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USE OF MANGROVES FOR AQUACULTURE: MYANMAR

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OVERVIEW OF MANGROVES FOR AQUACULTURE

Mangroves Areas

The Union of Myanmar, with an area of 676,577 km² and a long coastline of about 2831.84 km is rich in aquatic resources. Myanmar's coastal line can be divided into three coastal regions, the Rakhine Coastal Region, the Ayeyarwaddy and Gulf of Mottama Region (the Delta Zone) and the Tanintharyi Coastal Region.

Myanmar has extensive mangrove forests in Ayeyarwady Delta, Rakhine and Tanintharyi. The recorded forests of these areas are: Rakhine 64,752 ha, Ayeyarwady 177,256 ha, and Tanintharyi 140,024 ha (Table 1).

Table 1. Distribution of mangroves in Myanmar

<i>Location</i>	<i>Area (ha)</i>	<i>Percent (%)</i>
Rakhine State	64,752	16.9
Ayeyarwady Division	177,256	46.4
Tanintharyi Division	140,024	36.7
Total	382,032	100.0

Role and Potential of Mangroves in the National Economy

Mangrove forests provide a wide range of goods and services from which local people in coastal areas have benefited from time immemorial. The wide range of direct and indirect products from mangroves include the following:

- Under favorable conditions, mangrove trees *Rhizophora* (“byuchidauk”) can grow big. In the Asia-Pacific region, “byuchidauk” is not normally used as timber, but it is used for walling and flooring in Myanmar.
- *Heritiera formes* (“kanazo”) is the prime timber species used for house and boat construction, while the top portion of the tree is used for firewood.
- Poles from mangrove trees is in great demand for fishing stakes by coastal fishers, it is also used in the construction industry.
- Firewood and charcoal are the main products of the Delta people. “Kanazo”, the most favored charcoal-making mangrove species has now become rare.
- The versatile Nipa palm provides useful products to traditional village communities living near or in the coastal and estuarine mangrove forest areas. A variety of products are obtained from the leaves, the juice or sap from the inflorescence stalk, and the fruit. As its uses continue, it has become a cottage industry and a commercial operation. Nipa palm leaves have traditionally been harvested for roof thatching and for walling. In fishing, Nipa leaf petioles are used as float for fishnets, the axes for poles and as rope. Nipa is also used to produce vinegar, alcohol, and other fermented beverage.

Role of Mangroves as Fishery Resource

The importance of mangrove to fisheries is apparent especially for the white (banana) shrimp (*Penaeus merguensis*), the most important shrimp species in Myanmar because it is dependent on mangrove forests for shelter during its juvenile stage. Other shrimps, which also depend on mangroves at certain phases of their life cycle include *P. monodon*, *P. indicus*, and *Metapenaeus* spp. The larvae, post larvae and juveniles of some penaeids enter the estuarine mangrove areas in Myanmar.

Aquaculture has a long tradition in Southeast Asia, using constructed ponds and lakes. With the region's rising population and with seas getting crowded with fishers, there has to be other ways to satisfy the demand for additional fish protein. The potential for aquaculture in Myanmar is so good that a large part of the food demand can be met by expanding aquaculture thus taking the pressure off the "wild stocks." Aquaculture and mariculture give small-scale fishers a chance to widen the scope of their activities and provide them additional profits. These may be the best long-term possibilities that would enable a lot of people to stay in the fishing sector. Coastal aquaculture also has the greatest potential for future development.

Fish has always been the main source of protein for Myanmar's people. The consumption rate of seafood is estimated to be 18 kg/person/yr. Myanmar practices extensive fish farming particularly in the Rakhine State adjacent to Bangladesh. While the shrimp industry has developed rapidly in ASEAN countries, Myanmar has just embarked on modernizing this industry.

Myanmar's shrimp farmers are fortunate as they learn from the mistakes of other countries. The focus of technological development of the country's shrimp farming is the reduction of the environmental impact making more efficient the use of increasingly scarce resources. Myanmar's shrimp culture industry can incorporate these advances through technology transfer and adaptation.

Culture of marine shrimps is a major earner for the country's foreign exchange. There are about 12,000 ha of traditional fish farms in operation, which are mainly located in the Rakhine State. However, the yield from shrimp culture has been very low, about 100 kg/ha/year. The culture of sea bass (ka-ka-dit), grouper (kyauk-nga), is still on a pilot-scale.

