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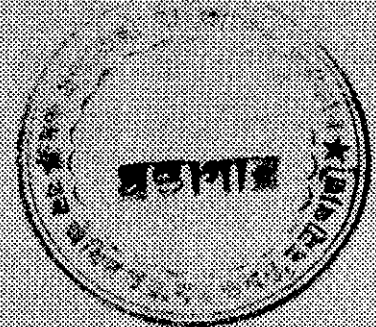
**INTEGRATED RESOURCE DEVELOPMENT
OF THE SUNDARBANS RESERVED FOREST**

BANGLADESH

**INTEGRATED RESOURCE MANAGEMENT PLAN
OF THE SUNDARBANS RESERVED FOREST**

IRMP Vol 1 Executive Summary 1998

PROJECT BGD/84/056



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This technical report is one of a series of reports prepared during the course of the project BGD/84/056. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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EXECUTIVE SUMMARY

This Integrated Resource Management Plan (IRMP) uses extensive information, derived from the fieldwork of the Forest Department (FD) and FAO in UNDP Project BGD/84/056, to formulate scientifically sound options for improving the sustainable management of the Sundarbans Reserved Forest (SRF). The plan is an advisory document for decision makers and managers which provides balanced guidelines and strategies to improve management of all aquatic and terrestrial resources.

The plan provides a thorough holistic assessment of resource statuses of the entire ecosystem for *the first time*. This will become an invaluable baseline for future working plans and development. It could not incorporate a traditional forestry plan since the necessary inventories and stock assessments were not available. However, it provides details of new inventory survey methodology and discusses gaps in the data. The wood resource and non-wood resources and their management were carefully researched to form part of the technical background to the plan, using an integrated systems approach.

It also includes guidelines for practical biodiversity conservation with emphasis on the potential for income and employment generation for disadvantaged groups living near the SRF. Inter-sectoral coordination, development of ecotourism; participatory planning, institutional capacity building and the protective role of the coastal forests are among the plan's components.

There are three parts:

- Volume 1 : Part 1 The past and current situation and Part 2 future management.
- Volume 2 : Appendices giving further details.
- Volume 3 : Maps prepared from GIS and Hydraulics data bases.

Information is provided on history, meteorology, geology, physiography, hydrology, soils, land use, flora, fauna, forestry, fisheries, wildlife, tourism, apiculture, harvesting and marketing, economics and socio-economics. For full details of separate technical reports refer to Appendix A15 (Vol 2).

The plan is framed round the following broad topics, some of which stem from the Forestry Sector 1980-1985 Five Year Development Plan:

- ecosystem analysis covering the biotic and abiotic resources of the Sundarbans Reserved Forest;
- scientific management of forest resources for the maintenance of the ecological balance and sustained production of timber, fuelwood and other production;
- the sustainable use of terrestrial and aquatic resources;
- the technical capability of the institutions operating in the forest area;
- practical approaches for long-term conservation of biodiversity and intrinsic values of the fragile and threatened coastal mangrove ecosystem;
- increase or improvement in wood and non-wood products to meet the needs of an expanding population;
- establishment of a data base as a basis for resource management;
- provision of accurate socio-economic information and policy guidelines to ensure greater income and employment opportunities for people who depend on the resources of the Sundarbans for their livelihood without adversely affecting the ecosystem;
- the promotion of socially and culturally beneficial tourism without degrading the ecosystem;
- investment opportunities for sustainable development.

The plan includes:

- (1) The status of the ecology of the Sundarbans based on the work of three consultants, Sukardjo (1993); Grepin (1994/95) and Rahman (1994/95). These confirm that the Sundarbans Reserved Forest still retains most of the attributes of locally disturbed climax mangrove vegetation with little human encroachment. On the other hand (there are signs that gross change are occurring in the ecosystem, reflected in alterations in vegetation associations and plant succession. It appears that these are caused by reduction in freshwater flushing, increasing duration of higher levels of salinity, increasing sedimentation and subtle intrusion by people.)

(2) A draft zoning scheme is proposed for different conservation or production purposes. The exact nature and intensity of management will follow from the inventory data which will be obtained in the IDA Forest Resources Management Project (FRMP) 1996/97. A ten-year implementation schedule indicates priorities, activities, timebound targets and financing. A GIS data base has been developed so that accurate spatial information is immediately available for conservation, production, zone revisions, sanctuaries, tourism and the 10 km border area where most resource users reside.

(3) By definition the SRF land use category is for forestry and it is to the great credit of the Forest Department that the area has retained the integrity of its borders and the nature of the enclosed mangrove ecosystem for over a hundred years despite unabated pressure from the public. The forest produces about 45% of the sector's total revenue.

The FD has a field staff to manage the SRF consisting of a Conservator, Khulna Circle, three DFO's and about 1000 of other ranks operating on an annual revenue budget of about Tk 34 million which is only 37% of an internationally recognised standard for species protection alone and is 5% of the total FD annual expenditure account. This is also less than 25% of the mean annual revenue for the SRF. The emoluments and terms and conditions of the FD staff working in the special conditions of the SRF should be the subject of separate and urgent GOB review aimed at improving these to levels commensurate with the unusually difficult working environment and unusually high level of responsibility and risk that all field staff face.

