

# THE USE OF MANGROVES FOR AQUACULTURE: PHILIPPINES

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## National Agencies Involved:

Department of Environment and Natural Resources (DENR)

Forest Management Bureau (FMB)

Land Management Bureau (LMB)

Mines and Geo-Sciences Bureau (GMB)

Environmental Management Bureau (EMB)

Ecosystem Research and Development Bureau (ERDB)

Protected Areas and Development Bureau (PAWB)

National Mapping and Resources Inventory Authority (NAMRIA)

Department of Agriculture (DA)

Bureau of Fisheries and Aquatic Resources (BFAR)

SEAFDEC Aquaculture Department (SEAFDEC-AQD)

Department of Interior and Local Government (DILG)

Local Government Units (LGUs)

Department of Science and Technology (DOST)

Philippine Council for Aquatic and Marine Research and Development (PCAMRD)

Department of Agrarian Reform (DAR)

## OVERVIEW

### *Mangrove Areas*

According to the National Forest Resource Inventory (NFRI), the estimated remaining area of mangrove forests in the Philippines in 1988 is 139,100 ha (DENR 1994). Of the total 139,100 ha mangrove forests, 78,593 ha are found within the mangrove forest reservations. Presidential Proclamation (PP) 2151 declares approximately 4326 ha as mangrove wilderness areas, while PP 2152 declares an aggregate 74,268 ha as mangrove swamp forest reserves.

Approximately 95% of these mangroves are secondary growth and only 5% are old growth mangroves. These old growth mangrove forests are mostly located in Palawan Island. Results of a survey revealed that Palawan covers 35% of the conservation area followed by Surigao del Norte, which covers 22% of the total mangrove forest reserve. Surigao del Norte covers more than 50% of mangrove wilderness areas followed by Bohol with 29%. However, recent survey showed that there are mangrove reservation areas converted and developed for aquaculture purposes. Portions of the mangrove swamp forest reserves are found in Palawan, Quezon, Camarines Norte, Leyte, Cebu, Bohol, Lanao del Norte, Misamis Occidental, Davao, Surigao del Norte, Surigao del Sur and Zamboanga del Sur.

### *Role and Potential of Mangroves in the National Economy*

Mangroves represent a valuable renewable commodity for coastal communities and are vital sources of forest products and aquatic resources. Direct economic values estimated in the Philippines for mangrove wood and fish products combined, ranged from US\$150 to 1396/ha/yr (White and Trinidad 1998).

The lowest estimate was based on the study of the Pagbilao mangrove forest for which direct observation of occurring species for both fish and forest was made in a relatively degraded area (Melana and Courtney 2000).

Mangrove wood is mainly used as firewood or charcoal, where firewood is traditionally marketed as small billets, split longitudinally from roundwood of 10 cm diameter or less and 60 cm to 100 cm in length. The national statistics relating to the removal of mangroves for firewood is incomplete but the estimate ranges from 1000 m<sup>3</sup>/yr in 1960 to 118,000 m<sup>3</sup>/yr in 1988 (ADB 1990). Charcoal from mangrove species is utilized for domestic purposes, especially in rural areas. However, there is no record of large-scale charcoal production from mangroves in the Philippines. Mangrove poles are extensively used for the construction of houses, particularly in coastal areas. Others are used to build fish corrals and fences.

Extractives derived from mangrove barks include tannin and dyes. There has been a local industry for extracting tannins from mangrove bark. National returns for tanbarks harvested averaged 337 mt/yr over the period 1969-87 (NRMC-NMC 1986). Tannin is also used as adhesive material necessary in laying and gluing-up stages of plywood/particle board manufacture. According to reports, tannin also serves as an important constituent of ink, rust preventives and insecticides. Other minor products derived from mangroves are cellulose xanthate, oil, medicine, resin, tea and livestock supplements. Nipa palm sap are extracted and fermented for vinegar, local wine and alcohol. Nipa shingles are used as roofing materials.

