

SPECIAL ISSUE

THE VALUES OF WETLANDS: LANDSCAPE AND INSTITUTIONAL  
PERSPECTIVES

Development and conservation of Philippine mangroves:  
institutional issues

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**Abstract**

The decline of Philippine mangroves from half a million hectares in 1918 to only 120 000 ha in 1994 may be traced to local exploitation for fuelwood and conversion to agriculture, salt beds, industry and settlements. But brackishwater pond culture, whose history is intertwined with that of mangroves, remains the major cause of loss. The paper discusses the institutional issues — aquaculture as development strategy, low economic rent of mangroves, overlapping bureaucracy and conflicting policies, corruption, weak law enforcement and lack of political will — relevant to this decline. Recommended policies are based on these institutional factors and the experiences in mangrove rehabilitation including community-based efforts and government programs such as the 1984 Central Visayas Regional Project. These recommendations include conservation of remaining mangroves, rehabilitation of degraded sites including abandoned ponds, mangrove-friendly aquaculture, community-based and integrated coastal area management, and provision of tenurial instruments. © 2000 Elsevier Science B.V. All rights reserved.

*Keywords:* Aquaculture; Brackishwater ponds; Community-based management; Integrated coastal area/zone management; Tenurial/property rights

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**1. Introduction**

The Philippines is an archipelago of about 7100 islands bordered by 17 460 km of coastline and 26.6 million ha of coastal waters. Marine re-

sources are important in providing food and other goods and services because more than half of the country's 1500 municipalities and 42 000 villages are coastal. Fish, for example, provide the greatest (65%) and cheapest form of dietary protein. Of a total 2.77 million mt fisheries production in 1996, 32.8% was contributed by municipal fisheries, 31.7% by commercial fisheries and 35.4% by aquaculture (Anon., 1997).

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A positive correlation between nearshore yields of fish and/or shrimp and mangrove area has been documented in the Philippines (Camacho and Bagarinao, 1986), Indonesia (Martosubroto and Naamin, 1977), Malaysia (Macnae, 1974), and Australia (Staples et al., 1985). Such correlation is reflected in the parallel decline in Philippine mangrove areas and production from nearshore municipal fisheries that contrasts with the increase in brackishwater pond area and aquaculture contribution to total fish production (Fig. 1(a, b)).

This paper will describe the intertwined histories of Philippine mangroves and aquaculture ponds, including pertinent legislation; discuss relevant institutional issues, e.g. low economic rent of mangroves, aquaculture as development strategy, and ineffective government management; and offer recommendations for the sus-

tainable management and conservation of mangroves.

## 2. Philippine mangroves and brackishwater culture ponds

Major and minor mangroves (Tomlinson, 1986) in the Philippines total some 40 species belonging to 16 families (Table 1). Another 20–30 species of shrubs and vines can be classified as mangrove associates (Arroyo, 1979; Fernando and Pancho, 1980). Of the remaining 120 500 ha of Philippine mangroves as of 1994, almost half were found in Western Mindanao and a quarter in the Southern Tagalog region (Table 2). In addition to these same regions, substantial mangrove forests could still be found in Central Luzon, Western Visayas, Bicol and Eastern Visayas more than 40 years ago (Table 2).