Proposals are made now for practical integration of multisectoral ecosystem management, protection, research, training and monitoring and evaluation (M&E) activities essential for sustainability in what amounts to a Managed Resource Area (IUCN classification).

The functional unit needed by the Forest Department (FD) for continuity in multiple resource research, technical training and capacity building is the operational unit (OPSUNIT) which was established at Khulna. Its structure is set out in Figure 9.

(4) Recommendations are made for improving institutional and fiscal arrangements. At present there is a strong case for short-term funding and finding the means for linking the OPSUNIT to the Forest Department's Resource Information Management System (RIMS) based in Dhaka, Headquarters whilst maintaining its long-term role in Khulna. Continuity is a major structural problem and the two-tier system of professional and technical foresters approved by the Secretaries Committees may help attain essential stability and continuity which are discussed in Section 26.

(5) The plan includes a soil-cum-vegetation map of the Sundarbans depicting the spatial variation in species composition and associations. This builds on the ODA 1985 1 : 50 000 vegetation maps and shows the clear relationship between soils, salinity and vegetation types (see volume 3).

Guidelines for the fishery and wildlife are drawn up based on the findings of Chantarasri (1994) and Tamang (1993). At the moment there is minimal management of these resources. Indications are that there is widespread over-exploitation of the fish stocks as well as a detrimental impact upon the environment. Unfortunately there is inadequate information at present on which to make management decisions.

(7) Reports on the statuses of important wildlife species have facilitated the inclusion of an outline wildlife management plan. The wildlife plan is supplemented with information on sustained yield harvesting, biodiversity management, reintroductions of extirpated species and the requirements not only for research and monitoring but also for proper commercial appraisal and sustainable utilisation of an undervalued resource. Protection of vulnerable and endangered species and uncompromising maintenance of wilderness values for ecotourism are considered to be high priorities for future implementation.

(8) The plan introduces a programme for investment in development:

Proposals are made in an indicative investment programme (volume 1) for follow on implementation including, strengthening the Forest Department itself, management of wood resources, non-wood resources, fisheries, tourism and recreation, apiculture, wildlife sustained

yield harvesting, extension programmes, employment diversification, small-scale industries and enhancement of opportunities for development for women and other stakeholders, all aimed at improving management, poverty alleviation and more effective resource utilisation. Details are given in Section 27 and Table 73.

- (9) A functional communication system consisting of boats, launches and wireless sets with necessary support services for maintenance and repairs is essential to efficient resource management over large areas such as the SRF. Substantial investment will be needed in additional equipment and training. Recommendations are made for inter-sectoral collaboration, for inter-netting between users, for use of photovoltaic power and for training operators.
- (10) Harvestable wood and non-wood resources were studied and reported on in specialist reports (see Vol 2) and planning guidelines are based on their conclusions:
- Results from analysis of 69 PSP's and felled sample trees indicate that the timber resource may have been incorrectly estimated (Leech, 1995) in the past in the ODA inventory and that the harvestable volume of Sundri *Heritiera fomes* and Gewa *Excoecaria agallocha* may have increased since the last PSP measurements 7.5 years ago, confirming the benefits of the Moratorium. A parallel finding has been that, in recent years, volumes from salvage fellings of Sundri have reached pre-Moratorium levels (Mitchell, 1995) and that the total harvest may be as high as 40% above the official harvest (Larsen, 1994). Thus recommendations are made to ensure that the forest does not veer again towards depletion.
 - Analysis of the PSPs indicates that the standing volume of Sundri as a proportion of the total appears to have remained constant at 53.4% in 1986/87 and 53% in 1994/95. This suggests that in the theoretical conditions of untouched forest under the Moratorium the proportion of Sundri is not changing. Yet the 1985 inventory compared the areas of Forest Types at 1960 and demonstrated that the area of pure Sundri forest had actually declined and that the area of Sundri-Gewa had increased over the period. This might imply that management practices have had a negative impact upon the standing value of the forest and there is a discernible impact upon natural succession. The areas of Sundri-Gewa and Gewa-Sundri were 1232 Km² and 600 Km² respectively in 1985.
 - Based upon the same analyses of re-measured plots and consistent volume estimation methods, it seems that the proportion of Gewa has increased slightly from 38.1% to 39.0% over the same period. The provisos in accepting these conclusions are that the PSP's have been excluded from official harvesting. It is virtually impossible to ascertain total consumption. They therefore do not necessarily provide a true measure of change in the production forest resource.
 - That information from the data made available to or obtained during the preparation of this plan are inadequate to make detailed operational plan management prescriptions for the wood resource. This will only be possible once the results of the impending 1996/97 FRMP inventory are known after which the Moratorium should also be reviewed.
 - Results show that 131 000 fishing boats of all sorts were licensed to enter the SRF in 1994 and that estimates of the total landed harvest, including the offshore fishery, are extraordinarily variable ranging between 75 000 t (MARC, 1995); 55 000 t (Ahsanullah, 1995) and 12 000 t (Forest Department, 1995). The most important finding is that finfish, shrimps, crabs and oysters are intensively harvested at the Maximum Social Yield level (Pena, 1994) and that this is unsustainable and requires properly directed management of breeding areas, fishstocks, and methods of harvesting. This matter is substantially complicated by lack of training in fishery management and inadequate inter-departmental coordination.
 - There is increasing inability for supply to meet demand causing unsustainable over-exploitation. More regulation and better control systems are needed, taking due account of socio-economic and land use factors outside the SRF.
 - That no increase in harvest levels should be permitted and that for fish, shrimps, crabs, oysters, other wildlife, golpatta and goran immediate attention should be paid by the FD to consider new harvesting and marketing systems and to improve existing systems.
 - That development of community participation in planning, decision making and management, requires considerable forward preparation in which the FD should take a lead role beyond the capacity of current staffing. Investment and proposals to strengthen the management capability are made as part of the ten-year follow on programme.

