

# Managing the Philippine Mangal for Long-Term Human Survival

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## INTRODUCTION

The mangal is one of several critically significant ecosystems that characterize the country's environment. It is considered a minor type, compared for instance to the mixed lowland rainforest ecosystem type, in that it occupies only a very small proportion of the total forest cover of the country. However, it is also of paramount importance to Filipinos in innumerable ways, especially to those who live in the coastal areas.

Economically, the mangal has been, still is and will be directly beneficial (Brown and Fisher 1920; Aguilar 1949; Francia et al. 1971; Bumarlong and de la Cruz 1976; Robillos 1976; Bagawan and Francia 1979; Amio et al. 1979; Gonzales 1980; Arroyo 1982; Lorica and Fortes 1982; Manas 1982; Redolozza 1982; Tesoro 1982; Zamora 1982, 1984, 1986, 1987, 1988, 1989, 1990; Escolano 1987). Specifically, the mangal is an important source of the following forest products: (1) poles for house construction (traditional use); (2) firewood (fuelwood) for cooking (traditional use); (3) charcoal as domestic energy source and as source of income; (4) tanbark for coloring tuba (fermented nipa juice); (5) nipa sap for various uses (i.e., tuba, vinegar, alcohol, sugar), both for domestic use and as source of income; and (6) nipa

shingles (for roofing and walling) for domestic use and source of income, source of fishery products (mangrove-dependent species), such as adult forms (finfishes, shellfishes, shrimps, mangrove crabs) for domestic consumption as well as a source of income and juvenile forms (fry) for food (domestic use) and for stocking brackishwater fishponds (as source of income). Mangal areas are also sites for human activities other than forest product gathering, fishing or gleaning industrial waste disposal, human occupancy, farming, commercial and industrial establishments and fishpondification. [Fishpondification was introduced into the literature by Zamora (1988) to refer to the massive conversion of mangal into brackish-water ponds for rearing marine animals for food production.]

The mangal is likewise beneficial indirectly to the coastal dwellers (Ronquillo and Llana 1976; Anonymous 1977; Gabriel 1977; Atchue 1978; Fortes 1982; Fortes and Jara 1987; Zamora 1979, 1982, 1984, 1985, 1986, 1987, 1988, 1989, 1990; Arroyo 1984; NMC Technical Staff 1986; Serrano and Fortes 1987; Paw and Chua 1988; Florido and Miclat 1988). For example, there are strong indications that the mangal: (a) exports detritus and nutrients, which form the food base of a complex of marine organism [This in turn supports valuable estuarine and nearshore fisheries, such as finfishes, shellfishes and crustaceans (Gomez 1983; Reyes 1983; Zamora 1987, 1990)]; (b) serves as feeding, nursery or spawning grounds for economically important marine fishes (Motoh and Solis 1978; NATMANCOM 1982; Pinto 1985); (c) serves to protect valuable properties by dampening storm surges and high winds associated with tropical typhoons (About 20 typhoons visit the Philippines each year. While the mangal coastal barriers may be battered and damaged in severe storms, they will grow naturally without cost to man.); (d) performs a flood reduction function (where it occupies estuarine floodplains; This function may be lost if the mangal is filled up and converted into other uses.); (e) helps prevent erosion of banks of rivers, thus, protects properties adjacent to the mangal; (f) serves as habitat for wildlife and provides

valuable opportunities for education and scientific study (While putting monetary value on these wildlife-based activities is difficult, they are nonetheless significant uses which add to the importance of mangal.); and (g) improves water quality by taking up suspended solid matter and floating materials (Zamora 1990).

## STATUS

**Areal Extent.** The National Mapping and Resource Information Authority (NAMRIA) updated the Philippine mangrove area statistics by manual (visual) reinterpretation. The 1987 SPOT satellite data using the scale 1:100,000 was enlarged to the scale of 1:50,000. As a result of this activity, NAMRIA reported that the mangrove area for the Philippines came to 139,725 hectares, as may be gleaned from Table 1.

**Geographical Distribution.** The rough geographic distribution of mangroves in the Philippines is shown in Figure 1. Table 2, on the other hand, shows a summary of the mangrove areas in the four major islands for 1972, 1982 and 1988. According to the most recent statistics (1988), mangrove distribution in the major island groups and their percentage equivalents are as follows:

Islands	Hectares	Percent
Luzon	22,700	16
Visayas	37,325	27
Mindanao	37,400	27
Palawan	42,300	30
Philippines	139,725	100

Of the estimated total mangrove forest as of 1 December 1984, approximately 49% is reproductive brush, 49% is young growth and 2% is old growth. Old growth stands remain only in Mindanao (4,582 hectares) and Palawan (5,317 hectares).

**Economically Important Species of Flora and Vegetation.** The known vascular flora of Philippine mangroves are categorized into

four groups, following Tomlinson's (1986) criteria: (1) major mangal elements (19 species, Table 3); (2) minor mangal elements (12 species, Table 4); (3) mangal associates (40 species, Table 5); and (4) specialized elements (24 species, Table 6). There are 95 species altogether of vascular plants in Philippine mangroves.

**Zonation.** Several zonation patterns of the Philippine mangroves have been described. A compilation of this information is shown in Table 7. The distribution of species within zones is probably a function of substrate type and salinity. However, there has been severe disturbance through most of the country and much scrub mangrove may not have recovered to the original species. Those species, which are active primary colonizers of treeless sites, are sometimes referred to as "frontal" species. In particular, *Rhizophora stylosa* colonizes coral rubble and sandy sites; *Avicennia marina* and *Sonneratia* spp, sandy loam to loamy sites; *R. mucronata*, *R. apiculata*, silty and clay loam river sites.

**Wood Products.** The most economically important species belong to the first group (major mangal elements). These species are sources of construction or building materials, fuelwood (firewood) and charcoal.

**Non-wood Products.** Some of the major mangal elements are sources of non-timber products like tanbark, nipa sap and thatching materials.

With regard to the volume of standing timber in the existing mangrove forest, the Forest Management Bureau (FMB) reported the following statistics in 1982: (1) Luzon, 308,000 cu m; (2) Visayas, 1,375,000 cu m; and (3) Mindanao, 2,626,000 cu m.