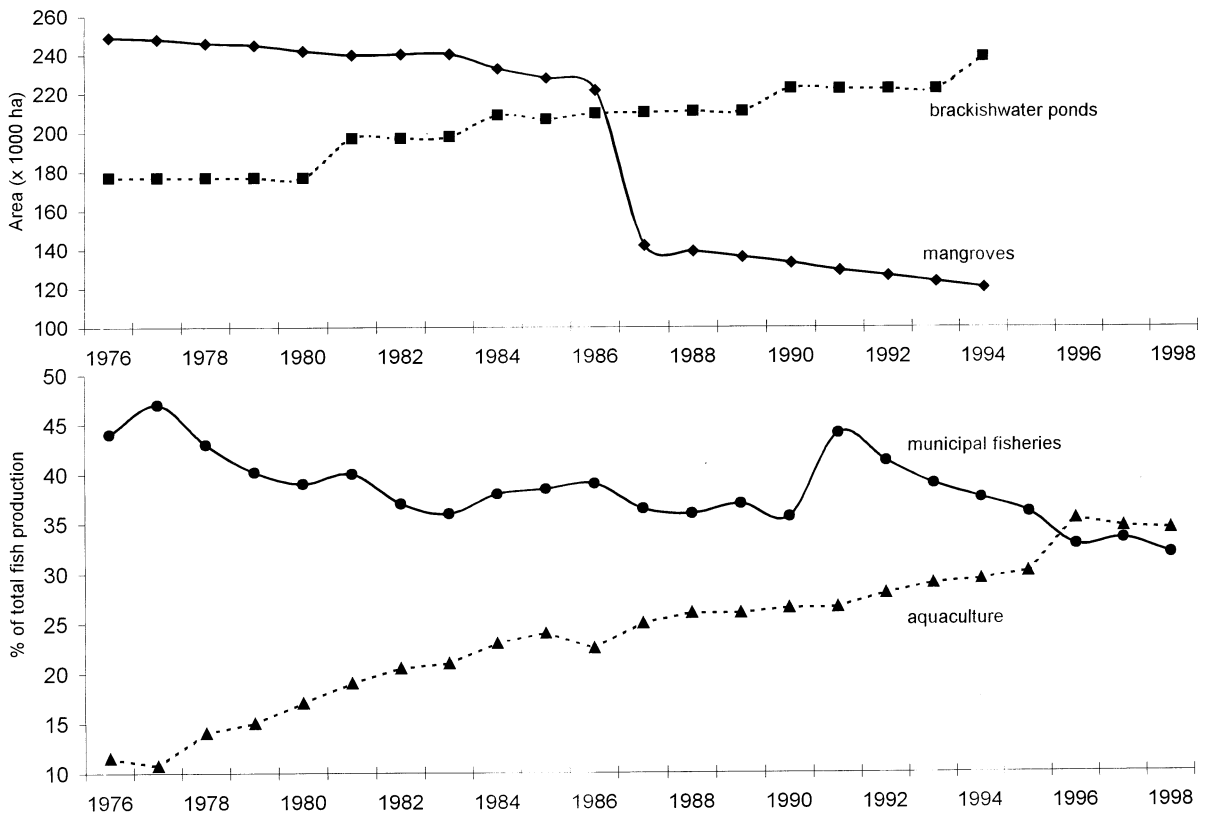


Fig. 1. Changes in (a) mangrove and brackishwater pond area and (b) contribution of municipal fisheries and aquaculture to total fisheries production in the Philippines, 1976–1990 (Primavera, 1997).

Table 1  
Major and minor<sup>a</sup> mangrove species in the Philippines<sup>b</sup>

Family	Species
I. Acanthaceae	1. <i>Acanthus ebracteatus</i>
	2. <i>Acanthus ilicifolius</i>
II. Avicenniaceae	3. <i>Avicennia alba</i>
	4. <i>Avicennia officinalis</i>
	5. <i>Avicennia marina</i>
	6. <i>Avicennia rumphiana</i>
III. Bombacaceae	7. <i>Camptostemon philippinensis</i>
	8. <i>Camptostemon schultzei</i>
IV. Combretaceae	9. <i>Lumnitzera littorea</i>
	10. <i>Lumnitzera racemosa</i>
	11. <i>Lumnitzera rosea</i> <sup>c</sup>
V. Euphorbiaceae	12. <i>Excoecaria agallocha</i>
VI. Lythraceae	13. <i>Pemphis acidula</i>
VII. Meliaceae	14. <i>Xylocarpus granatum</i>
	15. <i>Xylocarpus mekongensis</i>
VIII. Myrsinaceae	16. <i>Aegiceras corniculatum</i>
	17. <i>Aegiceras floridum</i>
IX. Myrtaceae	18. <i>Osbornia octodonta</i>
X. Palmae	19. <i>Nypa fruticans</i>
XI. Plumbaginaceae	20. <i>Aegialitis annulata</i>
XII. Rhizophoraceae	21. <i>Bruguiera cylindrica</i>
	22. <i>Bruguiera exaristata</i>
	23. <i>Bruguiera hainesii</i>
	24. <i>Bruguiera gymnorrhiza</i>
	25. <i>Bruguiera parviflora</i>
	26. <i>Bruguiera sexangula</i>
	27. <i>Ceriops decandra</i>
	28. <i>Ceriops tagal</i>
	29. <i>Kandelia candel</i>
	30. <i>Rhizophora apiculata</i>
	31. <i>Rhizophora lamarckii</i>
32. <i>Rhizophora mucronata</i>	
33. <i>Rhizophora stylosa</i>	
XIII. Rubiaceae	34. <i>Scyphiphora hydrophyllacea</i>
XIV. Sonneratiaceae	35. <i>Sonneratia alba</i>
	36. <i>Sonneratia caseolaris</i>
	37. <i>Sonneratia gulngai</i> <sup>c</sup>
	38. <i>Sonneratia lanceolata</i> <sup>c</sup>
	39. <i>Sonneratia ovata</i>

<sup>a</sup> Based on Tomlinson (1986).

<sup>b</sup> Sources: Brown and Fischer, 1920; Arroyo, 1979; Fernando and Pancho, 1980; Tomlinson, 1986; Anon., 1996; Spalding et al., 1997; Yao, 1999.

<sup>c</sup> N.C. Duke, University of Queensland, personal communication.

## 2.1. Mangrove decline

Among the major marine ecosystems including seagrasses and coral reefs, it is mangroves that have suffered the earliest and greatest degradation in the Philippines because of their relative accessibility and a long history of conversion to aquaculture ponds. Estimates of the country's mangroves were not made until 1918 (Brown and Fischer, 1918), although ponds were already on record in 1863 (Table 3). The former comprised not only primary and secondary forests, but also vast stands located near Manila of *Rhizophora* cultivated for firewood and nipa palm for roof shingles (Brown and Fischer, 1920).

Mangrove decline to only 120 000 ha in 1994–1995 (Tables 2 and 3) may be traced to overexploitation by coastal dwellers, and conversion to agriculture, salt ponds, industry and settlements. However, aquaculture remains the major cause — around half of the 279 000 ha of mangroves lost from 1951 to 1988 were developed into culture ponds (Figs. 1 and 2). Ninety-five percent of Philippine brackishwater ponds in 1952–1987 were derived from mangroves (PCAFNRRD, 1991). Mangrove-to-pond conversion and its attendant socioeconomic changes have been documented in detail for the village of Lincod in Maribojoc, Bohol (Ajiki, 1985) and for the municipality of Batan in Aklan (Kelly, 1996).

Pond construction peaked in the 1950s and 1960s at 4000–5000 ha/year with government incentives in the form of loans (Villaluz, 1953). The Fisheries Decree of 1975 (P.D. 704) mandated a policy of accelerated fishpond development and A.O. 125 extended 10-year fishpond permits and leases to 25 years (see Table 5). During the Shrimp Fever of the 1980s, pond development again increased to 4700 ha/year (Table 3).

