

FB02

Shrimp farming, mangrove depletion and environmental governance: A case study on the coastal region of Bangladesh

Sanzida Akhter, *Independent University, Bangladesh*

Abstract— Mangroves are one of the boons nature has provided us with. Bangladesh is also blessed with such kindness of nature. However, we have failed to realise the importance of such blessings and have been depleting mangroves for years. One of the major causes of the depletion is the adoption of inappropriate policies and poorly defined property rights structure in the coastal region of the country. This paper analyses one such policy implications regarding shrimp farming in the mangrove forest. In addition, issues concerning the property rights system in the same region are analysed.

INTRODUCTION

The mangrove forest of Bangladesh is a unique aspect of the coastal region of the country. It is also the largest block of mangroves of the world. This ecosystem is crucially important to support the diverse aquatic species of the region. These deltaic mangroves also sustain a number of endangered species of flora and fauna that are almost extinct elsewhere [1]. In addition, mangroves are critically important for a number of ecological services including protecting the coast from storm surges, providing breeding grounds to fish species, acting as a fish nursery and providing subsistence support to the local communities. Unfortunately, this unique forest has been severely exploited over the last two decades. Studies show that the mangrove cover is declining annually at a rate of 3.7 percent over the last 20 years (ADB, 2005). If the present trend of depletion continues, the coastal mangrove forest of Bangladesh will soon become a barren tract. Therefore, analysing the major causes and cures of such depletion is an important environmental, social and economic issue.

There is a range of possible causes (such as coastal area development, population growth, lack of regulations and monitoring, improper forest management practice and other industry activities) of mangrove depletion; however, analysing them all is beyond the scope of this short essay. The essay, thus, focuses on commercial shrimp farming, which is one of the major threats to mangroves as identified by recent studies [1]. Large scale commercial farming of shrimps emerged in Bangladesh during the mid 1980s [3]. The government adopted a number of policy instruments, including subsidising the industry, to promote its growth. However, most policies have exacerbated the environmental degradation associated with the industry. Degradation was also significantly influenced by ill-defined property rights and complex institutional setting. The aim of the essay is to analyse the implications of shrimp industry subsidy and property rights issues on the mangrove resource management.

The essay is divided into several sections. Section One analyses the development of the shrimp industry in Bangladesh as a major cause of mangrove depletion. Section Two analyses the subsidisation policy as a governance instrument and its associated social and environmental impacts. Section Three focuses light on the interaction between shrimp farming, property rights and

institutional issues. Section Four provides relevant recommendations and Section Five concludes the essay.

GROWTH OF THE SHRIMP INDUSTRY IN BANGLADESH

Shrimp aquaculture is not a recent phenomenon for the indigenous people of the coastal region of the country. Local people have been practicing the traditional coastal aquaculture known as 'Bheri-culture' for centuries in the mangrove swamps [4]. During the dry season they used to grow shrimp in the brackish water that drained from the sea through canals and rivers into the swamps, and during monsoons they grew rice on the same patch of land. They obtained both fish and rice from the same land. Their practice was sustainable and conducive to the regenerative capacity of the environment since there was no fry harvesting and stocking, no use of fertilisers, artificial feeding and aeration. Most of the harvested shrimp were consumed locally and some were sold in the adjacent markets. Historically, the practice of 'Bheri-culture' was environment friendly and un-exploitative [5],[6].

During the 1970s, demand for shrimp was growing steadily in the world market and a number of countries such as Thailand, the Philippines, India, Taiwan and Indonesia started exporting shrimp [7]. Several Bangladeshi businessmen also started operating small scale shrimp farming in the coastal mangrove swamps to export shrimp. In the early 1970s shrimp exports from Bangladesh were worth US\$ 2.9 million which accounted for only one percent of the total export from the country. However, by the mid 1980s this sector had grown rapidly and shrimp exports increased to US\$90 million by 1990 [4]. At present the shrimp farming industry is three-fold larger in terms of physical size than in the mid 1980s. Covering more than 145000 hectares of the mangrove swamp area, over 9000 farms are operating in the coastal region [4]. The current number of farms is beyond the sustainable capacity of the region as indicated by ADB (2005).