- Properly managed SRF ecotourism, as part of a one-week Bangladesh Module which would aim to capture 2% of the regional market, could lead to the development of an industry worth at least US\$100 million pa as described among other development projects.

(11) Two institutional development proposals are outlined to support the FD's management capacity. Assumptions are made which are common to both:

- that there is little doubt that the current management structure requires strengthening and reform to meet modern demands and new challenges;
- that the existing FD infrastructure, fleet of launches and vehicles and nearly the whole network of field offices requires either up-grading or replacement requiring a modernised management organisation;
- that any change must be intended to be permanent and that the new organisation must be wholly supported by GOB or be self financing and not dependent in the long-term on donor finance;
- that by improving efficiency, accountability and transparency the return from the resources of the SRF will be nearer their full economic value thus justifying higher expenditure on management.
- that there must be a capability for continually collecting data and monitoring the resource so that an up to date information is available at all times for the preparation of FD management plans;
- that the recommendations regarding changing the FD revenue system will be implemented to achieve the expected increase in revenue;
- that there should be no major retrenchment of existing FD staff and that terms and working conditions for the department will be significantly improved.

Option 1: This improves the existing management structure by up-grading the FD's *status quo* technical capabilities by providing requisite capital investments in training, infrastructure and equipment. The proposed structure is illustrated in the organogram in Figure 7.

Option 2: The structure enhances the FD's role as the pivotal organisation involved in administering and managing the SRF but changes the *status quo* through receiving direction from a top level National Mangrove Committee (NMC) - steering committee and by the addition of the OPSUNIT and Integrated Management Committee for technical direction. This arrangement offers the first methodical step towards genuine integrated resource management.

Attributes of option 2 are:

- Control and implementation of management plans would remain with the FD. The department would recruit specialists to manage fisheries, wildlife utilisation, tourism and community development in the border area. It facilitates cross-sectoral technical cooperation at all levels.
- It helps draw upon expertise in areas where the FD is not skilled or outside its mandate.
- To strengthen coordination and integration with other concerned ministries and agencies formation of a National Mangrove Committee (NMC) is recommended. The purpose of the NMC would be to formulate policy and legal reforms, contribute to operational transparency and to give support to the Forest Department.

The proposed structure is illustrated in the organogram in Figure 2.

Technical conclusions on which this plan is based are listed below:

1. The biophysical environment:

It is confirmed that major changes are occurring in the mangrove ecosystem. These are :

- Reduction in freshwater inflow from the upstream catchments.
- Increased rate of sedimentation in some places.
- An increase in the duration in most places of higher levels of salinity than measured in the past and that the area of greatest fluctuation in total salinity level is in the central part of the SRF. Information based on the project's pioneer hydraulic modelling studies of the mangrove system.
- Global warming indicates a sea level rise which will ultimately have a serious impact upon the ecosystem.

- Industrial, maritime and agricultural pollution from upstream sources and tidal flows from the Bay of Bengal may become critical to the biota.
- Without access to the 1995 FRMP aerial photographs it has not been possible to detect gross changes in plant associations and forest types measured in terms of total relative areas.
- The occurrence of the condition known as Sundri Top-dying is widespread and no single causal factor has been detected Rahman (1995) and Ciesla (1994). It is generally thought that the cause is likely to be a mixture of several factors acting together which in any case cannot be rectified; improvement in management and control of removals are required.
- In 1985 a change was detected in the total standing volume of Sundri and also that the number of trees per ha had declined since 1960 and this could be ascribed to inappropriate application of the selection management system. It has not been possible to ascertain whether this trend has continued for Sundri since that time but for Gewa the same management technique is still used to the probable detriment of the Sundri stock.
- The species populations of the larger animals especially tiger, spotted and barking deer, Rhesus macaque, wild boar and dolphins are either stable round mean density levels or declining.
- The avifauna is rich in species but populations generally exhibit unusually low densities.
- Fish, shrimps, prawns and crabs are over-harvested at all stages in life cycles and unusual fluctuations in their densities were observed in 1994/95.
- Crocodiles, turtles, monitor lizards and snakes are widespread in their occurrence but densities are low.