Another widespread mechanism by which mangroves have been lost from the public domain is when local residents or even outsiders stake claim on mangrove areas by paying to municipal governments a real estate tax on such areas. Because local governments are hard-pressed for cash, they accept the taxes without checking the status of the given area, whether forest reserve, protected mangrove or Alienable and Disposable (A&D). These

claims are generally handed down to family members or 'sold' to other parties. A prerequisite to legal ownership through issuance of titles is hav-

ing the area declared A&D by the Department of Environment and Natural Resources (DENR), if the interested party has adequate finances. Thus

Table 2  
Mangrove areas in the Philippines by region, 1951–1994

Region		1951 <sup>a</sup>		1994 <sup>b</sup>	
		(ha)	(%)	(ha)	(%)
I	Ilocos Region	771	0.2	100	0.1
II	Cagayan Valley	7322	1.7	3800	3.2
III	Central Luzon	56 799	13.3	100	0.1
IV	Southern Tagalog	77 997	18.2	29 400	24.4
V	Bicol Region	42 234	9.9	600	0.5
VI	Western Visayas	49 035	11.4	3000	2.5
VII	Central Visayas	24 213	5.6	2500	2.1
VIII	Eastern Visayas	36 501	8.5	600	0.5
IX	Western Mindanao	91 072	21.3	54 100	44.9
X	Northern Mindanao	18 273	4.3	20 300	16.8
XI	Southern Mindanao	17 518	4.1	5800	4.8
XII	Central Mindanao	6647	1.6	200	0.2
Total		428 382	100.1	120 500	100.1

<sup>a</sup> Villaluz, 1953.

<sup>b</sup> DENR, 1996.

Table 3  
Total mangrove and brackishwater culture pond area in the Philippines (after Primavera, 1995)<sup>a</sup>

Year	Mangrove area (ha)	Brackishwater ponds		Remarks
		Total area (ha)	Increase (ha/year)	
1860	No data (n.d.)	n.d.	762 (1860–1940)	First pond recorded in 1863
1920	450 000	n.d.	n.d.	
1940	n.d.	60 998	1176 (1941–1950)	
1950	418 382 (1951)	72 753	5050 (1951–1960)	Fishpond boom: Fisheries bureau created; IBRD US\$23.6 M for pond development
1960	365 324 (1965)	123 252	4487 (1961–1970)	
1970	288 000	168 118	811 (1971–1980)	Conservation phase: Natl. Mangrove Committee; 79 000 ha mangroves for preservation and conservation
1980	242 000	176 231	4668 (1981–1990)	Shrimp Fever: Commercial availability of fry and feeds; US\$21.8 ADB shrimp and milkfish project
1990	132 500	222 907	3052 (1991–1994)	
1994	120 000	232 065		

<sup>a</sup> Sources: Brown and Fischer, 1918; BFAR, 1970; BFD, 1970; BFAR, 1980; BFD, 1980; Philippine Census, 1921 in Sidall et al., 1985; NAMRIA, 1988; BFAR, 1990; Auburn University, 1993; BFAR, 1994; DENR, 1996

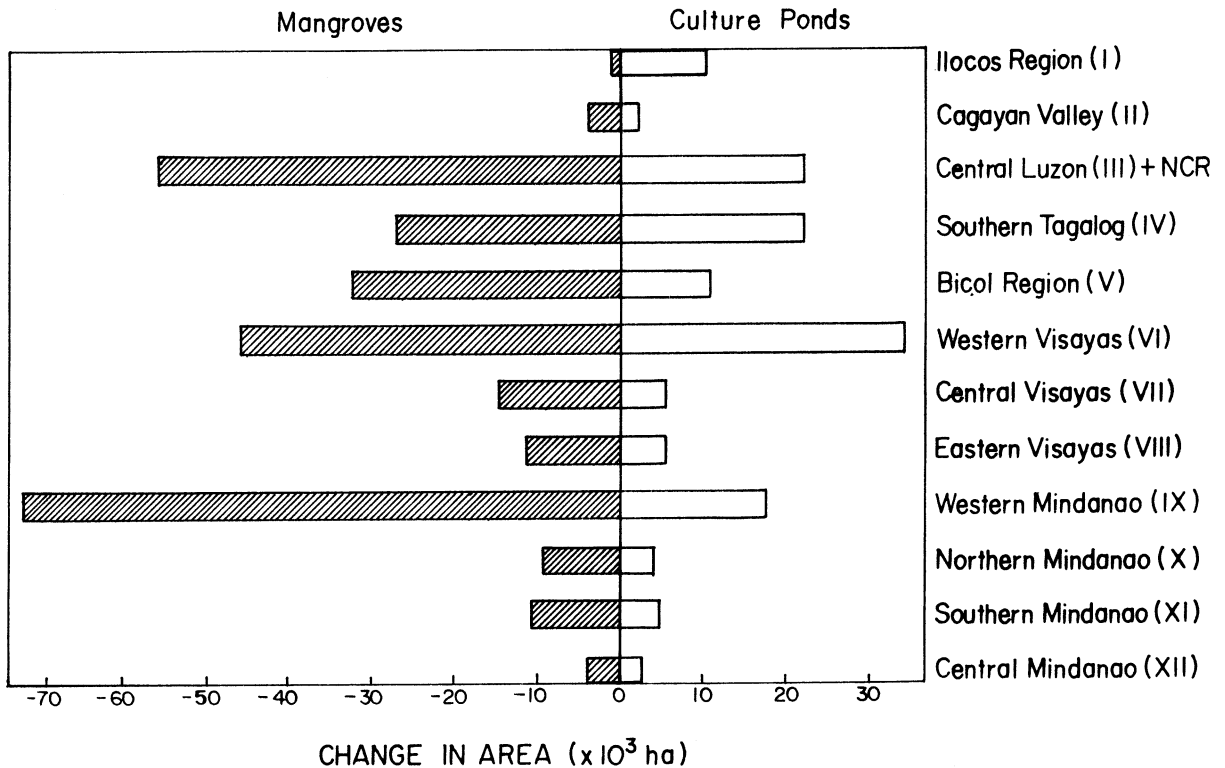


Fig. 2. Changes in mangrove and brackishwater pond area by Philippine geographical region, 1951–1990 (Primavera, 1997).

have many mangrove areas passed from government jurisdiction to private hands — through de facto (real estate tax) and/or legal means.