**Economically Important Species of Mangrove Fauna.** Mangrove-dependent species of economic value include: (1) finfishes (milkfish, mullets, gobies, others); (2) crustaceans (shrimps, mangrove crabs); and (3) molluscs (oysters, mussels, clams). There are five types of natural fisheries-dependent fishermen in the country: (1) shell gatherers; (2) fishermen; (3) crabbers; (4) nipa sap gatherers; and (5) baroy gatherers. Production statistics on mangrove fisheries may be gleaned from Camacho and Malig (1988).

**Ecological Values of Philippine Mangal.** An important role of the mangal is that it contributes immensely to the provision of

nutrients needed by fishes, shellfishes and crustaceans. Mangal achieves high productivity due largely to its ability to grow in areas with high solar radiation and its ability to take up freshwater from salt. However, local studies on this important aspect of mangrove ecology are wanting. Data on litter production and decomposition and nutrient transport are available through the studies of Fortes and his students, which were done in Calatagan (Batangas) and Pagbilao (Quezon) (Tables 8, 9). Fortes (1982) found that the major communities in a mangrove-reef flat in Calatagan contributed about 2.49 gm C/sq m/day to the food chain. Of the producer communities, the mangroves (leaves of *Rhizophora apiculata* and *Avicennia marina*) contributed the highest organic carbon to the nutrient pool, i.e. 1.38 gm C/sq m/day or 58% of the total output. In Pagbilao, the four dominant mangrove species were shown to have high annual organic matter yield (gm/sq m), thus:

Species	Organic Matter Production gm/sq m/yr
<i>Avicennia officinalis</i> (Api-api)	522.24
<i>Ceriops decandra</i> (Malatangal)	428.57
<i>Scyphiphora hydrophyllacea</i> (Nilad)	553.63
<i>Osbornia octodonta</i> (Tualis)	422.52

These values are fairly high, considering that mangrove trees grow naturally without energy subsidies, like fertilizers, and that they are not subjected to selective weeding and other means of yield improvement.

#### CONVERSION USES OF PHILIPPINE MANGAL AND THEIR PROBABLE IMPACT

In 1920, Brown and Fischer placed the area of the mangrove swamp forest of the country between 400,000 and 500,000 hectares (average of 450,000 hectares). In 1988, Bina placed the total mangrove area at 139,725 hectares. If we subtract the 1988 estimate (139,725 hectares) from the 1920 estimate (450,000 hectares), the difference comes to 310,275 hectares representing the denuded mangrove area over the past 71 years (1920-1991). In other words, nearly 70% of the total mangrove forest is

denuded, while nearly 30% remains covered by mangrove vegetation. Thus, based on the foregoing fact, the denudation rate of the mangrove forest cover of the country comes to 4,325 hectares per year. As may be gleaned from Figure 2 (Zamora 1990), a large portion of the denuded areas (which comes to more than 210,457 hectares out of the 310,275 hectares or nearly 68% of the total denuded mangrove areas) is now devoted to brackishwater fishponds (BFAR 1987). It is for this reason that the conversion of mangrove swamps into capital-intensive brackishwater fishponds is considered the more controversial issue in mangal development planning and management.

The increase in areal extent of fishponds and the concomitant decrease in areal extent of mangroves have caused a growing concern among environmentalists that further fishpondification may impose significant negative ecologic, social and cultural impact on the nearshore and nearby oceanic systems of the country. National and international conferences during the last decade (1977-1988) have arrived at the consensus that fishpondification has contributed to the decline in the yield of other mangrove products. Camacho and Bagarinao (1986), analyzing 1976-1982 data of the Bureau of Fisheries and Aquatic Resources (BFAR), found that municipal marine fish production was positively correlated with the area of existing mangrove swamps (see also Paw and Chua 1988; Mastaller 1989). They concluded that the levelling off of marine fish production during the past 10 years was in part due to the drastic alteration or destruction of the mangrove environment around the country (Zamora 1990).

As written earlier, the mangrove ecosystem has many functions, among which are nutrient export, breeding or nursery ground function and erosion control. All these are important to the maintenance of ecological stability of the ecosystem itself, as well as the surrounding nearshore ecosystem and nearby oceanic system (Zamora 1990).

For fishponds to function, the developer must change the mangal from a natural state to an artificial state. Once an area is converted into a fishpond, it can no longer function as a natural system. Thus, as a hectare of fishpond is improved, that same hectare can no longer be counted on to contribute to the productivity of the nearshore ecosystem. Thus, continued reduction of mangrove forest area is predicted to have the following

harmful effects: (1) decrease in nutrient export, which also affects the food chain of man; (2) decrease in area available for protection and nursery grounds for seed fish (fry) needed for stocking fishponds; and (3) decrease in the catch of the other fishery sectors (Fig. 3, Zamora, 1990). Consequently, the livelihood of a significant segment of the coastal population will be affected. These include: (1) 522,418 sustenance or municipal fishermen; (2) 42,947 commercial fishermen; and (3) 170,000 fry gatherers. Even the 12,660 fishpond operators will be affected (Fig. 4, Zamora 1990) for both the "adult pool" (mature forms) and "replacement pool" (fry for stocking fishponds). The effect may lead to "crashes" of the populations and ultimately when large numbers of populations are affected, the mangal itself will be affected. The continued proliferation of fishponds along the coastal areas means the clearance of more vegetated areas and subsequent diking and fertilization of the denuded areas. The disturbance of the mangal is said to be maximal because: (1) all standing biomass is completely removed; (2) soil profile is totally disrupted or covered up; and (3) subsequent natural regeneration cannot take place (Zamora 1990). Yet the effects of this artificial fish production technology on natural fisheries are not clearly understood.

If it is assumed that certain stages of the life cycle of some commercially important species of fish and shellfishes require the protection of the mangal, then it follows that fishpondification will affect natural fisheries. While quick and lucrative economic returns and benefits from fishpondification contribute to the escalation of protein production, fishponds still need fish and shrimp fry. The shallow littoral areas near mangrove areas are still the principal natural sources of seed fish for stocking fishponds (Zamora 1990).