The Myanmar Government considers aquaculture in general and shrimp farming in particular, high priority for its economy. Shrimp farming is potentially a very large generator of foreign exchange. If the 40,000 ha pond area can be brought under semi-intensive culture, the export income could be US\$400-500 million. The Government's State Peace and Development Council, has established a special program for shrimp culture development. It endorses a strategy, which prioritizes semi-intensive culture as the main vehicle for shrimp culture development. The current government policy supports and encourages foreign investment in shrimp culture.

PROTECTION AND DEVELOPMENT OF MANGROVE AREAS

Mangrove area is one of the most productive areas, for it helps maintain the food web in aquatic environment, protects the soil, moderates salinity, and provides timber, fuel wood, charcoal and a range of non-forest products. Wild life inhabits Myanmar's mangrove forests, among these are four species of marine turtles (loggerhead turtle, green turtle, hawksbill turtle and olive ridley turtle), the crocodile, the hog deer, wild pig, wild clog, Jackal, Samber deer, other monitor lizard, wild cat, and elephant.

The environmental problems that Myanmar is facing today are not the ones associated with industrialization and urbanization but those related to deforestation and loss of biodiversity. Although Myanmar has a relatively low population density compared to other countries in the region, its forest resources and natural environment have come under growing pressure. However, deforestation in Myanmar, unlike in some other developing countries, is not the result of commercial extraction of timber but due mainly to cultivation.

There are 65 fish and mollusc species and 13 crustacean species harvested commercially. The most important in terms of market value are “hilsa” and sea bass. Economically important crustaceans include the mud crab, freshwater prawn and tiger shrimp. Two rice crops per year are possible in freshwater areas, but only single cropping is feasible in brackishwater areas. The rice crop in the later is produced during the southwest monsoon (rainy season). Potable freshwater becomes scarce during the northeast monsoon (dry season).

In Myanmar, there are more than 1.8 million acres of deforested area and among them 100,000 acres has been restored annually. Among the many different types of forests, the temperate forests is of economic importance. However, as a consequence of rural population growth, some forests have been cut down for fuel. The Government is now undertaking serious measures to eliminate this by providing alternative wood substitute for fuel.

The Myanmar Forestry Department in collaboration with the Food and Agriculture Organization implements the Environmentally Sustainable Food Security and Micro-Income Opportunities in the Ayeyarwady (Mangrove) Delta Project (MAY/96/008) in the towns of Laputta and Bogalay. The project area is tidal and heavily influenced by brackishwater intrusion. Three salinity regimes were identified within the project area: freshwater, low salinity and high salinity. In the freshwater area, there is no brackishwater intrusion, although the influence of the tide reaches well into the regime. Freshwater-emergent vegetation and nipa inhabit the mid-to upper intertidal zone.

Sustainable forest management (SFM) becomes the key concern for our environment. As there has been a tremendous growth of technology, these have led to negative impacts on the environment. The most significant example is the erosion of ozone layer. Other impacts are that of El Niño and La Niña, which hit many parts of the world in recent years. With natural disasters as the consequences of deforestation, the Forest Principles should be environmental protection.

LAW, RULES, REGULATIONS AND POLICIES ON MANGROVES

Myanmar is occupying 167.18 million acres of land with forest that covers 85 million acres comprising tidal forests, swamp forests, evergreen forests, and dry zone forests.

The Government of the Union of Myanmar has promulgated a new Myanmar Forest Policy in 1995, in line with Myanmar’s forest policies focusing on the protection of nature and sustainability of natural resources, on satisfying the basic needs of the people, and on the participation and awareness of the people in biodiversity conservation. The old Wildlife Protection Act of 1936 was replaced with the “Protection of Wildlife, Wild Plants and Natural Area Law” in June 1994 in order to rehabilitate threatened wildlife and sanctuaries.

The key fisheries legislation of the Union of Myanmar include:

- The Freshwater Fisheries Law;
- Law Relating to the Fishing Rights of Foreign Fishing Vessels;
- Law Amending the Law Relating to the Fishing Rights of Foreign Fishing Vessels;
- Myanmar Marine Fisheries Law; and
- Law Amending the Myanmar Marine Fisheries Law.

The Department of Fisheries (DOF) controls aquaculture development by identifying suitable areas and allowing farms only in identified zoned area. (e.g., the Chaungtha and Kyauktan Shrimp Culture Zones). The identified area should have a master development plan, i.e., the area is subdivided into farm lots. Construction of the access road is undertaken by the government as well as the main water supply system and discharge canals while electricity for the zoned farms are also provided by the government.