### 2.2. Anthropogenic pressure

The Philippine population grew steadily from 10.3 million in 1918 to 73.3 million in 1995. However, the increase from 23 to 622 persons/ha mangrove over this period, in particular the sharp doubling in the late 1980s (Fig. 3), can be traced to aquaculture pond development (Table 3), in addition to population increase.

Among Southeast Asian countries (Table 4), population pressure on mangrove resources is relatively low (< 50 persons/ha mangrove) on a countrywide basis in Brunei, Malaysia and Indonesia because of a small population and/or abundant mangrove resources. Greater pressure (> 200 persons/mangrove ha) can be found in countries with wide expanses of brackishwater

shrimp and fish culture ponds — Thailand, Vietnam and the Philippines.

### 2.3. Legislation pertaining to mangroves and aquaculture

Tables 5 and 6 list the more important promulgations pertaining to Philippine mangroves and culture ponds, mainly from the DENR, Department of Agriculture (DA) and the Bureau of Fisheries and Aquatic Resources (BFAR; Cadiz, 1987; DENR, 1990; Primavera, 1993).

Early promulgations on mangroves were lumped with other forestry activities (DENR, 1990). Only in the 1980s did mangrove management and conservation gain impetus with the revision of guidelines for zoning of forestlands into fishponds and declaration of 79 000 ha as wilderness and forest reserve areas (Tables 5 and 6). The mangrove greenbelt and buffer zone requirement was extended to typhoon-prone and

other coastal and estuarine areas (Table 6). Subsequently, A.O. 15 of 1990 integrated all piecemeal policies on mangrove utilization, development and management (DENR, 1990).

Notwithstanding P.D. 704, which disallowed private ownership and placed mangrove forests under the joint administration of BFAR and DENR and the mangrove protectionist policies of the DENR, the yearly 'Fisheries Statistics' continued to list mangroves as 'Swamplands available for development' up until 1984.

#### 2.4. Mangrove rehabilitation

Mangrove reforestation projects have been initiated mainly in Visayas, central Philippines, whose numerous islands are more vulnerable to typhoons than the bigger islands of Luzon to the north and Mindanao to the south. As early as the 1930s–1940s in Bais Bay, Negros Oriental, and the 1950s–1960s in Banacon, Jetafe, Bohol, coastal residents, students and school officials planted mangroves primarily for wood supply and

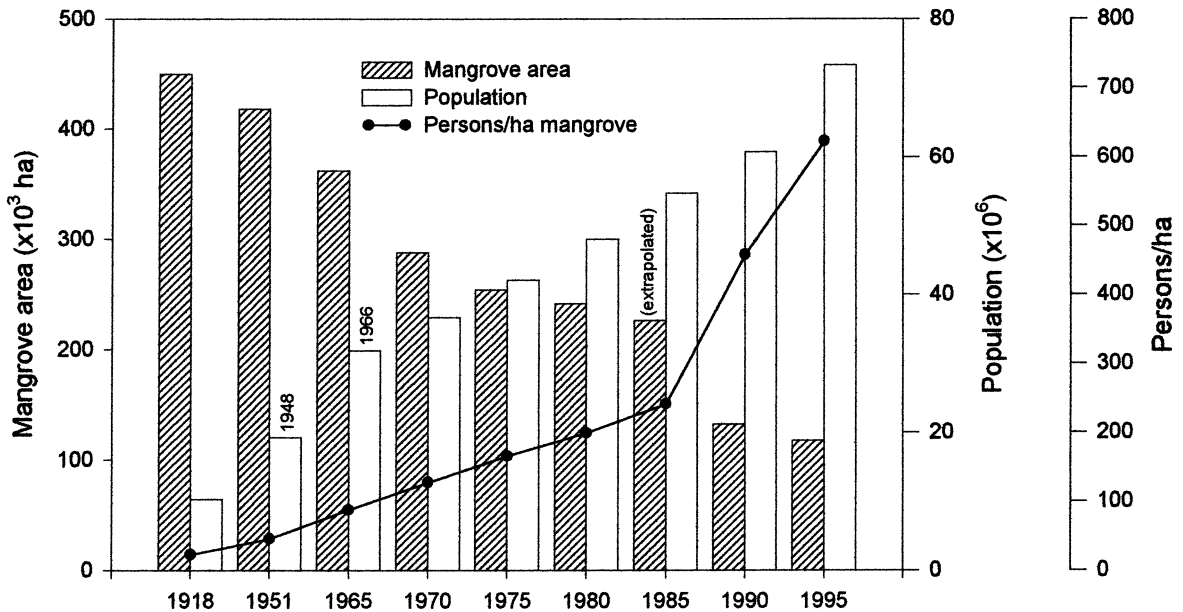


Fig. 3. Changes in Philippine population, mangrove area and population pressure on mangroves, 1918–1995 (Sources: Montilla and Dimen, 1953?; Anon., 1971; NEDA, 1984; NSCO, 1985; BAS, 1988; Famighetti, 1995; NSCB, 1995; Ibon, 1998).

Table 4  
Mangrove area (1997) and population (1996) in Southeast Asia.

Country	1997 mangrove area ( $\times 10^3$ ha) <sup>a</sup>	Mid-1996 pop. ( $\times 10^6$ ) <sup>b</sup>	Persons/ha mangroves
Brunei Darussalam	17.1	0.30	17.5
Malaysia	642.4	19.96	31.1
Indonesia	4542.1	206.61	45.5
Myanmar	344.4	45.98	133.5
Kampuchea	60.1	0.86	180.7
Thailand	264.1	58.85	222.8
Vietnam	272.3	73.98	271.7
Philippines	160.7	74.48	463.5

<sup>a</sup> Spalding et al., 1997.