2. Wood production

- There appears to have been an understandable small total net increase in standing volume of commercial timber species since 1987 but this will need to be verified.
- Despite the timber Moratorium the volume of removals of Sundri, Gewa and Goran are at pre-Moratorium levels.
- The official wood harvest for all species was estimated at 243 000 m³; undetected harvesting may have added a further 40% to this.
- Wood production at the combined current official and unofficial level could be leading to a depletion in the forest but this will not be known until the 1995/96 inventory results are analysed.

3. Non-wood production

- The total Golpatta harvest is said to have averaged 69 000 t over the last 10 years and the FD revenue in 1993/94 was Tk 5.9 million. From socio-economic and other evidence this harvest may be higher by up to 40%.
- The total landed fish harvest estimates range between 12 000 t and 50 000 t. The latter is considered the most probable.
- The total honey and beeswax harvest is unknown but is likely to be to the order of 600 t and 150 t respectively, three times the officially recorded levels, and are valued at Tk 2.2 million.
- The total harvest of shrimp fry was recorded by the FD at 231 million in 1993/94 accruing Tk 11 million in revenue but this harvest is exceptionally difficult to record and is probably underestimated.
- The total harvest of shells is about 3200 t for which the annual revenue is about Tk 86 000.
- The total number of international tourists visiting the SRF is thought to be about 300 and the total number of domestic tourists is estimated at about 5300 with a combined average revenue to the FD of about Tk 31 000 per year over the last seven years.

4. Socio-economics

- The human population living in the border area is about 2 million and will double at the present rate of 2.04 % pa in 34 years.
- At least 25 % of this population is probably engaged in some form of full-or part-time activity in connection with produce from the SRF and if all members of families are included this figure could be much higher.
- The dependence of people on the mangrove ecosystem is high (MARC, 1997) with about 46 % of all local income being derived directly from SRF resources.
- Those involved in timber and Golpatta harvesting are known as Bowallis and those involved in honey collection are known as Mowallis. Both communities do not appear to receive equitable benefits for their labour.

- Lack of personal security and unfair treatment were stated to be the foremost local concerns.
- Investments in post-harvest technology, social forestry, wildlife management, tourism, apiculture and aquaculture in the 10 Km border area, could do much to create new employment opportunities for women and disadvantaged groups and thereby help relieve pressure on the products of the SRF.

5. General

- Administrative responsibility rests in the hands of the Forest Department but sustainable development cannot occur in isolation. It is necessary for the Department's capability to be strengthened through dialogue and cooperation with other concerned agencies. It is widely acknowledged that conservation of natural resources cannot be successful against a background of widespread poverty. Management of the SRF should encompass this reality and recommendations are made which promote better protection in conjunction with social equity.
- With better resources, information and education in the border area, the Forest Department could readily move away from people's perceptions of a custodial and confrontational stance. This could be done by demonstrating a commitment to the principle defined at the UNCED conference in Rio de Janeiro 1992 Agenda 21, that there is little future for conservation without social justice. Following the reforms described in this plan the FD could manage the SRF in the certain knowledge that its actions accord with the multifarious needs of society and that its technical base has the backing of other specialist agencies.
- Ecological changes are occurring in the physical environment, most of which have their origins outside the SRF. These are outside the control of the FD but which should be researched and monitored through continuous survey using modern technology, GIS, hydraulics and remote sensing.
- Impediments to the FD's management capability, in the face of increasing population pressure on the environment and its resources, indicates a need for capacity building with considerable investment in resources and training.
- The widely held belief that the SRF resource is in decline is correct but the situation is not irretrievable; factors relating to management can be accommodated; others, such as sea level rise, cannot.
- The consequence of not implementing the actions, recommended and set out in this plan to improve management of all resources by investment in integrated strategies, will be an accelerating decline in the value of the SRF ecosystem and consequential increasing loss of social and economic benefits to the nation as a whole.

Recommendations for integrated resource management set out in the body of the plan are summarised:

R1 Conservation, integrated management and development

In order to ensure optimal utilisation of resources without disturbing the ecological balance inter-departmental cooperation and coordination of functions will be needed. It is recommended that future institutional and structural planning should clearly define the following functions and areas of responsibility:

- | | |
|--------------------------|--|
| • Management operations | • Protection |
| • Conservation | • Legal and audit functions |
| • Research activities | • Monitoring systems |
| • Training | • Information, education and extension |
| • Commercial enterprises | |

R2. Management Committees

It is recommended that regular meetings between concerned ministries, departments and other agencies should be structured by inter-ministerial agreement which would steer and direct the implementation of the IRMP and future management of the SRF. The following should be considered:

- The National Mangrove Committee (NMC)
- Sundarbans Integrated Management Committee (IMC)

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- Sundarbans Tourism Advisory Sub - Committee

Initially it is recommended that the proposed National Mangrove Committee and the Integrated Management Committee should be established as precursors to IRMP implementation and for on-going monitoring of management impacts on the SRF. Detailed terms of reference should be determined by exploratory meetings to exchange ideas and ascertain spheres of interest on policy, legislation, development, research, monitoring etc and to organise a *modus operandi*.

