Keynote Address: Seminar on the Sustainable Development of the North Western Province with the Protection of Environment organized by the Provincial Environmental Authority of the North Western Province for the Political leadership- 2002

Sustainable Management of brackish water shrimp farming industry in the North Western province

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Environmental issues

Brackish water prawn farming industry carried out in the western coastal region of the NWP has caused severe environmental problems.

Clearing of mangrove habitats for prawn farming has resulted in many environmental problems due to loss of their ecological functions. Mangroves, due to their extensive root system, are highly important to control erosion of the banks of water bodies. In addition, the mangroves serve as an important source of organic detritus in the aquatic environments due to shedding of plant parts i.e. leaves, floral parts, fruits, twigs, branches and bark. The aquatic ecosystems fringed by mangrove habitats are highly productive and support economically important detrital food webs. Clearance of mangroves for shrimp farming adversely affects these ecological functions. Clearance of mangroves, will contribute to an increase in the carbon dioxide content in the atmosphere due to reduction in carbon sinks and therefore, contributes for global warming too. Destruction of mangroves also results in erosion of the banks of the water bodies. Due to erosion, siltation of water bodies takes place resulting in a decrease in their carrying capacities as experienced in the Dutch canal. The reduction in carrying capacities not only reduce the volume of water available in the water body but also results in a reduction in the extent of environment available for aquatic fauna. Thus the reduction in carrying capacity will lead to a reduction in the population densities of aquatic fauna including commercially important fish and prawn species.

Increased erosion also results in an increase in the turbidity of aquatic environments due to suspended particles. As a result of increased turbidity, the amount of light penetrating into the water will be reduced. This will adversely affect the primary productivity of the aquatic environment by reducing the photosynthetic efficiency of aquatic flora including phytoplankton, sea grasses and other aquatic vegetation. Reduction in primary productivity adversely affects the productivity of the entire aquatic ecosystem. This leads to a reduction in the amount of food available to the organisms in higher trophic levels, ultimately resulting in a decrease in their abundance.

Suspended particles will clog the gills of aquatic organisms such as fish and bivalve mollusks and will also mechanically injure them. This will result in an increase in their mortalities. Further, some fish will move away from the silted area, resulting in a change in their spatial distribution pattern. This will adversely affect their fisheries.
Suspended matter will ultimately settle down on bottom covering the sea grasses and breeding sites of fish. This will adversely affect the photosynthetic efficiency of sea grasses

leading to a decrease in primary productivity. Covering of breeding sites of fish will adversely affect their reproductive success resulting in a decrease in their population sizes. Clearing of mangroves for the construction of shrimp farms will also result in a decrease in aquatic production due to decrease in organic detritus input because the amount of plant matter such as leaves, floral parts, fruits, twigs and branches shed into the aquatic habitat is reduced.

The micro-environment within the extensive root system of mangroves serves as nursery grounds for the juveniles of many species of fish and prawns. The young stages of marine prawns and some species of marine fish including grey mullets, spine foots and milk fish migrate from the marine coastal waters where they are born, to the estuarine waters and grow in the mangrove habitats. The epiphytic diatoms and other flora that grow on the mangrove roots and numerous other organisms which are abundant in this micro-environment serve as food for these young stages. Further, due to extensive root system of mangroves, they are protected from predators too. These individuals migrate back to coastal marine waters when they become adults. Due to clearing of mangroves, these micro-environments are lost resulting in a decrease in the abundance of fish and prawn populations, not only in the brackish water environments, but also in the coastal marine environments.

Mangroves also provide habitats for terrestrial fauna such as birds, amphibians, reptiles and mammals. These birds include migratory birds as well as resident birds. Clearance of mangroves and other vegetation for shrimp farming has resulted in the loss of habitats for these animals too. Along the western coastal belt of the NWP, as stated earlier, lies the migratory route of large number of bird species. Among the amphibians, reptiles and mammals that inhabit mangrove habitats are endemic as well as threatened species. Clearance of mangroves affects their populations too. Therefore, the clearance of mangroves for shrimp farming has significantly affected the biological diversity.

Construction of prawn farms has resulted in loss of grazing grounds for cattle too.

Construction of aquaculture ponds has also resulted in blocking of natural storm water pathways causing floods. Flooding will temporarily cover the habitats of terrestrial fauna with water adversely affecting their survival.

Construction of aquaculture ponds has resulted in a decrease in marshy areas too. The marshy lands not only serve as storm water absorbers but also provide habitats for many fauna some of which are endemic and threatened. Conversion of marshy areas into aquaculture ponds has resulted in the same adverse impacts on fauna and flora described earlier, such as loss of habitats and flooding.