The farm owners are primary stakeholders of the industry. Most of them are rich businessmen who hire either local or outside farmers to manage their shrimp ponds [8]. The locals have insufficient capital to practise commercial shrimping. Studies in one of the villages in this coastal region of the country indicates, of 500 households only 21 were involved in the shrimping business, and only 10 of them are directly involved as farm owners [9]. These particular households occupy only one percent of the shrimp farming region compared to the 99 percent occupied by outside businessmen. Most farm owners are also exporters directly involved in the commodity chain of production and export. In addition, there are a number of retailers who purchase shrimp from the owners. Adoption of intensive farming by most farms in the 1990s led to the establishment of other industries which are related to the shrimp production process - pharmaceuticals, hatcheries, processing plants, feed sellers and agro-chemicals

processing. Besides, two state agencies are involved in regulating the industry. The Forest Department (FD) is responsible for the mangrove protection and use, and the Ministry of Fisheries and Livestock (MOFL) is responsible for the regulation and promotion of the shrimp industry [11].

Overall, the shrimp industry has expanded unsustainably over the years by clearing mangrove swamps. However, industries cannot threaten the natural resources they depend on if appropriate governance measures are in place. Therefore, in effect, the industry by itself may not be blamed for the mangrove depletion. Rather, an improper government incentive that has promoted unsustainable growth of the industry is the root cause of the deforestation.

SUBSIDISING THE SHRIMP INDUSTRY AND ITS SOCIAL AND ENVIRONMENTAL IMPACT

As part of establishing a newly emerged nation during the 1970s, the government of Bangladesh undertook major structural reform [1]. The time was particularly pertinent for promoting the shrimp industry given the prevailing high demand of shrimp in the world market. The government adopted a number of policies to encourage export oriented activities, hence, decided to subsidise the shrimp industry to encourage its development. This policy offered input and production subsidies to all the new entrants. Furthermore, an export subsidy was offered to increase foreign exchange inflow to the economy. A number of indirect subsidies such as free water and land, and low sanctions were put in place along with lack of regulations. A substantial number of businessmen were attracted to enter into the industry as a result [8]. By the end of the 1980s, the industry was growing rapidly, at a rate of 80 percent per annum. However, the policies were solely targeted at industry growth; no proper guidelines were developed for regulating the industry activities in terms of environmental protection.

Impact of subsidisation

A huge body of literature criticises subsidies to fisheries because of their adverse impacts on resource management [11]-[13]. In light of this literature, the impacts of subsidising the shrimp industry is analysed from two perspectives: the impacts on income distribution and the impacts on resource management and sustainability.

Distributional impact

Financial assistance provided by the government to an industry can be regarded as a subsidy, for example the provision of shrimp production inputs at below market cost. Export subsidies can be defined as a payment to a farm or individual that ships a good abroad [13]. The economic rent generated by production and export subsidies induces the expansion of shrimp farming. Farmers further respond to the export price incentives up to the point where the domestic price exceeds the foreign price by the amount of the subsidy. This has an obvious impact on the distribution of income between the stakeholders involved in the supply chain. The farm owners gain by receiving the production subsidies and a share of the export price subsidy; exporters also gain from the latter. As shrimps are diverted to the more lucrative

export market due to the export subsidy, the local consumers are worse off due to the price increase of shrimps in the domestic market. The government is worse off because it has to expend money on the subsidy. Though the industry earns a substantial amount of foreign exchanges, the net benefit is hardly positive as considerable amount of that revenue has to be spent on the subsidisation. In addition, policies like subsidies alter market risks, rewards and costs, and thus give distorted picture of the real benefits, costs and their distribution.

The subsidisation policy – as an incentive for the producers to enter into the business and to export more to the world market – generates an adverse distributional outcome across the stakeholders. Shrimp farmers, the major shareholder of the benefit, as a result are attracted to expand the industry to the maximum extent.