Furthermore, if it is assumed that four hectares of mangrove forest are required (Hamilton and Snedaker 1984) to support one hectare of intensive oyster culture, i.e., ratio of 4 mangrove forest: fishpond, then it follows that further clearing of mangrove forest for fishpondification purposes will affect mariculture. At present, the country has only 139,725 hectares of mangrove forest, and 310,275 hectares of denuded mangrove area or close to a ratio of 1:4. Said ratio is the reverse of what is claimed to be needed to support intensive oyster culture (Zamora 1990).

## MANAGEMENT STRATEGIES

In view of available data and information on the present state of the mangrove forest, the government became greatly concerned and acted accordingly by formulating and implementing measures directed toward the: (1) protection and conservation of the remaining mangrove forest areas; and (2) rehabilitation of the critically denuded mangrove areas.

Most of these measures are now embodied in DENR Administrative Order Number 15 Series of 1990, which is a set of regulations governing the utilization, development and management of mangrove resources. This was formulated by the Coastal Resources Management Committee created by DENR Special Order Number 982 dated 25 October 1989; this committee replaced the former National Mangrove Committee (Appendix 1). In conclusion, it can be said here that this set of regulations is meant to promote a mutually productive and long-term coexistence of artificial fisheries (aquaculture) and natural fisheries (municipal fisheries, including fry fisheries and commercial fisheries), as well as to minimize environmental degradation of the mangal and near-shore ecosystem (Zamora 1990).



**Table 1. Mangrove Areas (in Hectares) of the Philippines for 1988 (by Region and Province)**

REGIONS	PROVINCES	TOTAL
I	Pangasinan (200)	200
II	Cagayan (3,000), Isabela (400)	3,400
III	Pampanga (300), Zambales (200)	500
IV	Aurora (300), Marinduque (1,100), Occidental Mindoro (900), Oriental Mindoro (1,500), Palawan (42,300), Quezon (4,000), Romblon (700)	51,000
V	Albay (400), Camarines Norte (2,500), Camarines Sur (2,500), Catanduanes (1,200), Masbate (1,500), Sorsogon (1,800)	9,900
VI	Aklan (0), Antique (100), Capiz (1,700), Iloilo (300), Negros Occidental (725)	2,825
VII	Cebu (400), Bohol (8,700), Negros Oriental (550)	9,650
VIII	Eastern Samar (6,000), Northern Samar (5,500), Western Samar (10,450), Leyte (2,900)	24,850
IX	Basilan (3,600), Sulu (*), Tawi-Tawi (*), Zamboanga del Norte (300), Zamboanga del Sur (15,400)	19,300
X	Agusan del Norte (1,100), Agusan del Sur (-), Misamis Occidental (1,200), Misamis Oriental (-), Surigao del Norte (6,300)	8,600
XI	Davao del Norte (0), Davao del Sur (0), Davao Oriental (800), South Cotabato (0), Surigao del Sur (6,300)	7,100
XII	Lanao del Norte (1,300), Maguindanao (300), Sultan Kudarat (800)	2,400
<b>TOTAL (**)</b>	<b>48</b>	<b>139,725</b>

\* Data on these two provinces were not included.

\*\* Based on the manual interpretation of SPOT multispectral satellite images 1987-1988 by NAMRIA (National Mapping and Resource Information Authority), Department of Environment and Natural Resources

(Source: Bina R. T. 1988 "Updating mangrove forest area statistics in the Philippines", presented tables in transparencies. Text read during the NATMANCOM (National Mangrove Committee) Symposium- Workshop on Mangrove Research, Environment, Policy and Information on 28-30 November 1988 at the Sulo Hotel, Quezon City, Philippines).

**Table 2.. Summary: Mangrove Areas of the Philippines (in Hectares) for 1972, 1982 and 1988 (in the four major islands)**

Major Islands	1972 <sup>a</sup>	1982 <sup>b</sup>	1988 <sup>c</sup>
Luzon	34,409.9	54,117	22,700
Visayas	38,467.6	46,146	37,325
Mindanao	120,066.3 <sup>d</sup>	92,513	37,400 <sup>e</sup>
Palawan	35,004.1	40,855	42,300
<b>Total</b>	<b>227,947.9</b>	<b>233,631</b>	<b>139,725</b>

<sup>a</sup> Based on digital analysis of 1972 LANDSAT I Data (Source: NRMIC Report 1979. Mangrove Inventory of the Philippines Using LANDSAT Data)

<sup>b</sup> Based on high altitude aerial photography, LANDSAT and aerial reconnaissance survey (Source: BFD NRMIC-UPCF Forestry Statistics 1984)

<sup>c</sup> Based on the manual interpretation of SPOT satellite data by NAMRIA (Report to be finalized)

<sup>d</sup> Does not include Tawi-Tawi

<sup>e</sup> Does not include Sulu and Tawi-Tawi

Note:

Luzon [Regions I, II, III, IV (including Palawan) and V]

Visayas (Regions VI, VII and VIII)

Mindanao (Regions IX, X, XI and XII).

Source: Bina, R.T. 1988. **Updating Mangrove Forest Area Statistics in the Philippines.** Paper read during the NATMANCOM Symposium- Workshop on Mangrove Research, Environment, Policy and Information held on 28-30 November 1988 at the Sulo Hotel, Quezon City, Philippines.

**Table 3. Major Elements of Mangal in the Philippines**

1. *Avicennia alba*
2. *Avicennia eucalyptifolia*
3. *Avicennia marina*
4. *Avicennia marina var rumphiana*
5. *Avicennia officinalis*
6. *Bruguiera cylindrica*
7. *Bruguiera gymnorhiza*
8. *Bruguiera parviflora*
9. *Bruguiera sexangula*
10. *Ceriops decandra*
11. *Ceriops tagal*
12. *Lumnitzera littorea*
13. *Lumnitzera racemosa*
14. *Nypa fruticans*
15. *Rhizophora apiculata*
16. *Rhizophora mucronata*
17. *Rhizophora stylosa*
18. *Sonneratia alba*
19. *Sonneratia caseolaris*