<sup>b</sup> Famighetti, 1997.

Table 5  
Some Philippine laws on fishponds and mangrove conversion  
(from Primavera, 1993)<sup>a</sup>

P.D. 704 (1975)	Fisheries Code: policy of accelerated, integrated fishpond development; set conditions for mangrove conversion to ponds; public lands for fishponds can only be leased, not owned
P.D. 705 (1975)	Revised Forestry Code: retention (and exclusion from pond development) of 20 m-wide mangrove strip along shorelines facing oceans, lakes, etc.
P.D. 953 (1976)	Fishpond/mangrove lease holders required to retain or replant 20-m mangrove strip along rivers, creeks
P.D. 1586 (1978)	Environmental Impact Statement (EIS) system (covering resource extractive industries such as fishponds)
BFAR A.O. 125 (1979)	Conversion of fishpond permits and 10-year Fishpond Lease Agreement (FLA) to 25 years (to accelerate pond development)
MNR A.O. 3 (1982)	Revision of guidelines in classification and zonation of forest lands
DENR A.O. 76 (1987)	Establishment of buffer zone: 50 m fronting seas, oceans and 20 m along riverbanks; lessees of ponds under FLA required to plant 50 m-mangrove strip
R.A. 6657 (1988)	Exemption of fishpond areas from Comprehensive Agrarian Reform Law for 10 years
BFAR A.O. 125-1 (1991)	Increase in fishpond lease from US\$2 to US\$40/ha per year effective 1992
BFAR A.O. 125-2 (1991)	Full implementation of A.O. 125-1 delayed
DENR A.O. 34 (1991)	Guidelines for Environmental Clearance Certificate (applicable to fishponds)
DENR A.O. 21 (1992)	Implementing guidelines for EIS
R.A. 7881 (1995)	Fishpond exemption from agrarian reform extended

<sup>a</sup> Abbreviations: A.O., Administrative Order; BFAR, Bureau of Fisheries and Aquatic Resources; DENR, Department of Environment and Natural Resources; MNR, Ministry of Natural Resources; P.D., Presidential Decree; R.A., Republic Act.

protection against monsoon winds and typhoons (Yao, 1986; Walters, 1998). Government-sponsored mangrove reforestation started only in the 1980s with the World Bank-funded Central Visayas Regional Project-Phase I (CVRP-I) covering five sites in three provinces, and a Japanese

Government-supported afforestation project in Kalibo, Aklan (Table 7). Both the CVRP-I and the 1988 Integrated Social Forestry (ISF) Program of the DENR were landmarks that provided tenurial instruments in the form of the Certificates of Stewardship Contract (CSC) and Mangrove Stewardship Agreement (MSA), respectively, to mangrove planters. The DENR also established policies for community level stewardship of mangrove forests in the early 1990s (Table 6).

### 3. Institutional issues

Among the institutional factors that have affected mangrove development and conservation in the Philippines are the promotion of aquaculture, low economic rent for mangroves, conflicting policies, and ineffective government management.

#### 3.1. Aquaculture as development strategy

The national policy encouraging brackishwater pond culture has been premised on the belief that mangroves and other wetlands are wastelands. Thus Carbine (1948) described the Philippine bangus (milkfish) industry as important 'because it makes use of otherwise practically valueless (mangrove) land'. Ohsima (1973) likewise declared that 'undeveloped' mangrove forests extending everywhere along the Philippine coastline were available for aquaculture.

The fishpond boom of the 1950s was fueled by a loan of US\$23.6 million for fishpond construction and operations from the International Bank for Reconstruction and Development (Siddall et al., 1985) released through such conduits as the Rehabilitation Finance Corporation. These loans were intended 'to accelerate... the conversion of vast areas of marshy lands (mangroves)... into productive fishponds' (Villaluz, 1953, p. 20). The domestic priority on aquaculture continued in the 1970s and beyond with the Central Bank and the Development Bank of the Philippines providing assistance for pond construction, fish raising, processing and marketing through the Fishery Loan and Guarantee Fund and similar programs (Kelly, 1996). Commercial availability of shrimp

seed and feed, and lucrative export prices led to the Shrimp Fever that swept the Philippines and the rest of tropical Asia in the 1980s (Primavera, 1998). The Asian Development Bank made available US\$21.8 million in aquaculture loans for shrimp hatcheries and ponds (Table 3).

International aid to aquaculture has increased from US\$368 million in 1978–1984 (representing only 14.1% of total fisheries assistance) to US\$910 million in 1988–1993 (33.7% of total fisheries assistance; Josupeit, 1984; FAO, 1995). Given the high level of external assistance to aquaculture, the loss of mangroves in the Philippines and other developing countries has been facilitated by multi-lateral development agencies (Siddall et al., 1985). Ironically, present-day mangrove restoration programs are financed by some of these institutions.

### 3.2. *Low economic rent*

Aside from fisheries catches, mangroves provide timber and wood products for fishing, construction and fuel; minor items such as medicines, dyes and fodder for livestock; and services such as storm protection, flood abatement, erosion con-

trol and waste treatment (dela Cruz, 1979; Saenger et al., 1983).

However, conventional economic analyses of mangrove goods and services generally cover only products that are traded, and ignore non-marketed services such as coastal protection (Hamilton and Snedaker, 1984). Reviews of published valuation data reveal a range of US\$10–4000/ha per year for forestry products (Radstrom, 1998) and US\$775–11 282/ha for fishery products (Ronnback, 1999).