Several important aquatic resources such as fishery products like fishes, shells (clams and mollusks), crabs, shrimps, and other crustaceans thrive in mangrove ecosystem (DENR 1994). Fry and fingerlings of different species also thrive in estuarine areas.

### ***Role of Mangroves as Fishery Resource***

Studies on fishes indicated that there are at least 68 families that are represented in the mangroves of the Philippines with the family *Mugilidae* being the most abundant followed by *Carangidae* (NRMC-NMC 1986). Fifty-four (54) species of crustaceans have been reported to occur in mangrove areas throughout the Philippines. They are dominated by species of the following families: *Penaeidae*, *Ocypodidae*, *Grapsidae* and *Portunidae*. In addition, at least 63 species of mollusks are known to occur in Philippine mangrove areas.

The dependence of fisheries, both inshore and offshore, on mangroves as natural habitats has become widely accepted. Mangrove ecosystems provide detritus and nutrients that form the food base of complex marine organisms, which in turn support valuable estuarine and near shore fisheries. The decomposing leaf litter is utilized by many aquatic organisms thriving in mangrove and nearshore ecosystems, such as, in the seagrass beds and coral reefs. Mangrove swamps serve as feeding, nursery and breeding grounds for commercially valuable fish species. They are also rich sources of fish fry, which contribute a great deal to the country's fry gathering industry. Melana and Courtney (2000) reported that parallel with the decline in the mangrove areas of the Philippines is the significant reduction of fishery resources. The loss of mangrove forests in the Philippines is also correlated with decreasing fisheries production in municipal waters and the depletion of larval and juvenile stages of shrimps and milkfish which are seed sources for pond aquaculture (Camacho and Malig 1988 as cited in ADB 1990).

## **PROTECTION AND DEVELOPMENT OF MANGROVE AREAS**

### ***Historical Data***

In 1918, Brown and Fischer estimated the mangrove forests of the Philippines to be as much as 400,000-500,000 ha. However, the mangrove areas were indiscriminately alienated for other uses as a result of industrial development and urbanization.

The Philippine mangrove forests have significantly dwindled at an average of 4572 ha annually. The depletion of Philippine mangrove forests was observed lowest in 1920–1950 at 2499 ha annually and highest from 1950–1972 at 6685 ha annually. The latter period coincided with the large-scale conversion of mangrove areas into fishponds (DENR 1994).

### **Reasons for the Decreasing (or Non-Decreasing) Mangrove Areas**

Mangrove ecosystems are vulnerable both to natural and man-made disturbances. The most obvious impact of human activity can be seen in the rapid reduction of mangrove swamps. This can be attributed to the following: (1) clear-cutting of vegetation for forest products, conversion into fishponds, saltbeds, industrial sites and human settlements; and (2) death of vegetation resulting from waste disposal, soil erosion and siltation. The conversion of mangrove swamp into brackishwater fishpond is a principal factor behind the loss of mangrove forests (Zamora 1990 as cited in DENR 1994).

The existing brackishwater fishpond is estimated at 239,323 ha (BFAR 2000). The continuous illegal conversion of mangrove areas for aquaculture purposes, also include those areas within the mangrove forest reserves (DENR 1994). Since the effectivity of Presidential Proclamations (PPs) 2151 and 2152 in 1981, there had been approximately 9532 ha of mangroves illegally converted into fishponds.

Erosion also affects the reduction of mangrove ecosystem. Most of the upland ecosystems in the Philippines have already been subjected to several utilization and developmental activities. These activities, among others, are logging, agricultural plantation establishment, mining and infrastructure build-up. Alteration of the surface and sub-surface soil structures resulted in irregular surface run-offs and severe siltation in rivermouths and estuaries where most of the mangroves are established.