**Table 4. Minor Elements of Mangal in the Philippines**

1. *Acrostichum aureum*
2. *Acrostichum speciosum*
3. *Aegiceras corniculatum*
4. *Aegiceras floridum*
5. *Camptostemon philippinense*
6. *Excoecaria agallocha*
7. *Heritiera littoralis*
8. *Osbornia octodonta*
9. *Pemphis acidula*
10. *Scyphiphora hydrophyllacea*
11. *Xylocarpus granatum*
12. *Xylocarpus moluccensis*

Table 5. Mangrove Associates in the Philippines

1. *Acanthus ebracteatus*
2. *Acanthus ilicifolius*
3. *Acacia farnesiana*
4. *Albizia saponaria*
5. *Alstonia macrophylla*
6. *Ardisia elliptica*
7. *Barringtonia asiatica*
8. *Barringtonia racemosa*
9. *Brownlowia tersa*
10. *Cassine viburnifolia*
11. *Cerbera manghas*
12. *Chloris barbata*
13. *Corypha elata*
14. *Crinum asiaticum*
15. *Cynometra ramiflora*
16. *Cyperus malaccensis*
17. *Derris indica*
18. *Desmodium umbellatum*
19. *Dolicahndrone spathacea*
20. *Ervatamia pandacaqui*
21. *Fimbristylis ferruginea*
22. *Flagellaria indica*
23. *Glochidion littorale*
24. *Glochidion mindorense*
25. *Hibiscus tiliaceus*
26. *Intsia bijuga (l. retusa)*
27. *Ipomoea pes-caprae*
28. *Kleinhovia hospita*
29. *Mallotus papillaris*
30. *Morinda bracteata*
31. *Oncosperma tigillarum*
32. *Pluchea indica*
33. *Pongamia pinnata*

34. *Premna integrifolia*
35. *Pseuderanthemumpulchellum*
36. *Schefflera odorata*
37. *Sesuvium portulacastrum*
38. *Strophanthus cumingii*
39. *Thespesia populnea*
40. *Thespesia populneoides*

Table 6. Specialized Groups in the Mangal of the Philippines

Climbers

1. *Bauhinia binata*
2. *Caesalpinia crista (C. nuga)*
3. *Columella trifolia*
4. *Dalbergia candenatensis*
5. *Derris heptaphylla*
6. *Derris lianoides*
7. *Derris trifoliata*
8. *Finlaysonia obovata*
9. *Tristellateia australasiae*

Epiphytes

1. *Asplenium nidus*
2. *Cymbidium finlaysonianum*
3. *Dischidia saccata*
4. *Dendrobium crumenatum*
5. *Dendrobium distichum*
6. *Dendrobium luzonense*
7. *Drynaria quercifolia*
8. *Hoya merrillii*
9. *Hoya reticulata*
10. *Hydnophytum membranaceum*
11. *Hydnophytum philippinense*
12. *Lecanopteris sinuosum*
13. *Myrmecodia echinata*
14. *Pyrrosia adnascens*
15. *Sarcochilus pallidus*

Table 7. Zonation of Philippine Mangroves

ZONE	TIDAL INUNDATION REGIME	SOIL TYPES	COMMON MANGROVE SPECIES
Seaward	Daily, including	Coral rubble, sandy, neap tides	<i>Avicennia marina</i> , <i>Sonneratia sandy loamalba</i> , <i>S. caseolaris</i> , <i>Rhizophora stylosa</i> , <i>R. apiculata</i>
Middle	Daily, except	Silty to silty clay during neap tides	<i>Avicennia alba</i> , <i>A. eucalyptifolia</i> , <i>A. officinalis</i> , <i>Rhizophora apiculata</i> , <i>R. mucronata</i> , <i>Aegiceras floridum</i> , <i>A. corniculatum</i> , <i>Bruguiera cylin- drica</i> , <i>B. gymnorhiza</i> , <i>B. parviflora</i> , <i>B. sexangula</i> , <i>Cerkipis tagal</i> , <i>C. de- candra</i> , <i>Excoecaria agallocha</i> , <i>Lumnitzera racemosa</i> , <i>Xylocarpus moluccensis</i>
Landward	Inundated only	Silty to silty-clay to clay	<i>Avicennia alba</i> , <i>Bruguiera sexangula</i> , <i>Excoecaria agallocha</i> , <i>Heritiera littoralis</i> , <i>Scyphiphora hydrophyllacea</i> , <i>Xylocarpus granatum</i> , <i>X. moluccensis</i> , <i>Nypa fruticans</i>
Riverine subdivided into river mouth and upstream foreband and backband	Variable inunda- tion, brackish/ freshwater	Sandy to silty to clay	Rivermouth: <i>Avicennia marina</i> , <i>A. officinalis</i> , <i>Aegiceras floridum</i> , <i>A. corniculatum</i> , <i>Campostemon philippinense</i> , <i>Rhizophora mucro- nata</i> , <i>R. apiculata</i> , <i>R. stylosa</i>  Upstream: <i>Avicennia alba</i> , <i>A. offici- nalis</i> , <i>Aegiceras floridum</i> , <i>A. corni- culatum</i> , <i>Bruguiera cylindrica</i> , <i>B. gymnorhiza</i> , <i>B. parviflora</i> , <i>Camp- tostemon philippinense</i> , <i>Excoe- caria agallocha</i> , <i>Heritiera littoralis</i> , <i>Nypa fruticans</i> , <i>Rhizophora mucro- nata</i> , <i>R. apiculata</i> , <i>Xylocarpus granatum</i> , <i>X. moluccensis</i>

Source: Final Draft Report of the ADB/DENR Mangrove TA Development Project Feasibility Study 13 August 1990 (prepared by Crown Agents for Overseas Governments and Administrations)

**Table 8.** Annual Organic Matter Production of Four Dominant Mangrove Species in Pagbilao, Quezon Province, Luzon (Reyes 1983)

Species	Local Name	Category	Leaf <sup>a</sup>	Total <sup>a</sup>
<i>Avicennia officinalis</i>	(Api-api)	Major	394	522
<i>Ceriops decandra</i>	(Malatangal)	Major	325	429
<i>Scyphiphora hydrophyllacea</i>	(Nilad)	Minor		554
<i>Osbornia octodonta</i>	(Tualis)	Minor		423

<sup>a</sup> Grams/square meter/year

Reyes M.R.C. 1983. **Litter Production and Leaf Litter Decomposition Rates of Dominant Species in Two Sites Within the Mangrove Forest at Pagbilao, Quezon.** M S Thesis, University of the Philippines, Dlliman, Quezon City.