The value of fish and wood harvests from Philippine mangroves has been estimated at US\$538/ha per year and US\$42–156/ha per year, respectively (Schatz, 1991). Based on the latter, a Fisheries Sector Program study suggested that the Fishpond Lease Agreement (FLA) fee be increased to US\$156/ha per year, a conservative figure that only captures the value of foregone forestry products (White and de Leon, 1996). Similarly, the economic rent of mangroves converted into aquaculture ponds is US\$20–130/ha per year depending on culture crop, planning horizon and discount rate (Evangelista, 1992). Obviously, the FLA fee of US\$2/ha per year

Table 6

Some Philippine laws on mangrove conservation and rehabilitation (from Primavera, 1993)<sup>a</sup>

P.D. 705 (1975)	Revised Forestry Code: Mangrove strips in islands, which provide protection from high winds, typhoons shall not be alienated
P.P. 2151 & 2152 (1981)	Declaration of 4326 ha of mangroves as wilderness areas and 74 767 ha as forest reserves
P.P. 2146 (1982)	Prohibition on mangrove cutting
MNR A.O. 42 (1986)	Expansion of mangrove forest belt in storm surge, typhoon prone areas: 50–100 m along shorelines, 20–50 m along riverbanks
P.D. 1067	3–20 m of riverbanks and seashore for public use: recreation, navigation, floatage, fishing and salvage; building of structures not allowed
DENR A.O. 77 (1988)	Implementing guidelines of Integrated Social Forestry Program (provides incentives in co-management of forest resources through provision of legal tenure)
DENR A.O. 15 (1990)	Policies on communal forests, plantations, tenure through Mangrove Stewardship Contracts; revert abandoned ponds to forest; ban cutting of trees in FLA areas; prohibit further conversion of thickly vegetated areas
DENR A.O. 9 (1991)	Policies and guidelines for Mangrove Stewardship Agreement
R.A. 7160 (1991)	Local Government Code: devolved management/implementation of community forestry projects, communal forests less than 500 ha, enforcement of community-based laws
DENR A.O. 30 (1994)	Community-Based Mangrove Forest Management, NGO assistance

<sup>a</sup> A.O., Administrative Order; DENR, Department of Environment and Natural Resources; MNR, Ministry of Natural Resources; P.D., Presidential Decree; P.P., Presidential Proclamation; R.A., Republic Act.



Table 7  
Mangrove reforestation projects in the Philippines<sup>a</sup>

Location	Area (ha)	Year	Remarks
1. Daco Is., Bais, Negros Oriental	–	1930s–1940s	Backyard planting
2. Bais Bay, Negros Oriental	–	1940s–1950s	'Hacienda' (along edges) planting
3. Banacon Is., Jetafe, Bohol	400	1957–1958, 1964–1970	Community participation
4. Pagangan Is., Calape, Bohol	4.8 km causeway	1968	Organized by school officials, students
5. Marungas, Sulu	150	1981	First large-scale government project
6. Basilan, Sulu	50	1985	Bureau of Forestry Development project
7. CVRP: 5 sites in Bohol, Cebu, Negros Oriental	650	1984	Central Visayas Regional Project: World Bank US\$3.5 million (nearshore fisheries); awarded Stewardship Contracts
8. <i>Community-based</i>			
Negros Oriental	14	(as of 1986)	57 planters, 2 towns
Cebu	365		384 planters, 5 towns
Bohol	562		870 planters, 10 towns
9. Kalibo, Aklan	50	1989	Phil. Peso 560 000 government project contracted by NGO
10. Aborlan, Palawan	> 70	1990	200 000 seedlings planted, ADB funding through Japanese NGO, national and local government support
11. Bais City, Negros Oriental	55	1991	DENR community/family planting
12. CEP FSP	6857	1994 (as of Dec. 1995)	DENR Coastal Environment Program, Family community contracts under DENR Fisheries Sector Program; ADB funding
13. CBMFP	No data	1996	DENR Community-Based Mangrove Forest Program, awards Mangrove Stewardship Agreement

<sup>a</sup> Sources: Cabahug et al., 1986; Yao, 1986; Alix, 1989; DENR, 1996; Guerrero, 1996; Primavera and Agbayani, 1997; Yao, 1997; Walters, 1998.

charged for government-owned ponds is unrealistic. Yet a successful lobby by the aquaculture industry has indefinitely postponed the implementation of a fee increase to US\$40/ha per year (Primavera, 1993).

Such low government fees underprice the rights to harvest public forests and induce mangrove conversion to ponds, but do not penalize low pond production (World Bank, 1989; White and de Leon, 1996).

### 3.3. Confused bureaucracy and inconsistent policies

The less than optimal management of mangrove resources may be traced to overlapping bureaucracy and legislative ambiguities. Although

they share the same resource base, the government agencies that administer mangroves (DENR) and brackishwater ponds (DA-BFAR) do not coordinate much.

This lack of coordination is evident in the earlier DA issuance of FLAs to mangroves around Cogtong Bay, Bohol province (Janiola, 1996). Fortunately, the DENR refused to grant cutting permits in 1982 to save the thick mangroves from pond development. Moreover, many fisheries officials do not enforce the 20–100-m wide mangrove greenbelt along shorelines and riverbanks as required by law (Tables 5 and 6), out of ineptness or sheer ignorance. An aerial view of the Philippine coastline will show a monotonous succession of ponds with hardly a relief of green. Ironically, early Filipino fish cul-

turists planted rows of mangroves and nipa to protect their ponds against wind, waves and soil erosion (Adams et al., 1932).

Another source of ambiguity is the centralized nature of the DENR relative to the DA-BFAR. Under a decentralized DA (resulting from local autonomy: see Section 3.5 below), municipal and provincial executives are vulnerable to pressure from local elites to approve pond permits in mangrove areas regardless of their classification as permanent forest (Walters, 1995). Hence, many large ponds in Negros Oriental and throughout the country have legal permits from local officials and/or FLAs issued by BFAR, but no formal consent from the DENR (Walters, 1995). Perhaps as much as 25–30% of Philippine brackishwater ponds have neither local permit, current FLA nor DENR clearance (J.H. Primavera, personal observation).