R3. Institutional framework : administration and management

It has been concluded that the institutional structure for improved management of the SRF requires some adjustment and two alternatives are described. It is recommended that an early decision be made by the government on the best way forward to meet future management goals. Details are in Sections 26 and 27.

R4. The Operational Unit

It is recommended that the Operational Unit illustrated in Figure 9 and described in Section 26 in Options 2 should be maintained as the first follow-on project in the IRMP. Financial arrangements are detailed in Appendix A17. If interim funding becomes available it is recommended the unit should be linked administratively and functionally to the ongoing FRMP RIMS operations.

Early transitional arrangements will be needed to ensure continuity and it is recommended that this should be treated as a high priority for possible inclusion in any review of the FRMP and for donor consideration. Its capacity should be developed and financed in a special bridging period of say two years using any discretionary finance that may be available.

R5. Integrated planning system

In the absence of inventory data which are to be acquired in 1996-97 by the FRMP IDA project, it has not been possible to prepare a new detailed Working Plan for the SRF and it is recommended that the new forest inventory data should up-date and add to the existing multiple-resources data on a continuous basis using the methodology defined in this plan (section 9.1).

R6 Environmental and ecological parameters for follow-on activities

It is recommended that priority topics for follow-on applied research on the mangrove ecosystem should be to focus initially on the broad fields listed below on which work has started but is far from complete:

- comparative vegetation mapping 1933, 1960, 1985, 1996
- meteorology - new SRF ecological research stations
- hydrology - shared waters and pollution
- soils, erosion and accretion
- biodiversity, fish stocks and other wildlife
- stakeholders' participation - People's Organisations, NGO's and donors
- baseline surveys of biodiversity in the wildlife sanctuaries and Border Zone
- analyse prospects for investment in economic developments in the 10 km border area especially tourism, cottage industries and post-harvest technology
- studies on the impact of land use practices in surrounding and upstream areas
- detailed studies of resources, ecology and protection of the 12 nautical mile marine zone.

R7 Future survey and monitoring

It is recommended that the Forest Department should change from a stratified random sampling methodology to continuous survey systematic sampling Leech (1995).

R8 The wood resource

Although the project was able to measure 69 of the Permanent Sample Plots it was not able to complete the task. There is a great deal of useful growth and yield information that could be utilised. The remaining plots should be measured as soon as possible. Likewise the environmental/site parameters which have been recorded also should be analysed and used to develop baseline data against which future measurements can be made. It is recommended that this activity should be carried out by the continuous survey team working with the FRMP team as a matter of high priority using the methodology derived by the project (Leech, 1995).

- It is recommended that the Forest Department use a volume control methodology for setting the allowable cut (AAC) from the Sundarbans rather than basing allowable cut on area control.
- It is recommended that simulation models be devised to determine, not only the effect that different levels of cut might have on growing stock estimates thus enabling computer sensitivity analyses to be carried out for determination of the most appropriate AAC for sustainable harvesting, but also for proper management of all other resources.
- Details of silvicultural research and monitoring, plantation trials, and nurseries Karim (1995) and growth and yield modelling, harvesting and inventory methodologies are set out in Leech (1995) and Mitchell (1995) and these are discussed as guidelines for future implementation:

R9 Production forest resource management

It is recommended that the following key issues be addressed in determining priorities for production forest management:

- The FRMP inventory to assess the current status of the wood resource is required. It is recommended that this should follow the TSP/ PSP survey system proposed by Leech (1995).
- Following the results of the new inventory design and implement a production management plan outlined by Leech (1995).
- Develop a new system for measuring all wood removals. It is recommended that timber sizes should be based on the metric system, firewood on metric stack measurements and pulpwood based on metric weights as it enters the mill (Mitchell, 1995).
- A new system of passing the removal records up the line for collation needs to be developed, so that all the information by the lowest level of resolution can be centrally processed.
- A new system of continually updating compartment records should be devised. This system must include records of all treatments undertaken in any part of the forest.
- Standardised computer menu reporting forms should be devised so that compartment information can be provided by station or range offices for regular collation. This would record the chronology and status of forest operations.
- Institute a system of periodical independent random auditing of all revenue systems.
- Improve silvicultural practices through tending, thinning, and improvement fellings.
- It is recommended that the timber Moratorium should continue pending the results of the FRMP inventory.
- Immediately re-define the criteria for selection of Top-dying Sundri so that healthy trees are not harvested.
- Introduce salvage removal of wind blown trees as a priority higher than removal of Top-dying Sundri.
- It is recommended that all Sundri logs be graded so that parcels of graded timber can be sold at auctions.
- Privileged selection of REB poles from the forest should be discontinued. These poles should be bought at open auction in the free market and not be harvested selectively.
- Revised felling rules are recommended for Sundri such as use of cross cuts and hand tools;
- Trials of enrichment planting and large scale plantations should be implemented.
- Trials of new silvicultural systems for Goran and Gewa harvesting need to be undertaken.
- A plantation extension unit should be set up to encourage tree planting.
- A nursery development programme needs to be instigated as appropriate.