Nature has also brought stresses on mangrove ecosystems. According to reports, mangroves in the estuarine areas and in riverbanks have often become hosts to clams and barnacles. Spats of these species attach themselves to roots and lower portion of tree trunks and complete their life cycle in these trees. The resulting shells when developed, usually are embedded partially into the banks and trunk of trees, which result in the obstruction of nutrient flows within the tree, hampering plant growth and resulting in death, in the case of severe infestation.

## **LAWS, RULES, REGULATIONS AND POLICIES ON MANGROVES**

### ***Historical Overview***

The history of Philippine policy initiatives and legislation related to the use of coastal resources started with the enactment of the first Fisheries Act (Commonwealth Act No. 4003) in 1932. Coastal areas and resources in the Philippines were once managed under the assumption that there was limited demand for what were considered unlimited economically valuable fish and other items (DENR, DA-BFAR and DILG 2001). In 1952, the Bureau of Forest Development (BFD) Circular No. 95 was created to zonify swamplands for various uses. Legalization on the definition and regulation of Fishpond Lease Agreement (FLA) started in Fisheries Administrative Order No. 60 of 1960.

The 1960s to mid-1970s marked the period of rapid expansion and development in fisheries and aquaculture. Presidential Decree (PD) No. 43 of 1972 directed and facilitated the orderly, systematic and expeditious transfer of jurisdiction of public land available for fishpond development to the Bureau of Fisheries and Aquatic Resources (BFAR).

PD 704, known as the Fisheries Decree of 1975, was signed into law forming the basis of the integrated law system on Philippine fisheries sector. Sections 23-25 defined the disposition of public lands for fishponds. In the same year PD 705 or the Revised Forestry Code was also enacted. It spelled out the kinds of public lands suitable for fishpond purposes that are to be released to and placed under the administrative jurisdiction and management of BFAR. It also declared that a 20 m wide mangrove strip along shorelines facing oceans, rivers, bays etc. is to be retained for coastal protection.

The period between 1970s-1980s covered a decade of unrestrained development in coastal resources, which resulted in a build-up of environmental issues. In 1976, the Ministry of Natural Resources (MNR) issued Special Order (SO) No. 309, creating the Philippine National Mangrove Committee to formulate a comprehensive national mangrove plan and review fishpond and timber license applications. SO 178 issued in 1980 reorganized both the membership & functions of the committee to align them with the new research emphasis on the ecological importance of mangroves to Philippine coastal environment, including the scientific methods in the rehabilitation of denuded mangrove areas. In 1981, PP 2151 was issued declaring specific areas in the country totaling 4326.50 ha as wilderness areas in which any form of exploitation was henceforth banned, while PP 2152 proclaimed the entire province of Palawan and other selected mangrove areas totaling 74,267.9 ha as mangrove forest reserves.

In 1982, PP 2146 was approved prohibiting mangrove cutting throughout the country. At the same year, the Ministry of Natural Resources (MNR) issued Administrative Order (AO) No. 3 revising the guidelines in the classification and zonification of forestlands. Other mangrove-related DENR Administrative Orders have been issued since 1986, introducing measures designed to prevent further destruction of the mangrove resource especially through fishpond development. MNR issued AO 42 declaring the expansion of mangrove forest belt in storm surge, typhoon prone areas to 50-100 m along shorelines and 20-50 m along riverbanks. DENR Memorandum Circular (MC) No. 15 of 1989 was issued prioritizing the implementation of mangrove reforestation. DENR issued AO 76 in 1987 establishing buffer zones: 50 m fronting seas and oceans and 20 m along riverbanks. It also required FLA holders to plant 50 m mangrove strip along buffer zone areas. At about the same year, interest in coastal resource management has gained impetus. Various foreign-assisted projects were drafted and commissioned such as the Fisheries Sector Program (FSP) and Central Visayas Regional Project (CVRP).

In 1990, DENR AO 15 introduced the revised regulation governing the utilization, development and management of mangrove resources. It provided for the issuance of Certificate of Stewardship Contract (CSC) for the management of mangrove areas, to individuals, communities, associations or cooperatives, except in wilderness areas, provided that the activities are sustainable. DENR MC No. 5 of 1990 provided guidelines on the cutting of mangrove trees within approved FLA area.

