mangrove associates and other bio-invasive plants will proliferate and ultimately culminate with the existence of a true mangrove eco-system provided human interventions are restricted. A positive aspect in the cost-benefit analysis of mangrove afforestation programmes is that it does not require any additional cost once the seedlings are properly planted as nature will take care of its further growth. Systematic plantation of mangroves in an area of one hectare costs about Rs.1.08 lakh with the break even cost of Rs.28.85 per tree (Table 1) generating multiple direct and indirect benefits.

**Table 1. Indicative Cost of mangrove afforestation programmes (Rs./ha) (3750 Nos. of plants per hectare)**

Sl. No	Item	Expenditure (Rs.)
1	Land preparation and planting charges	60,000
2	Seed cost (Rs.10 per one)	37,500
3	<b>Material cost</b>	
	a) Sand	600
	b) Clay	600
	c) Others	2,000
4	Miscell. Expenditure	7,500
5	Total cost	1,08,200
6	Break even cost (Per tree)	28.85

### Direct benefits

Among the direct benefits firewood is the principal component. Nearly 65% of the population is coastal residents. A majority of them are dependent on mangroves for fuel for cooking and timber for shelter construction for self and livestock etc. Therefore, by investing Rs.28.85/plant for planting, approximately five-fold return can be expected within 10 years with regeneration possibilities. As such, though restored artificially the renewed mangroves in course of time provide native population with seemingly endless variety of derived products such as thatching materials, charcoal, medicinal plants, that may grow later in the reclaimed area and animal fodders. In addition the restored mangroves also pave the way for the supply of food materials such as bird's eggs, honey and edible fruits from forest areas and from shore zone; aquatic organisms, such as finfish and shellfish etc. Above to all these mangrove areas are nurseries of numerous marine and brackishwater species and their juveniles grow in the ecosystem. Therefore it contributes substantially towards the capture fisheries resources by way of natural recruitment. Mangrove ecosystems are very favourable environment for a number of economically important species on which the artisanal fishery thrives in the coastal areas. It is indeed fond homes for Brackishwater species such as *Etroplus*, *Mugil*, *Lates*, *Sillago*, *Chanos*, *Macrobrachium*, *Seylla* etc. on which artisanal fishermen earn their livelihood.

Mangrove ecosystem provides many indirect benefits to the native population. Being a common property resource grown in no mans land, there is lack of any management regime or strict accountability on productivity and profitability especially the social benefit it generates to the stakeholders.

### Indirect benefits

Mangroves serve as a natural barrier against the intrusion of the sea by dissipating the wave action and preventing soil erosion. It also helps in the productivity of coastal waters by trapping the nutrients drained off from the uplands which otherwise would have found their way into the deep sea. The high productivity resulting from mangrove litter fall supports a host of detritus feeding animals, which are directly or indirectly related with fish and fisheries. Mangrove is a rich source of antibiotic enzymes and other metabolites of commercial value. This also helps to degrade and assimilate pollutants, pesticides and other chemicals, thus making the aquatic environment safe for other marine life.

Mangroves play a significant role in coastal stabilization promoting land accretion and fixation of mud banks besides helps in dissipating winds, tidal and wave energy etc. It acts as a bioshield which can to a certain extent reduce the impact of gaint waves of Tsunami. The green belt is more ecofriendly than stone walls. Tanin liberated by the mangrove vegetation hardens egg case of fin and shell fishes and ensure better survival for hatchlings. The wax from mangrove leaves and hymenopteran's hives controls predatory aquatic insects. Mangroves are rich in yeast concentration and their enzymatic activities breakdown the cellulose and the hemicellulose from the mangrove litters and pectin from shells of dead crustaceans respectively making carbohydrates, protein etc. readily available to the juveniles of finfish, shellfish and crustaceans which feed on detritus. Mangroves also purify the aquatic systems from hydrocarbon pollution. In general mangroves indeed enriches the coastal productivity. Therefore, this unique fragile wetland ecosystem must be conserved and managed by restoration/reclamation/rehabilitation through afforestation programmes.

Afforestation and reclamation of mangroves is a national necessity which can be done only by Government or public agencies as it generates more social benefit to the society rather than private profitability. Like the development of social forestry programmes, the potential spots of our entire coastal belt should come under the afforestation programmes sponsored by various agencies as there is no better opportunities and alternatives than planting mangroves in these areas for development. Considering the enormous potential demand for the seedlings for massive afforestation programmes, the indicative economics of a small scale mangrove nursery is worked out and given in Table 2.

**Table 2. Economics of small scale mangrove nursery (25000 seedlings/Annum)**

Sl. No	Items	Quantity	Rate	Cost (Rs.)
1	Construction and protection of bunds using sand filled gunny bags and mud	-	-	33,000
2.	Material cost (Polythene bag)	100 kg	Rs. 70	7,000
3.	<b>Labour charges</b>			
	a) Collection and transportation of saline mud flaps	30 labour days	Rs.150	4,500
	b) Mixing ingredients and filling the polythene bags	100 labour days	Rs.150	15,000
	c) Transplanting (10,000 Nos.)	60 labour days	Rs.150	9,000
	d) Shifting of polythene bags two times (75 labour days in one time)	150 labour days	Rs.150	22,500
4.	<b>Seedlings cost</b>			
	a) Cost of wild seedling of <i>Rhizophora</i> , <i>Kandelia</i> sp.	15,000 Nos.	Rs.2	30,000
	b) Cost of <i>Brugiera</i> , <i>Avicennia</i> , <i>Sonneratia</i> <i>Aegiceras</i> etc.	10,000 Nos.	Rs. 2	20,000
5.	Watch and ward	300 days	Rs. 100	30,000
6.	Boat hiring charges		-	5,000
7.	Miscellaneous expenses		-	8,000
8.	Total cost	-	-	1,84,000
9.	Break even cost (per seedling)	-	-	7.36
10.	Gross revenue @ Rs. 10 per seedling	-	-	2,50,000
11.	Net profit	-	-	66,000

A small scale nursery with an annual production capacity of 25,000 seeds can generate full time



*Sorting out of different trash fishes after catch at Particiapatory Rural Appraisal Technique*

employment for two persons. The break even cost of a seedling works out at Rs.7.36/-, which can be easily sold at a price of Rs.10/-. The gross income generated will be about Rs.2.5 lakh with the net profit of Rs.66,000/- in this venture. However the annual target of region-wise mangrove plantation should be fixed by Government and the requirements of seedlings

should be announced in advance. This will enable even unemployed youth to establish mangrove nurseries to cater the increase in demand of quality seedlings. The environmental degradation of the coastal regions can be controlled to a greater extent by developing mangrove forests which will further enhance the livelihood options of fisherflok.



## MANGROVES - SEA - LAND - INTERPHASE - INTER TIDAL - HABITAT : IN THE NATURAL PRODUCTION SYSTEM



ACANTHUS BELT PREVENTS SOIL EROSION AND PROVIDE REFUGE  
FOR THE JUVENILES FROM PREDATION



NATURAL NURSERY FOR FISH  
IN THE MANGROVE



FRESH WATER EEL (*ANGUILLA SPP.*)



*LATES CALCARIFER*



GREEN MUSSEL (*PERNA VIRIDIS*)



OYSTER (*CRASSOSTEA MADRASENSIS*)



FRESH WATER CAT FISH (*SILURUS WYNAADENSIS*)



FRESH WATER CAT FISH (*MYSTUS GULIO*)



*ETROPLUS MACULATUS*



*HYPORHAMPHUS LIMBATUS*