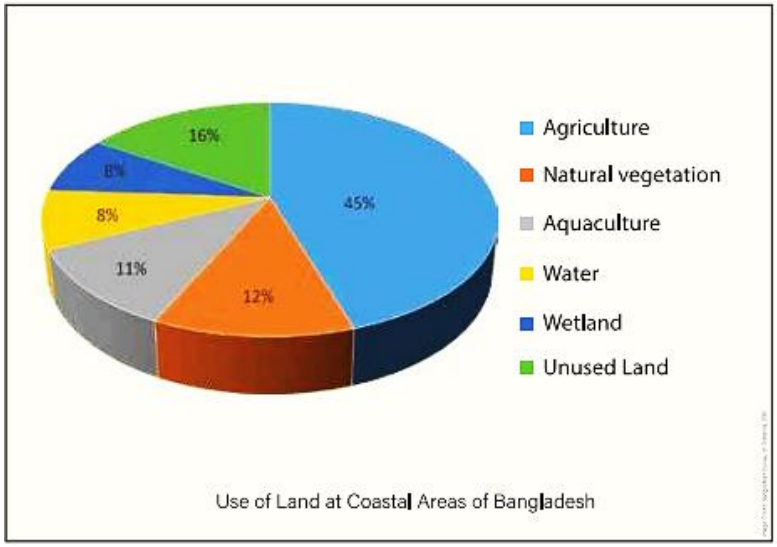
Sustainable Marine Agriculture: Towards Achieving Food Security of Bangladesh in the Face of Climate Change

S M Anisur Rahman

Introduction



Being a maritime nation, Bangladesh is the most precarious and unpredictable country due to climate change at the Bay of Bengal (BoB). The coastal area of this country is dominated by agriculture, followed by natural vegetation, aquaculture, water and wetland. Among these, coastal aquaculture, shrimp/prawn and finfish farming are expanding rapidly. Eco-friendly integrated farming is also getting priority. Small scale floodplain aquaculture also popularised and contributed significantly to the country's total fish production. Besides, the coastal fishers are also dependent on fishing at the Bay of Bengal. Presently, 15% of the country's fish production is coming from there. This coastal agriculture, both conventional and non-conventional marine food and fishes, contribute to our national food security. On the other hand, climate change significantly impacts marine agriculture to achieve sustainable economic growth in Bangladesh.

Marine Biodiversity

The Bay of Bengal is very rich in marine biodiversity. The major marine food fishes from BoB are hilsa, tuna, sardine, seabass, snapper, pomfret, grouper, catfish, threadfin, bombay duck, hairtail, jewfish. Squid, octopus, lobster, oyster, mussel, and seaweeds are among the non-traditional fisheries items. Among the crustaceans, penaeid shrimps (tiger shrimp, brown shrimp, white shrimp) are the most dominant, followed by some crab species (mud crab and swimming crab). In 2019-20 marine fish production was about 6,59,000 MT, out of which 70,000 MT fishes were exported (value: USD 469.67 million or 3,985 crore taka). In 2018-19 only hilsa fish production was 5,32,795 MT, which contributed 12% of total fish production and 1% of the GDP of Bangladesh. It was about 70% of the world's total production. Bangladesh fisheries activity accounts for 4.4% of our national GDP. It also provided support of about 22% to the agricultural GDP and <3% to the foreign exchange earnings through exports of fishery products. A total of 1.4 million people work full-time in this industry, with another 12 million working part-

time. But in the face of climate change following factors are hindering the habitats for marine fishes at the BoB:

