# Managing agricultural inputs for climate change adaptation

**Bangladesh is seriously vulnerable to climate-induced hazards although there are so many controversies about climate change. Role of Bangladesh is very limited in this regard (change), but she will have to suffer and face the tremendous impacts of climate change. There is no panacea to overcome the problems. Therefore, it will be wise for us to adapt ourselves with the changing environment with our limited resources.**

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Climate change is changing most of our traditional agricultural practices as the seasonal cycle and rainfall pattern have changed, droughts have become more frequent, violent stresses of cyclones, earthquakes, prolonged floods, salt water intrusion are increasing day by day. The average temperature has increased in the summer while winter season has shortened. There are some projections about climate change that are matter of concern for Bangladesh such as: temperature would rise 1.30 C by 2030 and 2.60 C by 2070, the sea level rise would be up to three feet and a greater part of the costal area would be inundated. As a consequence 17 percent of total cultivable land would be affected. Three core people would lose their farms and homestead. Threatening the richest and most productive region of the country, sea level rise could have dramatic consequences for the economy of the country. Increased flooding from glacial melt, more intense monsoons, or more intense cyclones could also adversely affect agriculture in near term by periodically inundating much of farm land. Sea level rise under climate change would also result in saline intrusion into the river system. Several hundred thousand tons of grain production could be lost as a result of increased salinization from sea level rise. The Global Climate Risk Index 2009 showed Bangladesh as the most vulnerable to extreme weather events as a result of climate change. World Resources Institute (WRI) said, "impacts of climate variability and change cause an additional risk for agriculture". Moreover, agricultural production is already under pressure from increasing demands for food. In this regard, the present writeup tries to find out possible alternatives of agricultural inputs to ensure expected yield of agricultural crops.

Agricultural inputs include seeds, seedlings, irrigation water, fertilizers and pesticides, land, capital, agricultural equipment etc. Some important inputs management are discussed below:

**Irrigation management**: The continued trend of more frequent and intense droughts and variations in rainfall due to climate variability and change may have significant impacts on agriculture. The rate of depletion of groundwater is increasing day by day. Production of boro rice and winter vegetables by natural water or surface water are being affected on regular basis. Rain fed agriculture (specially aus and aman rice) has mostly changed into irrigated agriculture. So, we must have the provision of irrigation throughout the year. Some possible strategies for managing climate variability and droughts are:

i) traditional practices such as pond excavation, retention of rainwater in mini pond or in 9´x6´x3´size pit at any corner of the land to provide supplemental irrigation.

ii) moisture conservation through mulching by straw, water hyacinth, rice husk, polythene etc

iii) governmentsupported practices such as deep tube well and shallow tube well facilitated irrigation with subsidy in fuel and electricity.

iv) introducing early maturity, shortduration, and droughttolerant crop varieties

v) following AWD (Alternate Wetting and Drying) method for rice cultivation

vi) alternative adaptation practices such as integrated croplivestock-fish farming systems, multiple cropping systems and homestead gardening etc.

**Fertilizer management**: Climate change may change our fertilizer management. Research revealed that an increase of atmospheric carbon dioxide reduces the nitrogen uptake by plants or crops. Moreover, fertilizer management is not same for irrigated agriculture and non-irrigated agriculture. Use of USG (Urea Super Granule) in wetland rice cultivation is a popular method now. But, if water crisis arised, this method will not be effective fully. Then, normal urea will have to be used again. So, we should not use USG in drought prone area or in sandy soils. Use of organic matter or organic manure should be popularised to increase water-holding capacity of the soil.

Seed or seedling management: Cyclones, storm surges, prolonged floods and droughts may cause serious crop damage any time. So, provision of extra seeds and seedlings must be there in disaster prone areas so that affected crops could be covered up. During flood floating seedbed, during drought dry seedbed of aus and aman rice may be effective measures. Government should provide improved method of seed processing and storage. Effective farmers training could be arranged for the target group.

**Labour management**: Due to increase of atmospheric carbon dioxide C3, weeds occur that are more harmful for crops. Moreover, air temperature rise causes higher incidence of pests. To control higher incidence of pests and weeds more labours are required. But, high cost of labour, lack of skilled labour, going abroad for better income by our labours are major problems in labour management. So, we need to depend on mechanized agriculture more and more. That will save time, reduce cost and make operations easy.

**Pest management**: Pest infestations and disease infections of crops are increasing day by day due to global warming. Again, lower night temperature with foggy weather and higher day temperature lead to severe blight disease. So, pest and disease tolerant and resistant crops and varieties, GM (Genetically Modified) crops with pest tolerant characteristics should be used. Community Agriculture Clinic may be established to identify and control pest and disease attacks.

**Appropriate crop or variety selection**: Cultivation of existing crops or any specific variety of a popular crop may not be possible following current cropping patterns or cropping systems due to any sudden and tremendous environmental change. Such as wheat cultivation will be impossible if average winter temperature increases 20 C in Bangladesh. Then, wheat will have to be replaced by other crops. Maize, sweet potato may be the suitable alternatives or any other variety of wheat may be introduced that can tolerate high temperature.