In 1991, RA 7160 (the Local Government Code) was passed devolving primary mandate for managing municipal waters to Local Government Units (LGUs) which include the communal forests less than 500 ha, implementing community forestry projects, and enforcement of community-based laws. The same year, RA 7161 was passed banning the cutting of all mangrove species. DENR AO 9 was issued defining the policies and guidelines for Mangrove Stewardship Agreement, while DENR AO 34 was issued defining the guidelines for Environmental Clearance Certificate (Applicable to fishponds). In 1994, DENR AO 30 created the non-government assisted community-based mangrove forest management (CBFM) and it was institutionalized at the DENR in 1995.

Republic Act 8550 known as the Philippine Fisheries Code of 1998 was passed establishing coastal resource management as the approach for managing coastal and marine resources. In the same year, DENR-AO #98-17 defined the major cause of mangrove deforestation as conversion into fishpond. Henceforth, it prohibits the further zonification and release of already zonified mangrove forest for fishpond development.

In 1999, the Philippines became a signatory to the implementation of the Rome Declaration on the Code of Conduct for Responsible Fisheries. And in 2000, the DENR and DA signed a joint Memorandum Order on the implementation of the Fisheries Code (RA 8550).

### ***Existing Legal Framework***

#### **Fishery Laws with relevance to mangroves**

The Philippine fishery laws and legislation with relevance to mangroves listed by JOFCA/NAMRIA (1999), Primavera (2000), and DENR et al (2001), are summarized as follows:

- RA 8435 - The Agriculture and Fisheries Modernization Act (AFMA) of 1997 provides for the maximization of agricultural and fisheries productivity and acceleration of modernization of said sectors. Aside from providing various incentives and many programs for developing agricultural production, the AFMA has implications on the management of coastal resources such as mangroves as it deals with fishery production. The AFMA prioritizes industrialization as its main objective for agriculture and fisheries sector, and is focused on turning these sectors from resource-based to technology-based industries. This is to be achieved through the formulation of Agriculture and Fisheries Modernization Projects that focuses on food security, poverty alleviation and social equity, income enhancement and profitability, global competitiveness, and sustainability as its primary goals.
- RA 8550 – The Philippine Fisheries Code of 1998 defines coastal zones as areas within the landmark limit of one (1) km from the shoreline at high tide to include mangrove swamps, brackishwater ponds, *nipa* swamps, estuarine rivers, sandy beaches, and other areas within a seaward limit of 200 m isobath to include coral reefs, algae flats, sea grass beds and other soft-bottom areas. Chapter II, article 3 of the code states that public lands and pond suitable for fishery operations shall not be disposed or alienated. It also provides guidelines on the issuance/renewal of FLAs and reversion of all abandoned, undeveloped or underutilized fishponds into mangroves.
- RA 6657 - Exemption of fishpond areas from the Comprehensive Agrarian Reform Law for 10 years.
- RA 7160 – The local government code of 1991, Section 17, states that the municipalities should enforce fishery laws in municipal waters including the conservation of mangrove forests.
- RA 7881 - Extension of fishpond exemption from agrarian reform.
- FAO 125 - Prescribes the rules and regulations governing the granting of 25-year FLAs.
- FAO 197 - Prescribes the rules and regulations governing the lease of public lands for fishpond development.
- FAO 214 - States the Code of Practice for Aquaculture outlining the general principles and guidelines for environmentally-sound design and operation for the sustainable development of the industry.

- BFAR AO 125-2 - Increases fishpond lease from US\$2 to US\$40 per hectare per year effective 1994.
- Joint DA-DENR General Memorandum Order No.3, series of 1991 - Defines the guidelines for cancellation and reversion of FLAs into mangrove forest lands under the administration of DENR.
- Joint DA-DENR Memorandum Order No. 1, series of 2000 - Defines the areas of cooperation and collaboration between the Department of Agriculture and the Department of Environment and Natural Resources in the implementation of RA 8550.