Similarly, municipal and provincial officials of Batan, Aklan, blocked a national DENR project to reforest 37 ha of foreshore land to give priority to their own conservation program (Bandiola, 1995).

Conflicting policies exist even within the same agency. The total DENR ban on cutting in permanent mangrove forests and reservations (P.D. 705, P.P. 2151 and 2152) is not consistent with the limited use allowed under the CSCs and MSAs granted by the Integrated Social Forestry Program and Community-Based Forest Management Program (Table 6). Stewardship agreements which assure planters valid possession of rehabilitated areas (Cabahug et al., 1986) offer mangroves better protection than official proclamations of reserve or wilderness status which cannot be enforced.

#### *3.4. Corruption, weak law enforcement and lack of political will*

A whole suite of administrative decrees, orders and proclamations has been promulgated to protect remaining mangrove areas and mitigate widespread deforestation (Tables 5 and 6). These include criteria for permanent forests (areas for shore/riverbank protection and bordering islands, game and bird sanctuaries), fishponds (denuded

mangrove areas, suitable elevation, soil, etc.) and FLA cancellation (violation of forestry/fisheries laws, obstruction of tidal flow, interference with passage of people and navigation). However, effective enforcement is hampered by lack of manpower and resources, overlapping jurisdiction, and bureaucratic corruption at many levels of government.

Three cases — Sagay in Negros Occidental, Dasol Bay in Pangasinan, and Davao Gulf in Mindanao — demonstrate how these factors have wasted once verdant mangroves and rich fishing grounds that have provided livelihood to coastal dwellers since time immemorial. In Sagay, a local court declared null and void the title to 627 ha of primary mangrove forests held by the relative of an associate of then President Marcos because the area was already classified as timberland (Anon., 1993a). Reaffirmed by a higher court and the Supreme Court in 1988, the decision could not be enforced by the DENR even with military backup because many armed goons guarded the area, by then developed into ponds.

Further north, conversion of portions of a 100-ha mangrove in Dasol, Pangasinan, was initiated by the municipal mayor and secretary in 1988 without legal permit or authority (Fuentes, 1997a,b). Affected by declining fisheries catches, local communities appealed to municipal, provincial and regional officials of the DENR, DA and the Department of Agrarian Reform, and even to then President Corazon Aquino to halt the illegal activities. More recently, mangroves surrounding Davao Gulf and Sarangani Bay in southern Philippines have been cleared for shrimp culture projects funded by multinational corporations and business associates of the city mayor (Anon., 1993b), despite the 1982 prohibition on mangrove cutting (Tables 5 and 6).

Repeated throughout the archipelago countless times over the years, these case histories graphically illustrate the decimation of Philippine mangroves since the turn of the century and their ongoing decline. They also explain how illegal development has transformed many large tracts of mangroves from public timberland and permanent forest reserves into privately owned ponds.

There is a duality of interests among government officials tasked to protect mangroves who also profit from the conversion of such mangroves (as pond operators themselves or indirectly through bribes). The corruption in Philippine agencies charged with managing forests and other natural resources is due to reliance on rules and regulations rather than on the proper pricing of access rights (World Bank, 1989). The right price can bend such rules and not a few fisheries and forestry officials have enriched themselves by facilitating FLA approval and alienation of mangrove areas.

The lack of political will is clearly seen in the exemption of aquaculture ponds from the landmark 1988 Comprehensive Agrarian Reform Law (R.A. 6657) which aimed to break up huge landholdings. The 10-year exemption was made permanent in 1995 by the passage of R.A. 7881, one of whose authors owns 200 ha of ponds (Anon., 1997). In contrast, the successful conservation of the 200-ha Talabong Mangrove Forest and decrease in illegal pond expansion in Bais City, Negros Oriental, were due to the personal commitment of the mayor and local officials, in addition to community empowerment and provision of tenurial instruments by DENR (Walters, 1995).

### 3.5. *Local government autonomy*

Political power in the Philippines has been concentrated in the Manila-based national government through almost five centuries of Spanish and American colonial rule, and even as an independent nation. The Local Government Code (R.A. 7160) of 1991 corrects this bias by decentralizing power and basic government services from national and regional agencies to the provincial, municipal and village levels. Under the Code, community-based forestry projects and environmental laws can be implemented at the municipal and provincial levels, respectively. Local autonomy was invoked by the Mayor of Batan, Aklan, when he assigned mangrove planting to the municipal government and rejected a national DENR project (Bandiola, 1995). Aside from increasing administrative authority, the Code allows local executives to test new management arrange-

ments (Walters, 1995). Local ordinances prohibiting the sale of mangrove fuelwood to bakeries in Bais, Negros Occidental (Walters, 1995), and outside the municipalities of Candijay and Mabini in Bohol (Janiola, 1996) proved more effective than the mangrove ban itself in halting illegal cutting.

## 4. Recommendations

The following policy recommendations are based on the discussions in this paper and other reviews (Cabahug, 1989; White and de Leon, 1996; Primavera and Agbayani, 1997).

### 4.1. *Mangroves and aquaculture ponds*

Conservation of the country's remaining 100 000 ha of mangroves shall be prioritized. Primary forests with high species diversity such as those around Pagbilao Bay, Quezon, and Ulugan Bay, Palawan, may be designated as biodiversity reserves for scientific studies and ecotourism (Baconguis et al., 1990). The status of other permanent mangrove forests, especially those near populated areas, shall be re-evaluated for possible application of family- or community-based management schemes to ensure their protection and prevent an 'open-access' situation.