**Table 9.** Productivity of Two Mangrove Species in Calatagan, Batangas, Luzon (Fortes 1982)

Species	Local Name	Category	Productivity <sup>a</sup>
<i>Rhizophora apiculata</i>	Bakauan-lalake	Major	0.74
<i>Avicennia marina</i>	Bungalon	Major	0.64

<sup>a</sup> Grams carbon per square meter per day

Fortes, M.D. 1982. **Productivity studies on mangrove, seagrasses and algae at Calatagan, Batangas (Philippines).** Mangrove Forest Ecosystem Productivity in Southeast Asia. BIOTROP Spec. Publ. 17:17-24.

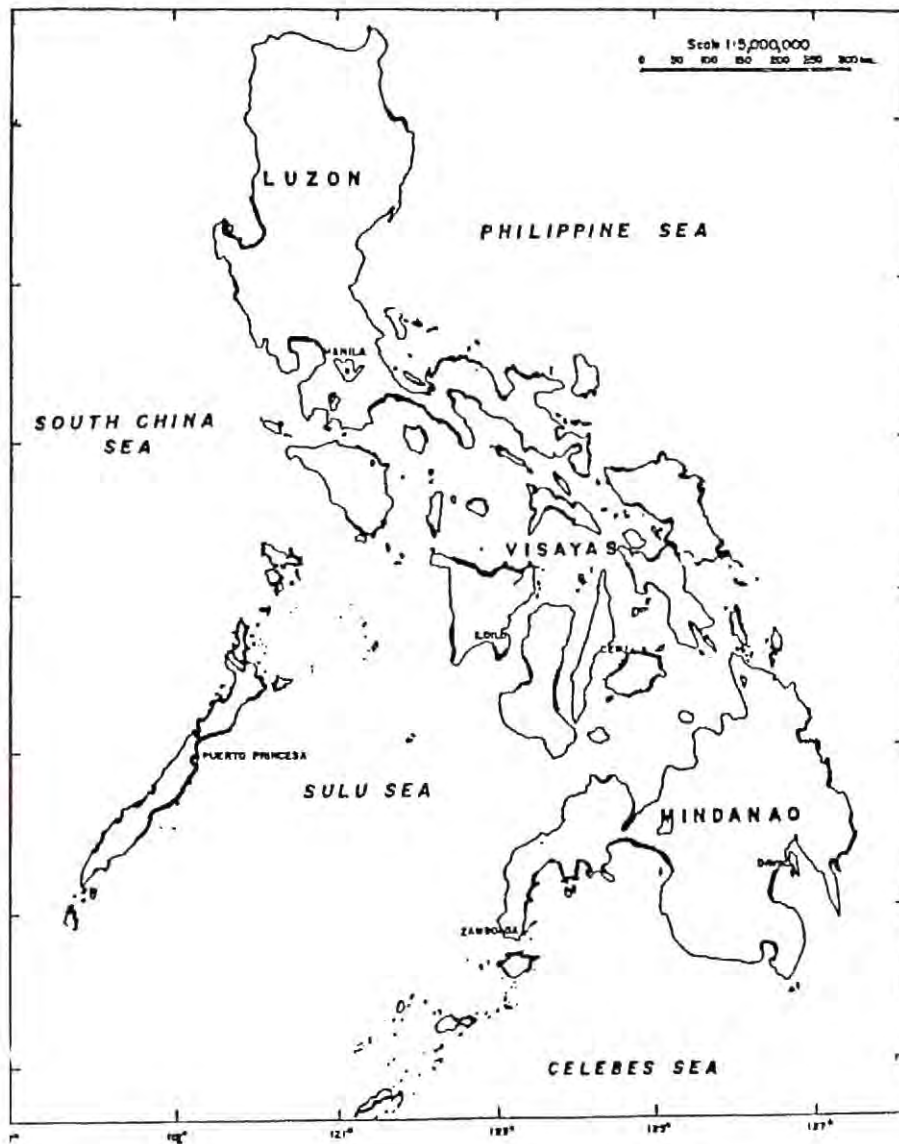
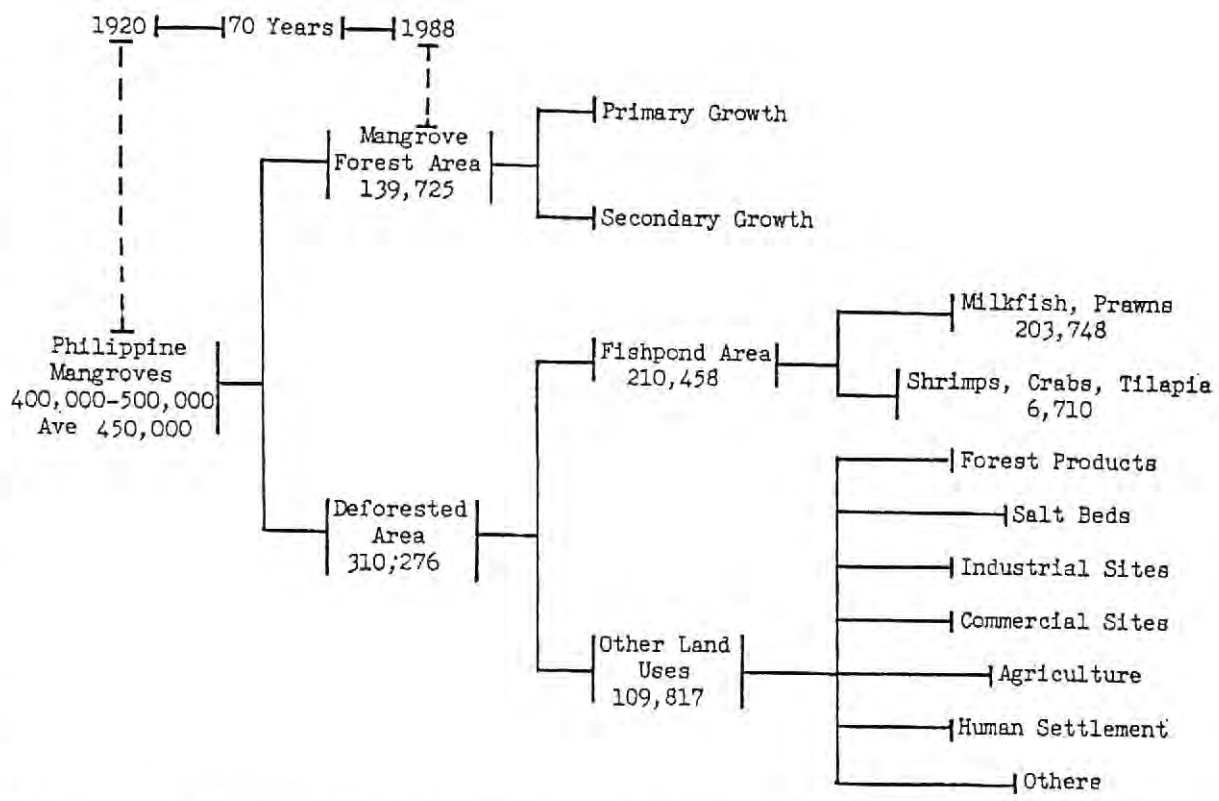