### **Environmental Laws with relevance to mangroves**

The Philippine environmental laws and legislation with relevance to mangroves are summarized as follows:

- PD 705 - The Forestry Act of 1975.  
Section 16 - States that areas needed for forest purposes include strips of mangroves or swamplands at least 20m wide, along shorelines facing oceans, lakes, and other bodies of water; all mangrove swamps set aside for coastal protection shall not be subject to clear-cutting operation; mangrove swamps released to BFAR for fishpond purposes which are not utilized, or which have been abandoned for 5 years shall revert to the category of forest land.  
Section 33 - Identifies riverbanks, easements, deltas, swamps, former river beds, and beaches as reforestable areas and covered with suitable and sufficient trees.  
Section 43 - States that mangrove forests which protect the shoreline, the shoreline roads, and even coastal communities from the destructive force of the sea during high winds and typhoons shall be maintained and not alienated; such strips must be kept from artificial obstructions.
- RA 7161 - Incorporating certain sections of the Internal Revenue Code to PD 705, among others, bans the cutting of all species of mangroves.
- PD 1151 – The Philippine Environmental Policy. Creation, development, maintenance, and improvement of conditions under which man and nature can thrive in productive and enjoyable harmony with each other; to fulfill the social, economic, and other requirements of present and future generations of Filipinos and to ensure the attainment of an environmental quality that is conducive to a life of dignity and well-being.
- PD 1152 – The Philippine Environment Code. Defines the mandates and policies for the management and conservation of natural resources.
- PD 1586 - Environmental Impact Statement (EIS) System. Requires that all agencies and instrumentalities of the national government, including Government Owned and Controlled Corporations (GOCCs), private corporations, firms and entities with projects or proposed projects that may significantly affect environmental quality must comply with an EIS System.
- PD 2151 - Declares certain islands and/or parts of the country as wilderness areas.
- PD 2152 - Declares the entire province of Palawan and certain parcels of the public domain and/or parts of the country as mangrove swamp forest reserves.
- EO 117 - Establishes the Inter-agency Task Force for Coastal Environment Protection.

- EO 192 - The Reorganization Act of the DENR. Redefines the mandate of DENR to include conservation, management and proper use of the country's environment and natural resources, as well as the licensing and regulation of all natural resources.
- EO 263 - Adopts Community-based Forest Management (CBFM) as the national strategy to ensure the sustainable development of the country's forestland resources and provides mechanisms for its implementation.
- DAO 76, s1987 - Establishes buffer zone in coastal and estuarine mangrove areas.
- DAO 07, s1989 - Suspends the application and issuance of mine prospecting permits in government reservations, including mangrove reserves.
- DAO 15, s1990 - Prescribes the regulations governing the utilization, development, and management of mangroves.
- DAO 03, s1991 - States the policy and guidelines for the award and administration of mangrove stewardship agreement.
- DAO 04, s1991 - Prescribes the revised regulations governing the Integrated Social Forestry Program.
- DAO 09, s1991 - Defines the policies and guidelines for Mangrove Stewardship Agreement.
- DAO 18, s1991 - Prescribes the rules and guidelines governing the distribution of canceled or expired FLAs; identifies responsibilities of DA-BFAR and DAR with respect to canceled or abandoned FLAs.
- DAO 34, s1991 - Prescribes the guidelines for the issuance of Environmental Compliance Certificate (ECC) or Environmental Clearance (EC) for fishpond development.
- DAO 21, s1992 - Prescribes the implementing guidelines for EIS.
- DAO 16, s1993 - Prescribes the guidelines for the establishment and management of buffer zones for protected areas.
- DAO 30, s1994 - Prescribes the implementing guidelines for NGO-assisted Community-based Mangrove Forest Management (CBMFM) for DENR.
- DENR MO 98-17, s1998 – Defines the major cause of mangrove deforestation as the conversion into fishpond, prohibits the further zonification of mangrove forest for fishpond development and the release of already zonified mangrove forests for fishpond purpose.
- DENR Memo Circ. #15, s1989 – Prioritizes the implementation of mangrove reforestation for the rehabilitation and development of mangrove forests.
- DENR Memo Circ. #05, s1990 - Prescribes the guidelines for cutting of mangrove trees within approved FLA areas. Among others, it provides that buffer zones are to be maintained and developed; cut trees are to be turned over to DENR for disposition through public bidding; and an area equivalent to the size where mangroves are clear cut shall be planted with mangrove species by the FLA owner.
- DENR Memo Circ. #7, s1991 - States the conditions governing the issuance of mangrove cutting permits within approved FLA areas and the survey of areas for FLA applicants.