Several lakh tons of grain production could be lost as a result of increased salinization from sea level rise. In this regard, salt tolerant crops or variety should be cultivated. It's a matter of hope; Bangladesh Institute of Nuclear Agriculture Research (BINA) has released two salt tolerant aman rice varieties (BINA-8, BINA-9) which showed positive results in last aman season. Bangladesh Rice Research Institute (BRRI) is going to release a salt tolerant rice variety for which field trial is going on. In case of prolonged flood any variety that can persist for long in submerged condition may be cultivated. BRRI has released two flood tolerant varieties (BRRI dhan 51, BRRIdhan 52) that can sustain at least two weeks of submersed condition.

Besides, late varieties of aman rice (BR 22, BR 23, BRRIdhan 46) can be cultivated just after the flood water recedes till mid October (Ashwin). Similarly, drought tolerant crops (jujube, pineapple and other fruits, maize, country bean etc and (BRRI dhan 42, BRRIdhan 43) and early maturity variety crops (BRRIdhan 33, BRRIdhan 39,) may be cultivated in drought prone areas.

**Capital management**: Cost of production increases due to abovementioned problems of climate change. So, easy access to agriculture credit is highly desirable the part of affected farmers. Interference of middlemen in loan distribution must be stopped. Rehabilitation program for severely affected people should be under taken. Subsidy for agricultural inputs may be another option. It is important to mention that the present government is not oblivious of the matter. Prices of non-urea fertilizer have been reduced, diesel subsidy will be provided to the marginal farmers directly by bank check in the upcoming Boro season as like earlier year.

A hybrid rice field

**Ensuring easy access to information**: We should ensure easy access to information specially those related to production and distribution of agricultural products and inputs. Required information: the reasons of climate change, possible impacts and damages, approximate time of disasters, pest and disease incidences, possible disaster prone areas and target groups, necessary actions to be taken etc must be provided to the farmers. Effective early forecasting method should be strengthened. Awareness building programme for target groups may be taken immediately. Community Radio may be an effective tool for these purposes. Length of agricultural programmes must be extended on TV and radio channels. Facilities of ICT or e-agriculture like AICC (Agriculture Information and Communication Centre) should be provided throughout the country for all farmers. Such centres also may be arranged as community agriculture clinic.

From the above discussion we find that availability of natural resources are decreasing, intensity of natural disasters are increasing, inputs management is becoming difficult resulting in high cost of production due to climate change and climate variability. Besides the above mentioned practices some recommendations might be helpful to ensure expected yield of agricultural crops:

*We should*

- follow the latest technologies, approved methods of cultivation, location and time specific agricultural practices (mulching, zero tillage etc)
- cultivate suitable high yielding varieties, modern varieties, GM crops (Genetically Modified) and Hibrid crops.
- use pest and disaster tolerant / resistant crops or varieties.
- increase cropping intensity.
- change land topography for higher yield.
- ensure effective forecasting of possible natural disaster.
- take appropriate disaster preparedness planning.
- carry out research on adaptability of new crops and varieties, and on adaptation by affected people.

**Conclusion**: Bangladesh is seriously vulnerable to climate-induced hazards although there are so many controversies about climate change. Role of Bangladesh is very limited in this regard (change), but she will have to suffer and face the tremendous impacts of climate change. There is no panacea to overcome the problems. Therefore, it will be wise for us to adapt ourselves with the changing environment with our limited resources.

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# Save plankton and bio-diversity for food security

**We see that governments and civil societies include environmental activities and anti-global warming activities in their programme around the world and are committing to bio-diversity conservation and marine resources conservation because people, even private sector corporations and companies have benefited greatly from animals, plants, marine waters and foods and rivers. In fine, it is high time eco-development for food security is paid attention in Bangladesh.**

MOHAMMAD MIZANUR RAHMAN

Climate is ever-changing. The past million years or so have shown a pattern of glacial advances and retreats, changes in sea levels, changes in rainfall pattern and so forth; all having tremendous impact on the living beings at the time. Nevertheless, it's different now-a-days; when climate changes, so must agriculture and, as has been observed, man, as he is conservative in his agriculture behaviour. Consequently, any rapid change of climate, in whatever direction is bound to decrease food supply. But South Asia is a region of significant importance for its rich phytoplankton, marine and coastal resources, fisheries, and bio-diversity etc. Therefore, it is high time to save phytoplankton and bio-diversity in this region including Bangladesh.

We know that plankton of sea includes a great variety of forms, even more than in fresh water rotifers: the nanoplankton consists mostly of protozoa, algae, bacteria, fungi etc; the green phytoplankton is the primary producer responsible for most of the food we take from the sea. Phytoplankton is heavily implicated in global biosphere equilibrium by driving elemental chemistry in surface oceans, exporting massive amounts of carbon to sediments and influencing ocean-atmosphere gas exchange.