Figure 1. Geographical Distribution of Mangroves in the Philippines.

(Zamora, P.M. 1987. Mangrove resources in the Philippines. Proceedings of First National Conference on Seagrass Management Research and Development. Metro Manila 1986: 16-42)

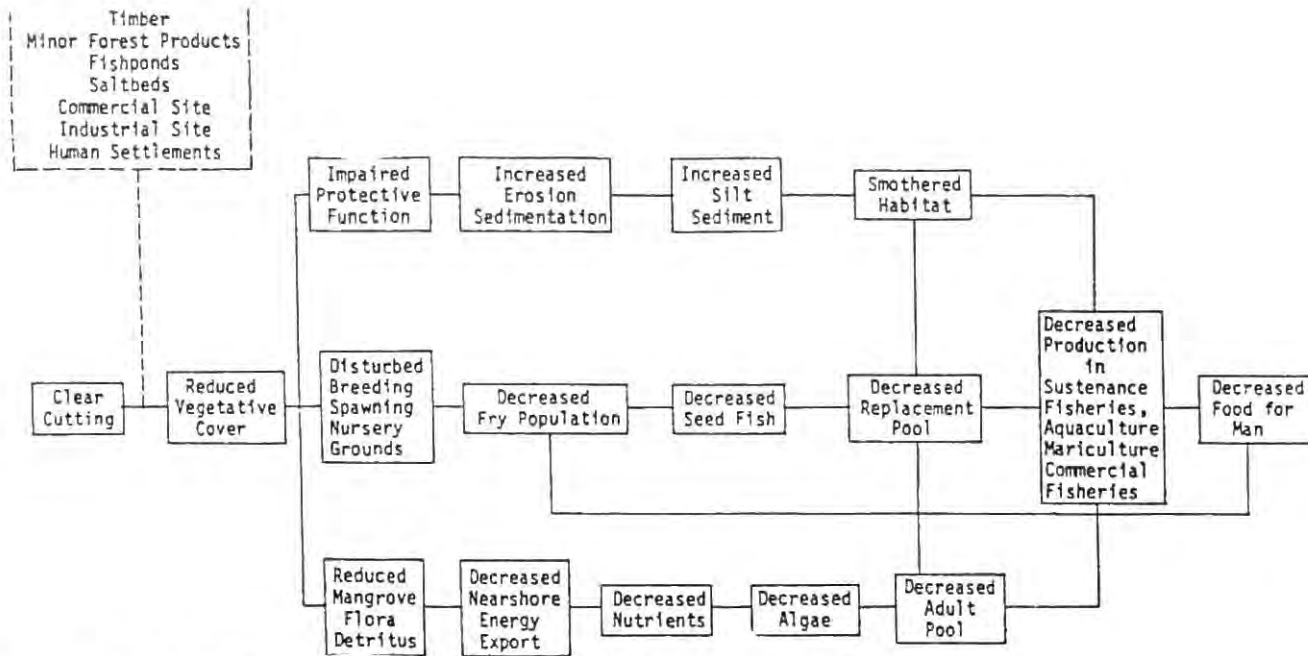


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**Figure 2. Estimated Area in Hectares of Existing Mangrove Forest and Mangrove Area Uses in the Philippines**

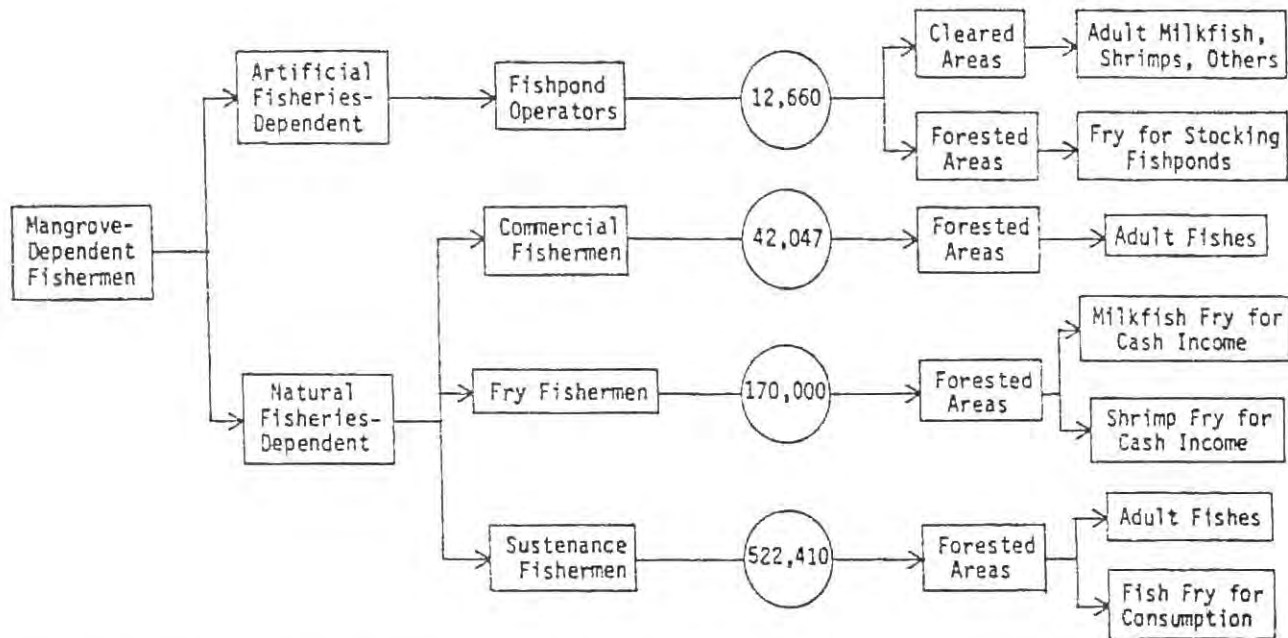
(Updated from Zamora 1981, unpublished. For 1988, Annual Rate of Denudation was placed at 4,432.5 hectares.)



