DENR Recommends

Volume 5

GUIDELINES FOR COMMUNITY-BASED REHABILITATION OF MANGROVES

Of the approximately 400,290 ha of mangrove areas of the Philippines, only 117,700 ha exists (Forest Statistics, 1995). This alarming situation has called for an immediate action on the part of the government giving rise to the DENR's Coastal Environment Program (CEP) of which mangrove rehabilitation is an integral component. The CEP brings into fore the community-based strategy wherein our coastal communities would be trained to be more responsive and responsible stewards of the coastal environment.

In support to the CEP, the Ecosystems Research and Development Bureau (ERDB) has formulated/developed Guidelines for Community-Based Rehabilitation of Mangroves for development workers, NGOs and POs. This material contains instructions for community organizing, nursery establishment (propagation, collection, handling and transport of mangrove seedlings) and plantation establishment and management.

Concept of community-based rehabilitation of mangroves (CBRM)

CBRM is patterned from the concept of Community-Based Mangrove Forest Management (CBMFM) wherein partnership between the stakeholders and the government in the upkeep of the country's natural mangrove resources is built. It involves the participation of coastal residents in the local and in the nearby/adjacent communities who are more concerned in the protection of the mangrove resources in their domain.

Objectives of CBRM

CBRM generally seeks to involve directly and effectively the traditionally-mangrove-dependent communities as co-managers in the management, protection and rehabilitation of the mangrove areas.

Specifically, it aims to:

- Identify, train and orient traditional mangrove users and other dependents of coastal resources particularly in the proper production techniques of seedlings in the nursery and plantation establishment and development;

- Conserve the remaining mangrove forests, bring them under effective management and protection and enhance their biological productivity and diversity through collective and cooperative efforts of the community;

- Provide technical assistance to the organized community in the proper methods of seedling production and plantation establishment; and

- Extend assistance to the community in the implementation of projects for managing the mangrove resources.

Vision

Sustainable and ecologically-sound mangrove areas managed by organized and self-reliant coastal communities.

What benefits may participants obtain from the CBRM?

- Enhanced skills on the techniques and practices for mangrove seedling production, plantation establishment towards rehabilitation and conservation;
- Training on mangrove-based and related livelihood activities;
- Leadership skills on community building, resource management and income generation;
- Improved socioeconomic and environmental conditions; and
- Sustainable use of mangrove resources.

Who may participate in the CBRM?

- Mangrove dependents and/or users (e.g., fuelwood gatherers, charcoal makers, nipa shingle producers, etc.)
- Fisherfolk
- Cooperatives and/or associations
- Traditional claimants/stakeholders
- LGUs (barangays and municipalities)

Important considerations in CBRM

- Mangrove Areas for Rehabilitation
    - Buffer zone (to be requested by the community for mangrove rehabilitation)
        - Areas found along the seacoast and estuaries sparsely vegetated with mangrove species
        - An open/denuded mangrove forest
        - Areas near, or adjacent ecotones
        - Areas released to the Bureau of Fisheries and Aquatic Resources (BFAR) which are not used or which have been abandoned for five years since the issuance of the

fishpond lease agreement and, therefore, have reverted back to the category of forestland in the absence of claimants

- Community Organizing and Mobilization

  Steps in community organizing:

  - A community organizer (CO) should first be designated by the DENR and her/his important task is to gain the trust and rapport of the people to obtain the necessary information/data for problem identification, analysis and priority and goal setting.

  - The CO must see to it that the community is fully aware of the need and importance of rehabilitating the mangrove areas.

  - A core group must be formed composed of identified, interested men and women who are aware of what they need, their skills and capabilities and the resources around them. Their capabilities must be enhanced through trainings, cross-farm visits and other forms of education/information campaign.

  - For the group to function properly, a simple but effective structure is needed consisting of ordinary/regular members and a management committee made up of a chairperson, a secretary and a treasurer (In a self-help group, these leaders play an important role). For proper guidance, record and budget management members must know what actions have been taken by the group.

  - Guidelines/policies/rules that are needed to minimize conflict and improve efficiency of group decision making must be set out by the community.

  - The core group with the advice of the CO shall plan together with potential members of the group of the priority projects for the management and protection of mangrove areas. The CO's role changes from initiator and active participant to assistant and adviser once the group has been formed and developed its own rules, record-keeping system and income generating activities.

  - If there are other small groups within the community whose objective is in line with mangrove rehabilitation, they must link up with intergroup associations (IGSs) because:

    - IGAs offer economies of scale both in group activities and in the delivery of development services;

    - IGAs can also represent the broader interests of their members in discussions with local authorities;

    - the poor become increasingly self-confident, earn greater recognition from the wider community and are able to make a greater contribution to development; and

    - all IGAs should begin with short-term realistic objectives and produce concrete benefits to members. IGAs may be legalized as pre-cooperatives or federations in order to obtain legal recognition, services and facilities.

- Once all draft constitution has been written, a first meeting of all interested groups should be called to discuss, revise, approve and sign the final IGA constitution.