The discharge of water from the aquaculture ponds has resulted in an increase in the nutrient loading into the water bodies of the area, especially the Dutch canal. Due to the establishment of large number of prawn farms, there had been excessive nutrients loading resulting in eutrophic conditions in the coastal water bodies, mainly the Dutch canal. Heavy eutrophication results in depletion of dissolved oxygen content in water at night or on cloudy days. This leads to increased mortality of some aquatic organisms, including fish and prawns which are commercially important.

The water discharged from aquaculture ponds contains silt too. Sedimentation of these silt leads to a reduction in carrying capacity of water bodies. Further, this silt will also increase the turbidity of the aquatic environment and ultimately settle down on bottom. This will result in the adverse impacts similar to those of increased siltation caused by erosion of the banks as a result of clearing of mangroves.

The NWP is rich in biological diversity. Loss of bio-diversity in the NWP has resulted due to many anthropogenic activities. The main reasons for biodiversity loss are clearing of forests for slash and burn agriculture, timber etc. and clearing of mangroves for aquaculture

Objectives of Sustainable Management of Brackish Water Prawn Farming Industry

Brackish water prawn farming industry has earned large amount of foreign exchange in the recent past due to the export of its produce. However, recently this industry has faced severe problems and the production as decreased drastically. The objectives of sustainable management of this industry are as follows.

i. Proper siting of aquaculture farms to minimize flooding.
ii. Maintaining the yield at the maximum sustainable level.
iii. Minimizing the spread of diseases of shrimps.
iv. Minimizing the intake of water from the natural environment.
v. Minimizing the environmental pollution due to discharge of effluents.
vi. Minimizing the destruction of mangrove habitats.
vii. Minimizing the impact on biological diversity.
viii. Rehabilitation of degraded environments due to prawn farming.

Recommended Action

Coordination and collaboration among central, provincial and local government authorities in the development and implementation of policies.

i. Proper siting of aquaculture farms without destroying and negatively affecting ecologically sensitive areas
ii. Designing and construction of aquaculture ponds in an environmental friendly manner
iii. Carrying out shrimp pond operations in an environmentally sustainable manner
iv. Proper siting of hatcheries
v. Proper designing and construction of hatcheries.
vi. Carrying out shrimp hatchery operations in an environmentally sustainable manner
vii. Carrying out good management practices in feed manufacture and supply
viii. Taking proper action by government agencies to ensure the sustainability of brackish water shrimp aquaculture
ix. Promote cluster farm concept among small scale shrimp farmers and established such clusters to minimize environmental impacts
x. Promote and develop the mother farm concept among shrimp farmers to minimize environmental impacts
xi. Continuous monitoring of environment quality of aquaculture ponds and their outlets.

To rehabilitate the already degraded environment in the area of prawn farming following action is recommended.

i.. Establishment of a mangrove belt of 10 m wide on either side of the Dutch canal. This will help to increase biodiversity in the area and prevent the erosion of the banks of the canal.

ii. Dredging of the Dutch canal to a depth of 1 m below the sea level to remove the silt. This will reduce the pollution load and increase the carrying capacity of the canal resulting in an increase in the abundance of the fish populations.

iii. Opening of the outfalls at Thoduwawa and Udappuwa and construction of an additional outfall at Palaviya. This will enhance the flushing of the Dutch canal resulting in a reduction in accumulation of silt and pollutants and an increase in the recruitment of fish and prawns from the sea.

Responsible agencies and time frame

	Action	**Responsible Agencies**	**Time frame**
I	Coordination and collaboration among central, provincial and local government authorities.	PMF, NARA, PEA, NAQDA	Continuous
Ii	Proper siting of aquaculture farms.	PEA, NAQDA, PMF, NARA, LG authority.	Continuous
iii	Proper designing and construction of aquaculture ponds.	NAQDA, NARA	Continuous
iv	Proper operation of ponds.	PEA, PMF	Continuous
V	Proper siting of hatcheries.	PEA, PMF, NARA, AQDA, PEA, PMF	Continuous
vi	Proper designing and construction of hatcheries.	NAQDA, NARA	Continuous
vii	Proper operation of hatcheries.	PEA, PMF	Continuous
viii	Proper management of feed manufacture and supply.	FPFEL, CADSL	Continuous
ix	Proper action by government authorities.	NARA, NAQDA, CCD, PEA, PMF, MFOR	Continuous
x	Establishing cluster farms.	NAQDA, CADSL, FPFEI	2003
xi	Establishing mother farms.	NAQDA, CADSL, FPFEI	2003
xii	Monitoring environmental quality of aquaculture ponds and their outlets.	CADSL, FPFEI, NARA, PEA	Continuous
xiii	Establishing mangrove belts.	NARA,PEA,MFOR	2003
xiv	Dredging of Dutch canal.	MFOR	2004
xv	Opening sea outfalls of Dutch canal.	MFOR	2004