> Arrival time of the monsoon every year

> Seawater temperature variation with time

> Change of sea current and bay wind direction with time

> Salinity variation at seawater with time

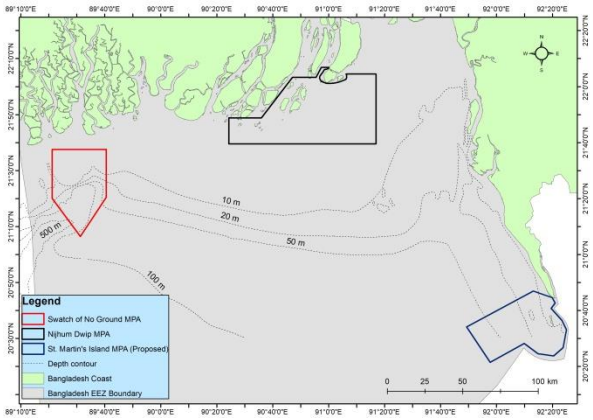
> Water density variation with time

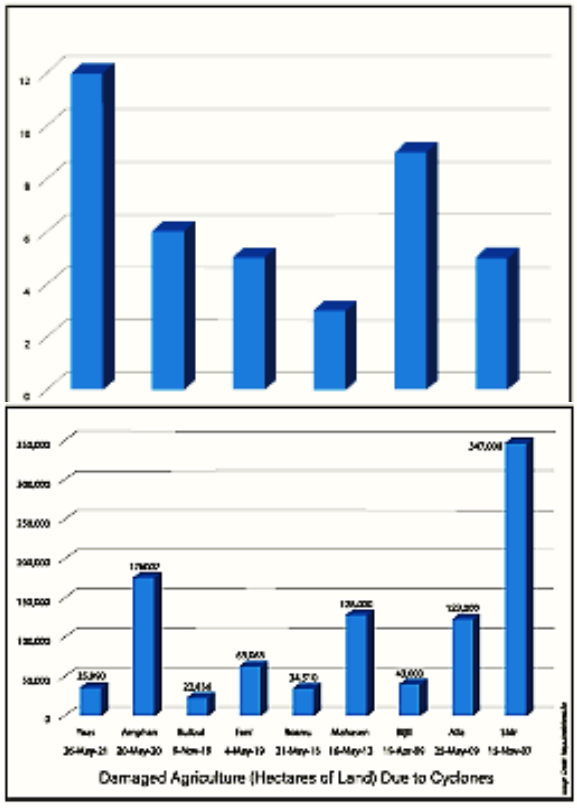
> Change of tidal stream due to development of the new islands

> Change of depth of sea due to siltation

These factors are also responsible for reducing phytoplankton and zooplankton, which are the foods of marine fisheries.

Multi-Use Marine Protected Areas



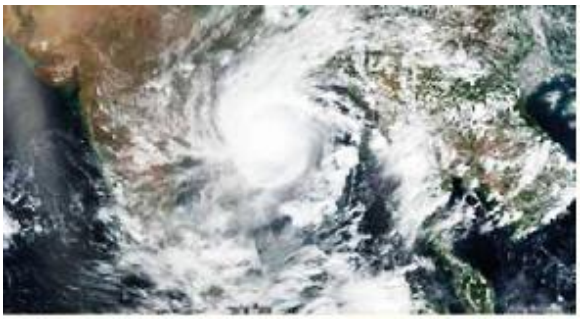


Ministry of Fisheries and Livestock (MoFL) declared two Marine Reserves as Marine Protected Area (MPA) in Bangladeshi waters (Swatch-of-No-Ground MPA and Nijhum Dwip MPA) in 2014 and 2019. The aim was to protect hilsa breeding & nursery grounds and prepare habitats for marine fishes, crustaceans, megafauna and migratory birds. The areas are beaconing the new hopes for a sustainable marine ecosystem in the face of climate change. The government, NGOs and local fishers are taking many initiatives and actions to protect marine biodiversity in these areas.

Tropical Cyclones (TCs)

In coastal areas of Bangladesh, the significant factors affecting food security due to climate change includes TCs, storm surges, tidal flood and seawater rise. Among these, the most unpredictable TCs cause maximum damage to our coastal agriculture. TCs that make landfall over Bangladesh's coast are responsible for major loss of life along affected coastlines and damaging the crop fields and coastal aquaculture.