- As a CO, he/she has a crucial role in helping the group develop a successful enterprise:

    - Shall form a special interest group or be incorporated in associations, or cooperatives in their respective communities;

    - Shall submit quarterly reports during the first year of the project and annual reports, thereafter, to respective CENRO/PENRO; and

    - Shall submit a management plan and rehabilitation plan with the assistance from the ERDB and DENR.

Livelihood opportunities

This component covers the promotion of nonforest-based and noninvasive seafarming livelihood systems in the site. Through this, the community benefits from other livelihood opportunities which are not necessarily dependent on coastal resources. Examples of these livelihood opportunities are shellcraft, bee culture, duck-and-egg production, goat-raising, aquasilviculture, aquasilvipasture and searanching.

Role of DENR

- Shall identify the mangrove areas to be rehabilitated;

- Shall set the criteria for site selection and prioritize the areas to be rehabilitated in each barangay;

- Shall provide technical training and assist in the development of management plans for the areas to be rehabilitated;

- Shall conduct parcellary survey following the allocation criteria made by the community, or authorize a private team to undertake the survey;

- Shall assist in the formulation and mobilization of local and military task forces which will vigorously enforce forestry and environmental laws and ordinances;

- Shall provide technical assistance for compatible income-generating mangrove-based projects; and

- Shall monitor compliance with agreements and the impact of mangrove rehabilitation on the community and the environment.

Nursery Management

Propagation

Degraded bakauan areas can be reforested using propagules, wildlings and potted seedlings. Mature propagules are directly planted in the mud. Wildlings are seedlings out of the seeds that fall from the actual stand of mangrove. They have one pair of leaves and are approximately 2-3 months old. Potted seedlings are those mature propagules sown in plastic bags and grown in a nursery.

Avicennia species could be propagated from seeds and wildlings.

Collection

Generally, the three bakauan species flower and bear fertile seeds every year. Bakauan babae can be collected from May to June; bakauan lalake from October to December; and bakauan bato from March to June.

It is best to collect mature propagules while these are still attached to the mother tree. This ensures minimal incidence of insect infestation and burn injury.

Mature seeds are easily distinguished by the whitish ring-like mark left on the portion of the hypocotyls adjacent to the pericarp. Pericarps of mature seeds are easily removed and the hypocotyls are sturdy and robust.

Wildlings growing vigorously with at least one pair of leaves can be collected by pulling them gently to extract the propagules intact with the root system.

For *Avicennia* species, seeds are mature when the seed coats turn yellowish and split. They are viable from June to mid-August. Mature seeds are collected by climbing the mother tree, or by reaching to the underneath canopy.

Wildlings/seed germinants are collected from large, mature stands where natural seeding occurs.

Handling and transport

After collection, do not expose bakauan propagules to direct sunlight especially during the major portion of the day. Sunburns which appear like brownish to blackish spots on the hypocotyls can cause low viability. Place propagules inside moistened sacks which should be kept cool and open at all times.

Keep the propagules under the shed covered with green banana leaves to prevent excessive loss of moisture especially during the dry season.

In transporting, keep them in a horizontal position and protected from heat. Banca, or the use of any other kind of boat is the most practical means of transporting propagules to the nursery site. Otherwise, they may be transported manually.

During the collection of wildlings/seed germinants of *Avicennia* species to be potted, keep the earth plugs moist. Prior to transporting, place them in containers such as plastic bags, or wooden boxes to protect them from the wind and direct sunlight.

Nursery construction

Temporary nursery can be constructed using local materials like bamboo poles, coconut fronds and fishnets. It should be established near the plantation site to minimize injury in handling and during transport of propagules. It must be accessible to transportation to facilitate nursery and field operations.

Another consideration is adequate water supply. Establish the nursery in areas near a stream, or with brackish water.

Preparation of potting materials

Potting Media. Use the combination of soil and coconut coir dust/sawdust with the ratio of 2:1 as potting media in mangrove species propagation.

Potting Bag. Use black polyethylene bag, 7" x 11" in potting bakauan species and 6" x 10" for *Avicennia* species.

Seed sowing

Sow the seeds of *Avicennia* in plastic bags and fill with pulverized potting media covering the seeds. For bakauan propagules, burrow one-third of the propagules in the potting bag. Water the seeds/propagules after sowing.

Maintenance

Water the seedlings early in the morning and late in the afternoon to prevent drying. Use fresh and brackish water alternately, or in combination since pure saltwater can cause stunting and wilting of seedlings.

Apply one tablespoon of complete fertilizer (14-14-14) to each seedling 45 days after sowing.

Inspect the seedlings regularly for possible occurrence of pests. Handpick insects found attacking the leaves and discard dead seedlings to prevent disease spread.

Hardening

Harden the seedlings for 2-3 months in the nursery prior to outplanting. This is done to acclimatize the seedlings to the local weather conditions.

Plantation Establishment and Management

Site requirements

The area suitable for planting mangroves is brackish water, or salt swamp, near, or at the edge of a river in places affected by tide.