Impact of subsidy on mangrove ecosystem and industry sustainability

The subsidy policy undermines the importance of surrounding ecosystem by promoting unsustainable expansion of the industry. The consequence has been unprecedented mangrove clearance. As the industry depends on the finite amount of mangrove ecosystem, clearing more mangroves also makes the industry untenable for future farming [1]. In addition, due to the absence of regulations on farm activities, the farmers do not check their effluent quality. They discharge the untreated water from the shrimp ponds into the adjacent land or sea. Improper farming shortens pond longevity, hence the farmers move to a different place and clear more mangroves, pollute more land and water. The 'economic zone' of the forest is almost saturated for further farming and lands in the designated conservation zone are being encroached by the shrimp farmers. Furthermore, shrimp farming poses a number of external costs on the adjacent areas. These include salinisation of the nearby region due to sea water infiltration, lowered water tables due to the use of fresh water in the ponds, and reduced fish diversity due to the loss of nursery.

The coastline of Bangladesh stretches for 580 kilometres on the Bay of Bengal. In the mid 1960s, 70 percent of the coastline was covered with dense mangrove forest. From 1985, since the introduction of subsidisation, till 2005, the area of mangroves was halved (ADB, 2005). While there were other factors such as population growth and coastal area development which has contributed to mangrove loss, recent estimates suggest that up to 50-60 percent of the mangrove loss has been due to rapid shrimp farm expansion since 1985. To facilitate the industry activities a number of roads, dikes and dams were built at the end of 1980s which further reduced the mangrove cover.

Overall, the initial objective of the government was quickly realised as the subsidy helped to expand the industry. However, the realisation had a cost of huge mangrove forest conversion. Subsidisation has promoted unsustainable growth of the industry, which in turn has caused unprecedented mangrove loss. This is an example of improper government policy leading to excessive resource depletion as argued by Ascher [14]. Subsidisation underpriced the costs of mangroves to exploiters, which in turn caused over exploitation of the valuable resources. The above analysis also shows that the social

consequences and environmental externalities generated by the industry due to subsidisation are rarely incorporated in the governance decision making process. Moreover, the exploitation of the resources is further accelerated due to ill defined property rights and a complex institutional setting in the coastal region of the country.

COASTAL COMMUNITIES, SHRIMP FARMING & MANGROVE LOSS: PROPERTY RIGHTS AND INSTITUTIONAL PERSPECTIVE

The FD has the legal authority to protect and manage mangrove forests [1]. Major legislation influencing the management and conservation of mangroves include the Forest Policy 1955, Forest Policy 1962, Forest Policy 1979, Forest Policy 1994 (ADB, 2005). Under the current regulations, mangrove areas are divided into two zones – economic and conservation. The conservation zone includes both the existing and the newly planted mangroves. The economic zone includes a multiple-use area to ensure the sustainable use of mangroves.

The communities living in the coastal zone have traditional rights to the land and depend on the mangroves for their subsistence requirements. The principal means of their livelihood has been seasonal fishing in the brackish water of the mangrove swamps and rice cultivation. In addition, the forest has remained a sole source of their medicinal and housing necessities. Studies show that the traditional customary rules and regulations regarding the forest resource use evolved due the communities' dependence on the mangroves [6]. These rules are embedded in their social norms and used to define the access and extraction rights of the users and govern the forest resource use patterns. However, these rules and regulations or the local institutions are not yet recognised by the state [1] though the current constitution encourages people and communities to participate in the management and conservation of mangroves. As a result, there has been an underlying tension between the local and formal institutions over many years.

Further, implementation of the Forest Reserve Act 1975 confined the communities within the economic zone only. This decision of the government marginalised the communities by ignoring their traditional customs of resource extraction. This policy also ignored the fact of population growth in the region. Demarcating the economic zone left fewer resources for them in the face of the growing population [15]. On top of that, the allocation of the access and extraction rights by the state to the shrimp farmers worsened the situation and further marginalised the communities by imposing resource sharing with these additional powerful stakeholders. In addition to accessing the economic zone, many farmers obtained rights to the conservation zone through bribing officials. Studies show that as shareholders of shrimp businesses, some high level officials and political elites are involved in local patron-client networks. These activities have apparent adverse impacts on the mangrove resource.