**Figure 3. Probable Chain of Effects of Clear-Cutting of Mangrove Vegetation Cover**

Source: Zamora, P.M. 1985. Mangrove management strategies: Philippine perspective. Lecture prepared for the UNDP/UNESCO Regional Mangrove Project RAS/79/002 Training Course on Life History of Selected Species of Flora and Fauna in Mangrove Ecosystems held on 2-16 October 1985 at Bangkok, Thailand.

(After Zamora, P.M. 1990. Wallaceana, Kuala Lumpur, Malaysia 58 (1989): 1-5).



**Figure 4. Mangrove-Dependent Fishermen in the Philippines**

Source: Zamora, P.M. 1985. Mangrove management strategies: Philippine perspective. Lecture prepared for the UNDP/UNESCO Regional Mangrove Project RAS/79/002 Training Course on Life History of Selected Species of Flora and Fauna in Mangrove Ecosystems held on 2-16 October 1985 at Bangkok, Thailand.

(After Zamora, P.M. 1990. Wallaceana, Kuala Lumpur, Malaysia 58 (1989): 1-5).

## APPENDIX 1

1 February 1990

DENR ADMINISTRATIVE ORDER

Number 15

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SUBJECT: REGULATIONS GOVERNING THE UTILIZATION,  
DEVELOPMENT AND MANAGEMENT OF MANGROVE RE-  
SOURCES

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In accordance with the provision of PD 705, as amended, otherwise known as the Revised Forestry Code of the Philippines, the following rules and regulations governing the utilization, development and management of mangrove resources are hereby promulgated for the information and guidance of all concerned:

**SECTION 1. Policy and Objectives. Mangroves have multi-uses.** As such, the utilization, development and management of mangrove resources shall involve as many uses as possible for the benefit of the greater number of users. To sustain optimum productivity, it shall be the policy of the government to conserve, protect, rehabilitate and develop the remaining mangrove resources of the country; give preference to organizations, associations or cooperatives over individual users in the utilization and development of the mangrove resources; stop the wanton exploitation of the mangrove resources; and enhance the replenishment of the denuded areas through natural or artificial means.

**SECTION 2. Definition of Terms.** For the purpose of this Order, the following terms are defined:

- a. **Alienable and Disposable Lands** refer to those lands of the public domain which have been the subject of the present system of classification and certified as not needed for forestry purposes.
- b. **Communal Mangrove Forest** refers to a tract of public forest set aside by the Secretary of the Department of Environment and Natural Resources upon the recommen-

dation of the Director of the Forest Management Bureau for the exclusive use of the residents of the municipality from which said residents may cut, collect or remove mangrove forest products, such as firewood and mangrove timber for charcoal production for home consumption in accordance with existing laws and forest rules and regulations.

- c. **Denuded Areas** refer to mangrove areas which have been devoid of mangrove trees, shrubs and/or nipa palms. Treeless areas covered with weeds and vines fall under this definition.
- d. **Fishpond Lease Agreement** is a privilege granted by the State to a person or group of persons to occupy and possess in consideration of specified rental any public lands for the raising of fish and other aquatic products.
- e. **Forest Lands** include the public forest, the permanent forest or forest reserves, and forest reservations.
- f. **License** is a privilege granted by the State to a person to utilize forest resources within any forest land, without any right of occupation and possession over the same, to the exclusion of others, or establish and operate a wood processing plant, or conduct any activity involving the utilization of any mangrove forest resources.
- g. **Mangrove Area** refers to the area found along the sea-coast and estuaries whether sparsely or thickly vegetated with true and/or associated mangrove species, or open swampy areas, including brackish fishponds, extending along stream where the water is brackish.
- h. **Mangrove Buffer Zones** are strips of land at least 50 meters in width fronting seas, oceans and other bodies of water and 20 meters on both sides of river channels/banks maintained and developed to enhance the protective capability of the mangroves against strong currents, winds and high waves except in areas covered by Ministry Administrative Order No. 42, Series of 1986.
- i. **Mangrove Forest** refers to forest stand found in the mangrove areas and composed primarily of mangrove and associated species.
- j. **Mangrove Plantation** refers to a stand of mangrove trees and/or palms of true or associated species planted in the mangrove area.

- k. **Mangrove Resources** refer to all terrestrial and aquatic flora and fauna in the mangroves including land and minerals which could bestow any form of services, influences and amenities to man and the environment.
- l. **Mangrove Swamp Forest Reserves** are mangrove areas of the public domain which are declared as such under Presidential Proclamation 2152 and are determined to be needed for conservation and protection purposes.
- m. **Permit** is a short-term privilege or authority granted by the State to a person or group of persons to utilize any limited forest resources or undertake a limited activity within any forest land without any right of occupation and possession therein.
- n. **Protected Areas** refer to mangrove areas declared as such under the Integrated Protected Areas System to be instituted by the DENR.
- o. **Timber** refers to any piece of wood more than 1.5 meters long and having an average diameter of more than 15 centimeters.
- p. **Wilderness Areas** refer to the mangrove areas which have been declared as such by the President of the Philippines under Presidential Proclamations for the preservation of the floral and faunal species found therein to prevent their extinction and to serve as gene pool for the proliferation of said species.