R10. Products : management, harvesting and economics

The relentless pressure on wood and non-wood products, aquatic and terrestrial resources, and palpable threats to the whole integrity of the environment which sustains them, are reflected in daily demands for other kinds of development. These compel continuous up-dating of information not only on the statuses of products but also on harvesting methods, market economics and public opinion. Management proposals are geared fulfil the needs of the present without compromising the ability of future generations to meet their needs as well.

It is recommended that early consideration be given to reorganising the revenue system and that the system of measuring produce which should be standardised using metric units.

R11. Wood products

It is recommended that after completion of the FRMP inventory priority consideration should be given to the following for improvement of yields and management of wood products Larsen (1994):

- Estimate the likely effects of lifting or relaxing the Moratorium before the year 2000.
- Re-define the harvesting criteria applied to Top-dying Sundri if the Moratorium is to remain.
- Assess the cost-benefit of utilising species such as Baen *Avicennia officinalis* and Jhanna *Rhizophora mucronata* for poles and piles currently wasted and only harvested unofficially.
- Assess the cost-benefit of harvesting wind-blown and fallen trees.
- Gewa is harvested as an exception to the moratorium for use by the Khuina Newsprint Mill. In the event that the mill becomes uncompetitive and faces closure alternative use for Gewa must be researched.

R12. Non-wood resources

The increase in emphasis on non-wood forest products (NWFP) has accelerated in recent years firstly because of high social and commercial values (higher in total value than the wood resource) and secondly because the immediate consequence of the growth in interest in these products has been the increase in demands placed upon the FD for day to day management. The Department has barely had the means for managing the timber resources and thus a big shortfall in capacity exists in its ability to handle the new, often highly specialised requirements, of modern management of both plant and animal based produce. It is recommended that this matter be given priority attention in future investment programmes.

The large numbers of people connected with harvesting NWFP's bring with them a host of management problems connected with harvesting methods Shiva (1994), ecological and environmental disturbances, distribution of benefits, marketing, transportation, investment and social equity, many of which are directly associated with institutions and the activities of people outside the SRF. For future improvement in NWFP's management, it is recommended that the FD work with NGOs, the civil administration and all other relevant parties. Steering this should be one of the preliminary functions of the IMC.

R13. Plant based NWFP'S

In the order of priorities it is recommended that Golpatta, Hantal and Bholia are given priority attention in terms of making a proper determination of their distribution and statuses because of the exceptionally high social value which is attributed to these products.

Golpatta management requires early attention.

It is recommended that :

- An assessment of the area and total standing stock of Golpatta should be made as soon as possible.
- A research programme into growth and yield and also the effects of different cutting regimes should be implemented.
- The measurement of Golpatta removals by BLC should be changed to either selling the area standing at auction or stack measuring the boat loads.

- New cutting rules should be introduced to reduce the amount that is currently wasted by trimming fronds.

R14. Animal-based NWFP'S

The Fishery : management of the Sundarbans fishery involves issues which affect the wildlife sanctuaries, forest resource conservation, socio-economics, international boundaries and border area agriculture. This matter involves many agencies and areas well beyond the SRF. It is not a case of giving foresters more training in another specialised field or of developing a new division with a multitude of skills overlapping with other institutions but a matter of integrating existing complementary functions, skills and responsibilities to mutual benefit under the auspices of the FD.

The fishery resource includes commercially important finfish as well as shrimps, oysters and crabs, values for which have escalated enormously in recent years. Several administrative, management and research issues must be resolved and it is recommended that early attention be paid to establish coordinated management involving agencies concerned with:

- straddled fish stocks especially *Hilsha ilisha*, *Lates calcarifer* and shrimps which have part of their life cycle outside the mangrove forest;
- international trespass in marine waters;
- migratory seasonal fishermen, in particular winter visitors to SRF from Chittagong and elsewhere;
- management of shrimps, crabs and oysters; conservation biology, harvesting and post-harvest treatment;
- practical measures to increase the minimum sizes of fish and shrimps caught;
- proper assessment of closed seasons and their enforcement;
- integration of research and monitoring data collection and sharing of information between the Forest Department, Fisheries Department, Fisheries Research Institute, universities and regional fisheries projects.