Marginalisation of the locals, the limited capacity of the FD to monitor and enforce the laws and corruption among the state officials has consistently contributed to the overall deterioration of the forest. Moreover, the overlapping institutions and property rights have depressed the social climate at the local level and led to

conflict among the stakeholders, which facilitates further resource depletion. Based on the above analysis Table I demonstrates the institutional and property rights matrix of the coastal mangrove region.

Table I⁴ Institutional matrix and property rights structure of the major stakeholders

Institutions	Customary Local communities	State FD	Commercial Shrimp farmers
Form of rights and authority	Local, customary	State, legal	Private (obtained from state), legal and illegal
Source of power	Customary law	Political & coercive	Coercive and economic
Form of control	Shared cultural	Coercive	Monopoly of interest

Although the state through the FD ostensibly owns and controls mangrove areas, in practice they are *de facto* open access areas onto which anyone can encroach. Moreover, since local institutions are not recognised by the law, the community also fail to protect the resources when the shrimp farmers illegally enter into the conservation zone. Further, local people are displaced due to the expansion of the shrimp farms as they do not have any legal title to the land other than the traditional *de facto* rights. People are also displaced due to the environmental degradation in the surrounding region as a result of the discharge of effluents from the farms. The flow of benefits the local communities used to derive from the mangrove forests is drastically reduced as a result of the degradation of the environment. As a result, the expansion of shrimp industry not only threatens the environment but also local subsistence by converting mangroves.

Overall, it appears that the locals have little bargaining power in protecting the resources when faced with powerful stakeholders [7]. Moreover, analysis above indicates that property rights play a significant role in the local communities' decision to participate in the conservation in order to secure rights to land and resources they possess *de facto*. Therefore, to create incentives for them, the recognition of local rights to these resources is vital. There is substantial evidence that, in similar cases throughout the developing world, common property can be an effective management regime for common pool resources such as coastal mangroves in Bangladesh [16]. In fact, if exclusivity is well enforced, a common property regime can approach to private property for the group. A secured communal property regime is vital for ensuring the net long-term streams of benefits from cooperation. In the case of the coastal mangrove region of Bangladesh, it is therefore essential that the rights of local communities be well recognised by the law to ensure better local management of the mangrove resources. To devise a pragmatic solution in this regard, the next section discusses possible recommendations.

⁴ Based on author's analysis.

RECOMMENDATIONS

Two clear policy recommendations emerge from the above analysis. First, there is a need to address the main policy failure at the heart of the economic incentives for excessive conversion of mangrove areas to shrimp aquaculture. As long as government policies continue to subsidise shrimp farms establishment and production, both directly through underpricing inputs and indirectly through not requiring shrimp pond owners to control the external costs of water pollution and mangrove depletion, this activity will remain excessively attractive to commercial investors. There is also an urgent need to address the main institutional failure in terms of poorly enforced property rights concerning management of mangrove resources. The present law and formal institution in Bangladesh do not allow coastal communities to establish and enforce their local rules effectively [1]. Nor do the current institutions and laws provide the incentives to the local and other resource user groups to resolve conflicts among stakeholders.

Improving the Incentive Structure

The government can take the following steps, first, as an export earning commercial activity, all input in shrimp aquaculture should be priced at border-equivalent level and all preferential subsidies for the inputs used for farming should be ended. Second, laws and regulations should be promulgated for the development of waste water treatment system for shrimp farming. Third, several options are available for controlling the loss of mangroves resulting from the establishment of the farms. Each farm can be charged to fund for mandatory replanting and rehabilitation of all mangroves forests damaged or destroyed by the shrimp farm.

In addition, restrictions can be imposed on farms to select coastal land to operate and concession fees can be charged for the mangrove areas that are converted. These fees should be sufficiently high to reflect the foregone value of the mangrove and other coastal resources. The revenues generated by this scheme can be used to compensate the local communities and finance the technical and educational support for the local organisations participating in managing the mangrove forests.