**SECTION 3. Prohibition in the Issuance of License and Permit.** Upon the effectivity of this Order, the granting and/or renewal of mangrove timber license and/or permit of any kind that authorizes the cutting and/or debarking of the trees for commercial purposes in areas outside the coverage of Fishpond Lease Agreements and mangrove plantations shall no longer be allowed.

**SECTION 4. Conversion of Mangrove Areas into Fishponds.** Conversion of thickly vegetated mangrove areas into fishponds shall no longer be allowed. All mangrove swamps released to the Bureau of Fisheries and Aquatic Resources which are not utilized, or which have been abandoned for five years from the date of such release shall revert to the category of forest land in accordance with existing laws and regulations.

**SECTION 5. Fishponds in Mangrove Forest Reserves and Wilderness Areas.** In accordance with the national policy fishponds will not be allowed within mangrove forest reserves and wilderness areas. However, in cases where legally acquired productive fishponds are found within such areas, and the government opts to revert them to the category of forest lands and if public interest so dictates, the operator would be justly compensated.

**SECTION 6. Issuance of Certificate of Stewardship Contract.** A Certificate of Stewardship Contract may be issued covering mangrove areas to individuals, communities, associations or cooperatives, except in wilderness areas, provided that the activities shall be limited to sustainable activities as indicated in the approved Management Plan for such areas. Conversion of mangroves for, but not limited to, fishpond development, saltworks and paddy cultivation shall not be allowed under the Certificate of Stewardship Contract.

**SECTION 7. Cutting of Trees within FLA Areas.** No cutting of trees within existing Fishpond Lease Agreement (FLA) areas shall be allowed without the benefit of a permit from the Department of Environment and Natural Resources. The trees cut in FLA areas through a permit shall be turned over to the DENR for disposition through public bidding. FLA holders are given the right to equal the highest bidder, in which case the bid is automatically awarded to him.

**SECTION 8. Establishemnt, Development and Management of Communal Mangrove Forest.** Communal mangrove forests may be established in mangrove-endowed municipalities/cities in accordance with the policy guidelines as enunciated in Ministry Administrative Order No. 48, Series of 1982, as amended. The development and management of the communal mangrove forest shall be the responsibility of the community people concerned under the concept of community-based forest management and in accordance with an approved Management Plan to be monitored closely by the Regional Offices of the DENR. However, the DENR may disestablish a mangrove area as communal mangrove forest if the allowable activities thereat are found to be non-sustainable to the resource.

The DENR through its field offices shall conduct a sustained information dissemination campaign on the environmental aspect of mangrove management. Local immersion should also be used as a tool to train the people on the technical aspect of mangrove management. The substance of the training should be attuned to the policy as enunciated in this Order.

**SECTION 9. Fishpond Development.** Fishpond development shall only be allowed in denuded areas which have been zonified as suited for such activity. Estuarine mangroves which are predominantly, if not totally, vegetated with shrubs shall not be disposed for fishpond development as such areas still contribute to the productivity of the nearby marine ecosystem, hence should also be extensively rehabilitated. Applications for fishpond development covering the estuarine areas shall be returned to the applicants immediately with a corresponding responsibility on the part of the Department of Environment and Natural Resources to assist the applicants in locating suitable areas as an alternative area for fishpond development in accordance with the provisions of this Order.

**SECTION 10. Responsibility and Authority on the Protection, Development and Management of Mangrove Areas.** The protection, development and management of mangrove areas shall be the responsibility of the concerned Regional Offices of the Department of Environment and Natural Resources in coordination with the Department of Agriculture.

**SECTION 11. Continuing Assessment of Mangrove Resources.** There shall be a periodic assessment of the mangrove resources throughout the country. The National Mapping and Resource Information Authority (NAMRIA) shall be responsible in the interpretation of aerial photographs, Land Satellite (LANDSAT) and other remote sensing data while the Regional Land Evaluation Teams will do the ground verification activities. The involvement of interested non-government organizations shall also be solicited in the conduct of the assessment.

**SECTION 12. Establishment of Mangrove Plantations.** Mangrove plantations are allowed to be established in denuded or sparsely-vegetated mangrove forest lands and A and D areas through an approved permit in accordance with the relevant provisions of Forestry Administrative Order No. 8-3, Series of 1941, prescribing the revised guidelines governing the special uses of



forest lands, as amended, and other related laws, rules and regulations. The initial maximum area allowed for mangrove plantation establishment shall be fixed at 50 hectares for corporations, cooperatives and associations and 10 hectares for individuals. However, additional areas may be subsequently granted to existing developers after thorough evaluation of accomplishment provided that the accumulated area does not exceed 200 hectares for corporations, cooperatives and associations and 50 hectares for individuals.

**SECTION 13. Cutting of Trees in Mangrove Plantations.**

Mangrove plantation developers shall be allowed to cut the planted trees found within their respective plantations through clear cutting by strips system, whether such is intended for personal or commercial purposes; Provided, That they secure a permit from the immediate office of the DENR.

**SECTION 14. Silviculture.** Silvicultural practice allowed in naturally grown mangrove forest shall be a combination of seed-tree method and planting. In the course of harvesting, at least 40 healthy trees per hectare, spaced regularly over the area, and representative of the species in the area, shall be retained to provide the seeds necessary for regeneration purposes.

**SECTION 15. Penal Provision.** Violations of any of the provisions of this Order shall be penalized in accordance with existing laws and regulations.

**SECTION 16. Repealing Clause.** This Order supercedes radiogram message dated June 13, 1986; BFD Circular No 13, Series of 1986; and all previous administrative orders, regulations, circulars, memorandum orders or instructions involving disposition of mangrove resources inconsistent herewith.

**SECTION 17. Separability Clause.** Should any of the provisions of this Order be subsequently or otherwise revised, modified or repealed accordingly, the same shall not affect the validity or legality of the other provisions so far as they could stand independently of the provisions so revised, modified or repealed.

**SECTION 18. Effectivity.** This Order shall take effect 15 days after its publication in a newspaper of general circulation.

**FULGENCIO S. FACTORAN JR.**

Secretary

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