The following should be considered:

- Avoid sites submerged to more than 1.5 m to prevent or minimize barnacle infestation;
- Avoid areas exposed to rapid currents;
- Prioritize secondary growth, sparsely vegetated areas and abandoned fishponds for rehabilitation purposes and tidal flats for expansion purposes;
- Species must be compatible with community preferences;
- Adequate freshwater supply must be available – The water supply comes from rainfall, runoff from the land and flooding by tide from the nearest river systems. Mangroves grow best on muddy coastal plains where adequate freshwater supply from river discharges is available; and
- A suitable soil type is necessary during plantation establishment (See Table 1).

Table 1. Preferred sites and soil types for mangrove reforestation species.

Species	Common Name	Preferred Site	Preferred Soil Type
Avicennia alba	Bungalon puti	seaward	coralline/sandy
Avicennia marina	Bungalon	seaward	coralline/sandy
Avicennia officinalis	Api-api	landward	silty loam to clay loam
Bruguiera gymnorrhiza	Busaing	landward/riverine	silty loam to clay loam
Bruguiera sexangula	Pototan	landward	silty loam to clay loam
Bruguiera parviflora	Langarai	landward	silty to silty loam
Ceriops tagal	Tangal	landward	silty to clay
Nypa fruticans	Nipa	river fringes	silty to silty clay/brackish
Rhizophora apiculata	Bakauan lalake	middleward	sandy loam/silty
Rhizophora mucronata	Bakauan babae	middleward/riverine/seaward	silty clay
Rhizophora stylosa	Bangkaw	seaward	coralline/sandy/rocky
Sonneratia alba	Pagatpat	seaward	

Site preparation

- Clear the site of debris such as stumps, tree branches, other unwanted vegetation and solid wastes to avoid injury of the young plants as tide recedes.
- Divide the whole plantation area into compartments with size manageable by a planter (i.e., 20 m x 30 m) and 10 m for the passage of bancas/boats.

- Establish a temporary fence or put stakes around the perimeter of the plantation for delineation and to ensure protection from trespassers.

Collection, handling and transport of bakauan species for direct planting

- Collect mature propagules of bakauan babae from May to June. Bakauan lalake seeds are available from October to December and bakauan bato, March to June.

- Collect mature propagules by climbing the mother tree, or by reaching out to the underneath canopy.

- Collect propagules from places with similar climatic and edaphic conditions as the planting sites.

- Bundle collected propagules in 50s or 100s to facilitate transport. Place them inside sacks which should be kept cool/open at all times. In transporting, keep the propagules in horizontal position and properly protected from heat.

- Use banca/boat in transporting bakauan propagules to planting sites. Otherwise, transport them manually.

Planting

- Bakauan species

    - Direct seeding is recommended. However, in highly barnacle-infested areas, use seedlings previously grown in nursery as planting materials. Establish planting spots with the necessary spacing using planting bars, or stakes. Use a spacing of 1 m x 1 m in areas exposed to wave action and also appropriate species intended for poles and piles. For fuelwood and charcoal, however, it is best to plant at 2 m x 2 m spacing. In vegetated and protected areas, spacing may be from 1 m x 1 m to 2.5 m x 2.5 m. However, the ideal spacing is 1.5 m x 1.5 m. Further, planting in open mud flats of the seaward fringes is done during the low tide months.

    - Burrow propagules directly and deep enough or into mud or substrate to prevent it from toppling. The planting depth should be 4-7 cm or one-fourth to one-third of the total length of the hypocotyls. Remove the brownish cap at the end of a propagules before sticking it into the mud. Be sure that soil elevation is low enough to ensure frequent flooding of tidal water and adequate water circulation. Stagnant areas tend to overheat causing the death of planted propagules.

    - If potted seedlings are used even in replanting dead propagules, select those with 4-6 leaves. Dig holes deep enough using a long, heavy and pointed pole. Remove the plastic and slowly bury seedlings in the holes. Then fill the holes with soil to stabilize the newly-planted seedlings.

- *Avicennia* species

    - The spacing for planting depends on the purpose of the plantation. If the species is planted for fuelwood purposes, a 4 m x 4 m spacing is normally practiced.

- Plant potted seedlings/wildlings into the mud, or holes previously prepared at a depth of 6 cm. Remove the plastic bags.

- Fill the holes with soil to protect the seedlings from toppling.

- Plant seedlings in close clumps to achieve best results. Clumping offers the central plants additional protection.

Maintenance and protection

- Visit the new plantation regularly to monitor the growth of the seedlings. Maintain the cleanliness of the plantation by removing debris that might hamper the growth of the seedlings.

- Replace dead seedlings to maintain the spacing of the plantation.

- Replace fleshy, discolored and barnacle-covered propagules or seedlings at once and discard properly by dumping them on areas far from the plantation.

- With the use of a knife, scrape off the barnacle attached to the propagules/seedlings.

- Handpick pests found infesting the seedlings.

- Post warning signs in the plantation to drive away vandals.

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