Policies on fisheries management

The national fisheries policies on Socio-economic Development have the following objectives:

1. To step up the productivity and production by the exploration of fishery resources within the Maximum Sustainable Yield (MSY);
2. To develop and increase aquaculture technology and production;
3. To increase fish production for self-sufficiency and export of the surplus;
4. To develop quality assurance, standard, safety and wholesomeness of aquatic products;
5. To promote fishery research and to protect fishery resources and the environment; and
6. To upgrade the socio-economic status of fishing communities.

RECOMMENDATIONS

The following recommendations are made to improve the coastal zone management in Myanmar:

1. Conserve national resources
2. Maintain and restore mangrove forests
3. Eliminate deforestation by providing alternative wood substitutes for fuel, income-generation activities based on resources
4. Implement a sound program for the proper utilization of mangroves in the country, by solving some of the constraints through
 - (1) Promoting awareness among the public on the importance of mangroves for the environment and the country's economy
 - (2) Promoting a clear understanding on the ecology of mangrove forests
5. Adopt coastal zone management approach involving close cooperation between line agencies on the national and local levels
6. Develop regulations for comprehensive management in coastal zone and marine resources exploitation
7. Define clear responsibilities of agencies, departments to strengthen the institutions involved, to improve coordination and regulation
8. Develop coastal and marine environmental monitoring and marine resource information system
9. Encourage mangrove-friendly aquaculture practices in the ASEAN region

INFORMATION ON LAND USE

A summary on policies on land use including mangroves in Myanmar, is shown below:

1. Primary mangrove forest areas are dedicated for forestry purposes or as game sanctuaries or source of timber;
2. Secondary mangrove forests with thick mangrove trees can be declared as potential forest areas;
3. Other inter-tidal areas such as marsh lands and secondary mangrove areas with short mangrove trees or shrubs can be declared as fallow land to be utilized as paddy land or aquaculture area;
4. Use of land for aquaculture should be permitted by local government;
5. Commercial macro-farms for local and foreign investments are allowed by the Government according to the laws and regulations as prescribed by the Myanmar Investment Commission;
6. The term of lease is usually 30 years and can be passed on through generations in accordance with the pre-agreed terms and conditions.

CONCLUSION

Aquaculture has only started to develop rapidly in the past few decades, due to better knowledge of culture species, improved methodologies and techniques in breeding, nutrition and increasing demand for food fish of high-value species such as shrimps, sea bass and groupers.

Mangrove deforestation has an impact on shrimp culture itself, the success of the latter (when traditional culture method is used) depends on stocking of wild fry. For semi-intensive and intensive shrimp culture, the number of wild caught spawners may decrease because wild shrimp populations also use mangrove swamps as its feeding ground.

Other negative effects of mangrove destruction to make way to shrimp ponds, include water pollution from pond effluents, sedimentation from the release of solid materials from pond, interruption of the tidal water flow, dwindling natural shrimp and fish stock due to increased pollution or product contamination due to indiscriminate use of chemicals.

Chemicals and drugs (antibiotic) should not be used in fish and shrimp culture for prevention and control of bacteria and viral diseases. In order to ensure the sustainable development of aquaculture, it is important to bear in mind the interdependence of technology and natural resource under various socioeconomic setting.

FOR THE REGIONAL GUIDELINES: INITIAL INPUTS

The following initial inputs were provided by the country representative for the preparation of the Regional Guidelines on the Responsible Use of Mangroves for Aquaculture:

1. 30-40% of total mangrove areas may be allowed for aquaculture purposes;
2. Countries exceeding this limit may have to reduce their areas and conform with the provisions in the guidelines;
3. Countries that have not yet reached the limit would be provided the necessary guidance in order that further development should be sustainable;
4. 100 m from the shoreline should be conserved or rehabilitated as green belt;

5. In order to mitigate the mangroves, environment-friendly aquaculture should be practiced;
6. Environmental Impact Assessment (EIA) should be established in aquaculture to be assessed in a regional workshop organized every two years;
7. Public awareness should be regularly conducted through on-site training;
8. Socio-economic status of the rural people should be evaluated after which efforts should be made to improve standard of living by providing the rural people with appropriate technologies and related incentives;
9. The land use policy of each country should be made clear to its people especially from the technology point of view;
10. The impact of effluents from shrimp farms on the environment should be reduced (e.g., coastal water quality, hydrology, aquatic organism, mangrove and terrestrial vegetation);
11. The introduction of exotic species should be investigated;
12. The production cost of mangrove-friendly aquaculture should be made economical;
13. Encourage the integration of green water technique with seaweeds and bivalves as biofilters in a closed re-circulating shrimp pond system; and
14. Information on any technology developed should be published and disseminated to the region as fast as possible.