Improving the Institutional Framework

Allocating a properly defined right of the resource to the locals should be the foremost step in protecting the mangrove forest. Then, the policy recommendations for a new institutional framework for mangrove management in Bangladesh can take the following form. First, a strict prohibition on the use and conversion of preserved mangrove forests should be issued in any area designated as a conservation zone. Second, establishment of community mangrove forests can be encouraged. However, the decision to allow such local management efforts should be based on the capabilities of communities to enforce their local rules effectively and manage the forest sustainably. In addition, active participation of all stakeholders such as government agencies, local communities and other user groups should be encouraged for a successful community forest management regime. Finally the government must provide technical,

educational and financial support for the local community organisations participating in managing the mangrove forests. Moreover, conflicts between local communities and outside users or other management problems that are beyond the capability of the local communities should be resolved by the active intervention of the state.

CONCLUSION

Mangrove forests are a crucial component of coastal resources that are valuable and significant in terms of forestry, fisheries and the protection of the quality of the coastal environment. Strongly influenced by the economic incentives provided by the government, the development of commercial shrimp farming over the last few decades is acting as a primary force behind the depletion of the valuable ecosystem. In addition, poorly defined and enforced property rights and overlapping institutions also exacerbate the depletion process by promoting conflict among the stakeholders. Keeping the importance of such a unique ecosystem in mind, urgent steps should be taken by the government in terms of property rights and institutional issues and an economic incentives structure if the mangrove forest is to survive long into the future.

REFERENCES

- [1] S.M. Islam and A. Wahab, "A review on the present status and management of mangrove wetland habitat resources in Bangladesh with emphasis on mangrove fisheries and aquaculture", *Hydrobiologia*, vol. 542, 2005, pp.165-190.
- [2] Asian Development Bank, *Development perspectives of the Forestry Sector Master Plan*, Ministry of Environment and Forest, Government of the Peoples' Republic of Bangladesh, 2005.
- [3] S.M. Islam and M. Haque, "The mangrove-based coastal and near shore fisheries of Bangladesh: ecology, exploitation and management", *Reviews in Fish Biology and Fisheries*, vol. 14, 2004, pp. 153-180.
- [4] S.M. McLachlan, *Export-oriented shrimping, rural people and environment in Bangladesh: Good, bad and simply ugly?*, Dhaka: The University Press Ltd, 2003.
- [5] FAO, *Global Characterization of Inland Fishery Enhancements and Associated Environmental Impacts*, FAO Inland Water Resources and Aquaculture Service, Fishery Resource Division, FAO Fisheries Circular 945, 1999, p. 89.
- [6] M.S. Islam, "Perspectives of the coastal and marine fisheries of the Bay of Bengal, Bangladesh", *Ocean & Coastal Management*, vol. 13, 2003, no.2.
- [7] E.B. Barbier and S. Sathirathai, *Shrimp farming and mangrove loss in Thailand*, Cheltenham:Edward Elgar, 2004.
- [8] S.A. Ahmed, D.L. Mallick, M.L. Ali, and A.A. Rahman, AA, "Literature Review on Bangladesh Shrimp", European Commission INCO-DEV Project PORESSFA No.IC4-2001-10042, 2002.
- [9] A. Begum and S.M. Nazmul, *Social aspects of Shrimp aquaculture in Bangladesh*, Report prepared under the World Bank, NACA, WWF and FAO Consortium Program on Shrimp Farming and the Environment, 2002.
- [10] W.E. Schrank and W.R. Keithly, "The concept of subsidies", *Marine Resource Economics*, Volume 14, 1999, pp. 151-164.
- [11] FAO, Corporate document repository, ADB TA 1355- BAN UNDP/FAO BGD/88/025.
- [12] F.A. Khatun, D. Bhattacharya and M. Rahman, *Environmental Impact of Trade Liberalization and Trade-Related Policies on the Marine Fisheries Sector in Bangladesh*, Dhaka:Centre for Policy Dialogue, 2002.
- [13] P. Krugman and M. Obstfeld, *International Economics: Theory and Policy*, Boston:Addison Wesley, 2007.
- [14] W. Ascher, *Why Governments Waste Natural Resources: Policy Failures in Developing Countries*. Baltimore:The Johns Hopkins University Press, 1999, Chapters 1-2.
- [15] M.M. Mustafa, "A review of forestry policy trend in Bangladesh", *Policy Trend Report*, 2002 pp. 114-121.
- [16] E. Ostrom, *Governing the commons: The evolution of institutions for collective action*, Cambridge:Cambridge University Press, 1999.