A summary of recommendations is provided below to assist integrated fishery management:

- Collect monthly length-frequency data for commercially important species.
- Attempt to age fishes using hard structures, otoliths and scales to provide an alternative to length-frequency data.
- Measure the abundance of fish and crustacean stocks.
- Collect length-weight data for commercially important species and use the constant *b*, defined in the IRMP, in the length-weight relationship to monitor the body condition of fish stocks over time.
- Record the distribution of fish species including seasonal movements in the SRF.
- Make an independent assessment of the numbers of fishermen, fishing gears and catch composition.
- Collect data on the catch size and composition of the offshore set bag-net fishery.
- Determine where and when *Hilsha ilisha* that pass through the SRF spawn.
- Identify different fish stocks and their movements in and outside the SRF
- Research the effects of capture by rod and line on the survival of *Macrobrachium rosenbergii*.
- Introduce a minimum catch size for *Lates calcarifer* of 30 cm TL and 10 cm TL for *Johnius argentatus*.
- Restrict the numbers of hilsa gill nets, pangash gill nets and gill nets operating in the SRF or endeavour to keep to current levels.
- Endeavour to hold exploitation of commercially important species (except *Penaeus monodon* fry) constant at present levels.

It is recommended that for straddled stocks and species which spawn outside the SRF, either in the open ocean such as *Lates calcarifer* or upstream *Hilsha ilisha*, effective stock management control over the entire life-cycle of a stock should be introduced.

Regulatory systems, including new revenue controls, closed seasons, net mesh limits and stock conservation rules should be established as a matter of urgency by coordination of responsibilities and management, in and outside the SRF.

Wildlife: with the establishment in 1994 under the FRMP of the Environment Management and Nature Conservation Division (DCCF in Dhaka) and appointment in Khulna of a DFO Environment and Nature Conservation with three ACF's who are responsible for the SRF Wildlife Sanctuaries, it is recommended that early implementation of wildlife management, conservation and research programmes should be instituted in consultation with IMC and with particular regard to:

- definition by the CCF and DDCF Environment Management and the Conservator, Khulna Circle, of areas of responsibility and integration of activities of all the DFO's working in the SRF especially overlapping functions which stem from the Forest, Wildlife and Fisheries Acts;
- finalisation of Wildlife Sanctuary extensions ; protection and production area zoning and boundary descriptions as soon as possible; - Map 13.
- training of staff connected with wildlife management;
- implementation of the Wildlife Management Plan outlined in the IRMP in furtherance of the objectives of the FRMP;
- follow up on research already started on the ecology of the tiger, spotted deer, wild boar, muntjac, turtle, dolphins and crocodile populations;
- ensure integration of management, protection, research and monitoring activities with other forestry and fisheries staff and link data collection, storage and analysis with the CST, GIS and IDB data bases;
- establish biodiversity conservation priorities in collaboration with IUCN and with due regard to NEMAP and the NCS.
- consider reintroducing extirpated species such as rhinoceros, buffalo, swamp deer, hog deer and marsh crocodile.

Other wildlife related matters on which recommendations are made include:

- | | |
|-------------------------------|------------------------------|
| • Zoning | • Boundary delineation |
| • Vegetation studies | • Deer and crocodile farming |
| • Legislation and Regulations | • Ecology of tigers |
| • Saltwater crocodile | • Wildlife Management Plans |

R15. Tourism and recreation

Recommendations for socially and culturally acceptable tourism and recreation are based upon the judicious implementation of a Ten-year Development Plan referred to as the TYDP which makes proposals for ecotourism development, investment and management (Moss, 1993; Mitchell, 1995). Optimum use of the wilderness asset is proposed without exposing the SRF to environmental degradation in any way. This is in line with the policy of the FD and the National Tourism Policy (NTO, 1992).

It is recommended that a Tourism Advisory sub-Committee be convened as soon as possible to examine and co-ordinate in particular:

- SRF tourism development responsibilities and functions of the Public Sector, Parastatal organisations and the Private Sector, especially integration of the roles of the Forest Department, the Parjatan Corporation, the Tour Operators' Association of Bangladesh (TOAB) and private investors.
- Development of domestic tourism and international tourism, especially hard-currency earning ecotourism based upon development of the one-week (6 nights 7 days) 'Bangladesh Module' - Dhaka, river journeys and the Sundarbans Experience of 'Jungle Camps and Lodges' (Moss, 1993).
- The validity of the proposed TYDP tourism development model and strategies for its implementation. The outline TYDP plan is shown in Table 71.
- Zones, concession arrangements, management agreements, leases, standards, controls and monitoring.
- Domestic tourism facilities should be developed only at Mongla and Munshiganj. International ecotourism should start with the TYDP in the Katka - Kachikali area, followed soon thereafter by Nilkamal and Mandabaria areas.

Other tourism matters covered in the plan on which recommendations are made include :

- Training
- Common objectives, commitment and policy
- Prioritise product development
- Prioritise development plans
- Publicity and marketing
- Development without destruction
- Tourism targets
- Regulation and monitoring

R16. Apiculture

Honey has been collected in the Sundarbans by Mowallis from time immemorial but the interests of this subsistence user group have never featured highly in traditional management plans. It is recommended that the entire system of apiculture management be reviewed and that arrangements should be made for more equitable access to the resource on the one hand and better resource management on the other.