- Letter of Instruction No. 917 - Declares that mangrove forests essentially needed for foreshore protection, the maintenance of estuarine and marine life, including special forest which are the exclusive habitats of rare and endangered Philippine flora and fauna, are wilderness areas.
- MNR AO 42, s1986 - Declares the expansion of mangrove forest belt in storm surge, typhoon prone areas to 50-100 m along shorelines and 20-50 m along riverbanks.

### ***Policy options with relevance to mangroves & coastal areas***

At present, there are numerous government policy options being implemented relating to conservation, protection, rehabilitation, sustainable utilization and management of mangroves and coastal areas. These policy options are mostly translation and implementing guidelines of existing laws, rules, regulations and policies already enumerated above. Under the present government, policy options are geared towards the attainment of its national priority thrust of increasing food production, increasing income and livelihood generation through wise utilization and management of its natural resources within sustainable limits. Some of the more important policy options being undertaken during the last decade are the institutionalization of the Coastal Resource Management Programme (CRMP) both by government and non-government sectors, the establishment of Fisheries and Aquatic Resources management Councils (FARMCs) in the national level and every coastal municipalities throughout the country to assist in the formulation of policies and enforcement of laws relating to protection and sustainable utilization of fisheries and aquatic resources, the strengthening of linkages between national & local governments (by providing them technical financial, equipment supports and training) on the enforcement of laws and management of fisheries and aquatic resources under municipal jurisdiction as mandated by the Local Government Code of 1991, promotion of sustainable and environment-friendly technologies and the promotion and intensified information dissemination campaign on the code of conduct for responsible fisheries. Moreover, abandoned and underdeveloped brackishwater fishponds, privately-owned or covered by fishpond lease agreements (FLAs), are now being encouraged by the government for reversion into mangroves or converted into mangrove aquaculture livelihood projects for the fisherfolk.

### **GENERAL POLICY RECOMMENDATIONS (USE OF MANGROVES FOR AQUACULTURE)**

The major concerns of the present government are food sufficiency and security, livelihood generation and increase income of fisherfolk. Therefore, the fisheries sector plan and priorities are designed to ensure a long-term sustainability of the fisheries resource-base including mangrove areas. For calendar year 2003, the fisheries sector is being challenged to increase production by 10% from a total fish production of 3.3 M metric tons in year 2002. As part of the whole management strategy to attain this objective, the Bureau of Fisheries and Aquatic Resources (BFAR) is promoting for the conversion of coastal wastelands, particularly the abandoned and under-developed brackishwater fishponds, into productive areas utilizing environment-friendly mangrove aquaculture technologies. In support to this policy objective, BFAR has established a 4-ha mangrove aquaculture pilot demonstration project at its National Brackishwater Aquaculture Technology Research Center at Pagbilao, Quezon.

Furthermore, mangrove-friendly aquaculture projects have been launched by BFAR in some strategic locations of the country to provide additional livelihood to fisherfolk associations. At present, mangrove-friendly aquaculture technology is disseminated through training and seminars being conducted by BFAR, most especially to the fisherfolk recipients of mangrove-friendly aquaculture livelihood projects.



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