The coastal regions of Khulna, Patuakhali, Barishal, Noakhali and Chattogram and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands are the most vulnerable areas for cyclones, storm surges, tidal flood, and seawater rise. Maximum damages occur here, which hamper the national economic growth and weaken our country's food security.



Salinity Intrusion

Another consequence of tropical cyclones, storm surges, tidal floods and seawater rise is salinity intrusion. It causes an unhealthy environment for the average crop production throughout the year in the coastal belt. The organic matter content of the coastal soils is pretty low (1.0-1.5%). Nutrient deficiencies of N and P are pretty common in saline soils. Micronutrients such as Cu and Zn are both widespread. As a result, decreasing food crop production in Bangladesh's coastal region has a significant impact on the country's economy.

This threat is more elevated because of the reduction of freshwater flow from upstream and groundwater discharge. The coastal belt of Bangladesh consists of 19 districts, which cover 32% of the country and accommodate more than 35 million people. During 1973, salinity affected 83.3 million hectares of land, increasing to 102 million hectares by 2000. During 2009, salinity affected a recorded 105.6 million hectares. Around 2.5 million hectares of low-lying coastal lands represent 0.9 to 21 salinity levels among these affected areas. Over the last 35 years, salinity has increased around 26% in the coastal region of Bangladesh.

Global Warming

The rise of sea level at BoB due to global warming is another factor hindering our food security. It has slow but significant effects, which is also subject to the physical environment of Bangladesh. Relative sea-level rise is expected to be in the range of 0.5-1.5 m by 2100. By 2050, with a projected 50 cm rise in sea level, Bangladesh may lose approximately 11% of its land, affecting an estimated 15 million people living in its low-lying coastal region. The sea-level rise and climate change would significantly affect the country's agricultural output. The recent research depicts the followings:

> 0.83 million hectares of agricultural land are vulnerable to sea-level rise in the coastal region

> 0.3 m rise will cause a net reduction of 0.5 million metric tons of food grains

> 8.0-17.0% of rice production could be affected by 2050 due to the loss of agricultural lands

> Agricultural GDP will decline between 27.0%-57.0%

> Hilsa fish production may decline up to 25% in inland waters and 10% in EEZ

> The standard 30 cm and 50 cm SLR (Sea Level Rise) by 2030 and 2050 will lead to loss of up to 3.0% and 6.0% of coastal agricultural lands in the respective years

What can be done?

Addressing climate change will require many solutions. There's no magic bullet. Yet, nearly all of these solutions exist today, and many of them depend on how people are changing the way they act and make decisions. For protecting land from damage due to tropical cyclones, storm surges, tidal flood and salinity intrusions following activities can be prioritised:

> Building more dams along the river bank and coastline

> Reducing the siltation rate at the river mouth and near the coast through continuous dredging

> Plantation of mangrove forest along the coast

> Introducing salt-tolerant crops in the coastal zone

> Rainwater harvesting for cultivation and domestic use

The dropping of global warming requires changes in technologies, behaviours and policies that encourage less waste and more intelligent use of our resources. Improved energy efficiency and vehicle fuel economy, increased use of wind and solar power, extraction of biofuels from organic waste, carbon pricing and forest protection are all effective approaches to reduce carbon dioxide and other heat-trapping gases on the planet.

Conclusion

Climate change has become a important issue all over the world. It involves rising temperatures and extreme weather events, rising sea levels and a range of other impacts. It also has a significant impact on Bangladesh's coastline area and the biodiversity of the BoB. As a maritime nation, it has become apparent that its destiny has an unbroken link with the sea resources and coastal agriculture. The livelihood of coastal dwellers, the country's food security and our country's economic prosperity are linked to this. Therefore, a long-term climate action plan has become imperative in the face of climate change.

Writer: Lt Cdr S M Anisur Rahman, (H3), BN is the Director (Admin) of BIMRAD.

The article was published in PAAL Magazine, Volume 04, Issue 03, December 2021