Rehabilitation of degraded sites must also be undertaken with priority given to islands among the 7100 in the archipelago vulnerable to the 20–30 typhoons that yearly wreak havoc on lives and property (Primavera, 1993). Aside from coastal protection, each hectare of protected or restored mangroves can contribute 600 kg each of fish and shrimp (Sasekumar and Chong, 1987; Singh et al., 1994) to artisanal catches based on the nearshore mangrove-fisheries linkage earlier discussed, thereby providing food and income to fisherfolk.

Mangrove planting projects shall follow biophysical criteria, e.g. suitable species, sites and seasons, to avoid the high mortality rates of many DENR programs. Socioeconomic factors such as local knowledge and skills, social organization and institutions, land use and tenure must also be considered in mangrove restoration programs

(van Mulekom and Tria, 1997; Walters, 1997). The costs of planting 1 ha of mangrove (*Rhizophora*) at 0.5–1.0 m spacing is US\$40–80/ha in Central Visayas (Cabahug et al., 1986). In Thailand, replanting mangroves costs US\$946/ha (3758 baht/rai) compared to only US\$189/ha (757 baht/rai) for protecting existing mangroves. Still, these are less expensive options compared to rehabilitating abandoned shrimp ponds which requires US\$13 750/ha (55 000 baht/rai) (Sathirathai, 1997).

All government-leased brackishwater ponds shall remain as public lands and not be alienated for private ownership (to counter a strong industry lobby). The privatization of these public lands (80 000 ha in 1994) will pre-empt future government efforts to restore former mangrove areas. Abandoned or undeveloped ponds shall be returned to DENR management for rehabilitation.

Fees for aquaculture ponds shall be increased to encourage efficient pond utilization and capture economic rent that can provide funds for mangrove rehabilitation. The Fisheries Sector Program study recommended rates of US\$360–800/ha per year (Schatz, 1991) whereas Evangelista (1992) suggested US\$130/ha per year based on economic rent of shrimp/milkfish ponds which approximates the US\$120–600/ha per year market rental fee for privately held ponds (White and de Leon, 1996).

#### 4.2. Mangrove-friendly aquaculture, ICZM and community-based CRM

Mangroves and aquaculture are not necessarily incompatible. For example, seaweeds, bivalves and fish (in cages) can be grown in mangrove waterways; and crabs, shrimp and fish in aquasilviculture or integrated mangrove ponds and pens (SEAFDEC AQD, 1999). Such mangrove-friendly aquaculture (MFA) technologies are amenable to small-scale, family-based operations and can be adopted in mangrove conservation and restoration sites.

MFA and mangrove management projects shall be in the context of a wider integrated coastal zone/area management (ICZM or ICAM) that coordinates the needs of various sectors: fisheries,

aquaculture, forestry, industry, etc. Management of mangroves and other marine habitats shall be community-based, in cognizance of the role of local residents as users and day-to-day managers of coastal resources (Ferrer et al., 1996). Community involvement in the planning and implementation of coastal resource management (CRM) projects and sharing in the benefits of such interventions will contribute to the success of CRM.

Aside from community participation, co-management of CRM with local government units (LGUs) is also important, especially in the context of the Local Government Code (see Section 3.5). Local government officials are responsible for the enactment of ordinances pertaining to marine conservation and rehabilitation and their enforcement, i.e. the apprehension and punishment of violators. When local officials of Sumilon Is., Cebu, and Cogtong Bay, Bohol, were replaced during elections by politicians not supportive of CRM projects, illegal fishers made a comeback, sanctuaries were violated and fish catches drastically declined (White, 1989; Janiola, 1996; Katon et al., 1998).

Aside from local government support, property rights and community involvement, other factors important in CRM initiatives are effective educational programs, supplementary livelihood options, and external technical expertise and funding (Heinen and Laranjo, 1996; Janiola, 1996). Although the Nearshore Fisheries component of CVRP-I improved fish catches and household incomes for the shortterm, the project had shortcomings such as weak leadership, lack of LGU support, ineffective information dissemination, inadequate technical expertise and follow-up (delos Angeles and Pelayo, 1995).

#### 4.3. The role of government

There is a need to rationalize government policies and reconcile conflicting laws on mangrove conservation and management. Also important is the dissemination of such policies not only to coastal residents, but also among government extension workers responsible for enforcing forestry and fisheries laws. For example, local governments should stop the widespread practice of

accepting payments of real estate taxes on mangroves (as a means of raising much-needed revenues) and their corresponding declarations, which clearly violates the protection conferred on mangroves by national laws (Tables 5, 6).

Moreover, organized communities and committed leadership can only achieve limited success unless tenure or property rights are granted to resource users to improve sustainability of mangrove restoration and other marine interventions (Katon et al., 1998). Legal tenurial instruments such as CSCs and MSAs legitimize the de facto claims of local communities over coastal resources. By ensuring security to land and allowing selective harvest of mangrove products for livelihood, these renewable 25-year contracts encourage community participation and local responsibility.

The coordination and support of local government units (LGUs), national government agencies and non-governmental organizations (NGOs) is essential. LGUs and NGOs can facilitate community organizing and strengthening of local associations and cooperatives. The DENR and other national agencies can provide planting materials, monitoring and technical backstopping.

#### 4.4. *External development assistance*

There is a need for international development banks, bilateral funding sources and other external assistance agencies to invest in the restoration of mangrove habitats (and agricultural lands) damaged by shrimp and other aquaculture, and to stop supporting the further expansion of unsustainable shrimp culture in the Philippines and tropical Asia (Primavera, 1998).

In 1985–1989, only 0.1% of total external assistance to fisheries went to environmental protection in contrast to 27.9% for aquaculture (Insull and Orzescko, 1991). Guidelines for socially and environmentally responsible aquaculture are embodied in the NGO Statement on Sustainable Aquaculture and the Choluteca (Honduras) Declaration, both issued in 1996, and the 1997 FAO Guidelines for Responsible Fisheries (Aquaculture Development).

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