- An extension specialist in apiculture is needed to prepare and distribute information on honey collection and beekeeping to Mowallis and beekeepers. Work should commence as soon as possible as a follow on project (Zmarlicki, 1994).
- For training of honey collectors, apiaries in the Sundarbans should be maintained every year during the honey flow season and serve as demonstration apiaries. The apiculture handbook should be translated and published in Bangla.
- The honey processing establishment should be targeted to train and assist honey collectors from the SRF and other local small-scale producers who could benefit directly through improving the quality of their product. This could be achieved by combining resources through revolving funds and with small-scale credit facilities to facilitate packaging and marketing.
- It is recommended that a plan for effective utilisation of the apiculture equipment which will be transferred to the FD should be prepared. Joint management between the Forest Department and an NGO should be approved to ensure that the processing plant is used to assist Mowallis and local producers, especially women and other disadvantaged groups.

R17. Socio-economics : resource utilisation and community affairs

Preliminary findings (MARC 1997) confirm firstly the growing number of people, probably at least half a million, who participate to a greater or lesser extent in SRF resource utilisation and secondly the need to revise some harvesting and marketing practices which do not satisfy criteria for social justice.

Whilst many people consider that their food and clothing needs are met personal security is reported to be the single most important concern for people who access the SRF. This is a matter which should be given high priority in future development planning.

Literacy rates are well below the national average low and although incomes are above the national average by 45% (13 000 Tk pa) in the border area it is clear that there should be a more equitable distribution of direct benefits to local communities. For example nearly all firewood is exported to Dhaka and thus there are negligible direct economic or social benefits derived from the Goran firewood resource locally.

R18. Integrated management strategy : the common goal

Integrated multiple resource management implies setting and agreeing common goals which can be shared between disparate managers and users for the common good. It is a tenet of modern management that separate specialised technical departments and agencies should work together where a common need justifies combined effort, pooling of resources and economies of scale.

Today the inexorable growth of human populations accompanied by the alarm of diminishing resources, increasing gap between rich and poor, universal access to media information and the increasing international awareness that sustainable conservation and development of resources will only be achieved if managers can ensure that benefits go back to locally dependent people, should be a cornerstone of new policies.

This will require innovative management and commitment. This plan discusses the means for better management and development through constructive arrangements of the FD with other agencies whilst at the same time retaining overall administrative authority.

It is recommended that the aims of the IRMP are carried through with full cross-sectoral technical agreement since expectations have been heightened and the pressures at all levels are acute:

- GOB to approve the proposed management - the NMC Steering Committee and IMC and re-affirms the Forest Department as the administrative agency for the Sundarbans Reserved Forest.
- Steps be taken by UNDP/FAO and GOB to ensure the continuity of the OPSUNIT as the base for future long-term research, monitoring and evaluation.
- Consideration should be given by the FD to collaborate where appropriate with other concerned agencies and stakeholders to determine areas of mutual concern.
- Ensure that the scope of the Forestry Master Plan FRMP/IDA includes adequate training of Forest Department staff in integrated resources management.
- Ensure that the FRMP inventory results are added to existing data to enable the prescriptive part of this plan to be completed.

R19. Implementation, development and investment

Proposals for investment leading to follow-on projects and development assemble all the different components of the SRF and together they form a plan for phased and sustainable development with capital and recurrent expenditure over 10 years estimated at least US\$ 30 - 40 million. Each is discussed in Section 27 and it is recommended that these are given early consideration by MOEF and the FD so that detailed financing and implementation can follow with minimum delay using the guidelines for priority requirements listed below:

- | | |
|--|--|
| <ul style="list-style-type: none"> • The Forest Department • The operational unit • Fisheries • Institutions | <p>staffing, capacity building, training, equipment and infrastructure for integrated research, GIS, continuous ecosystem survey post harvest technology, marketing, extension services, training development options, NMC, IMC, OPSUNIT, BFRI, Khuina University, BWDB etc, training, equipment and infrastructure</p> |
| <ul style="list-style-type: none"> • Wildlife management | <p>Project Tiger (autecology study), sustained yield harvesting, biodiversity management, captive animal breeding programmes, re-introductions, protected areas, boundary demarcation</p> |
| <ul style="list-style-type: none"> • Tourism • Wood resource • Non-wood resources • Socio-economics | <p>develop the TYDP ecotourism Jungle Camps and Lodges model silviculture, firewood, harvesting methods, revenue systems apiculture, golpatta, hantal, shrimps, shells, crabs and others community participation, human development, revolving funds, small-scale credit, employment generation, NGO's, user groups.</p> |

There are three target clusters which will require different approaches to implementation:

1. Projects which concentrate on management within the SRF.
2. Projects which affect both the SRF and the Border Zone.
3. Projects which have regional or broader international dimensions.

R20. Official commitment

To achieve the objective of sustainable development much will depend upon official commitment, investment and strategic planning and further Technical Assistance.

An early policy decision by the Government on the recommended reforms would provide a tangible indication of the way forward for implementing integrated management systems for the Sundarbans. It is recommended that the feasibility studies to augment policy decisions be implemented as soon as possible against the targets of the Indicative Investment Programme outlined in Table 77 of the plan.

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