Climate change will alter the marine environment within the next 100 years. Increasing atmospheric CO2 has already caused higher aquatic PCO2 levels and lower pH (ocean acidification) and rising temperature will affect ocean stratification, and hence light and nutrient conditions. Phytoplankton has been affected by these Earth system transformations in many ways, altering the complex balance of biogeochemical cycles and climate feedback mechanisms. Prediction of how phytoplankton may respond at the cellular and ecosystem levels is a key challenge in global change. According to one recent EC study, physiological reactions of important phytoplankton groups such as diatoms, coccolithophores, cyanobacteria to environmental factors will be affected by global change.

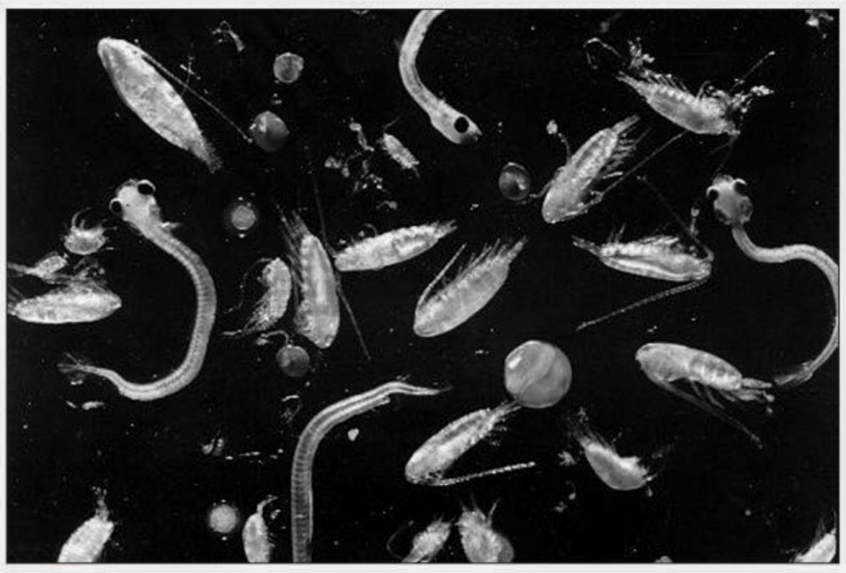
However, besides the climate change impacts, we continue to pollute the seas with chlorinated hydrocarbon, insecticides, polychlorinated biphenyls and thousands of other pollutants until bringing in a worldwide ecological disaster. Subtle changes may already have started a reaction in that area. We have to save our marine resources -- phytoplankton as well as zooplankton -- for protecting food security.

'To quote from a journal Nature,' the 2006 review of the economics of climate change, chaired by economist Nicholas Stern, served as a wake-up call to the need to respond to long-term climatic risks.' Similarly, the final report of the Economics of Ecosystems and Biodiversity study, this October, was touted as a stern review for nature. It no doubt made a grim reading that presents the massive price of biodiversity loss, and the destruction of ecosystems and the services they supply.

Climate change is becoming a sensitive factor in human socio-economic activities as anthropogenic activities alter the Earth system. These can entail rising losses and damage associated with climatic hazards, thus requiring urgent and purposeful adaptation to climate conditions and managing climate-related risks. Natural systems such as wetlands, phytoplankton, mangroves, coral reefs and rain forests, Arctic and high latitude ecosystems are especially vulnerable to climate induced disturbances.

The impacts of climate change on biodiversity will of course vary considerably from region to region, partly because changes in temperature and precipitation will differ among regions. The most rapid changes in climate are expected in the far north and south of the planet, and in mountainous regions. Unfortunately, these are the regions where species often have no alternative habitats, a factor that prevents them unlike animals and plants in some temperate regions from migrating or spreading elsewhere to survive.

Other species are vulnerable in different ways. Corals and other organisms living in coral reefs, for example, have already shown devastating losses because of increased water temperatures. Species restricted to small areas, or in small populations, are also particularly vulnerable. Natural ecosystems provide a range of services often not recognised in national economic development accounts but vital to human welfare: regulating water flows, water quality, flood control, pollination, decontamination, carbon sequestration, biodiversity conservation, soil conservation, nutrient and hydrological cycling. Enhanced protection and management of these habitats and biodiversity can mitigate the impacts of climate change and help vulnerable communities to adapt with biodiversity loss increasing at an unprecedented rate in Bangladesh.



Planktons

According to one recent study focusing on five regions of the world, if the climate continues to warm it could dramatically increase the number of species going extinct. Mid range, predictions suggest that 15 to 37 per cent of species in these regions will be on their way to extinction by 2050 due to climate change. At least 40 percent of the world's economy and 80 percent of the needs of the poor are gleaning from biological resources. Since the 1600 A.D till date, already plant species numbering 654 and animal species numbering 484 are known to have become extinct through greedy human activities.

Plant and animal species are the building blocks of biodiversity and ecosystems and provide us with essential services; not only food, fuel, clothes, medicine but also purification of water and air, prevention of soil erosion, regulating climate, and pollination of crops. They also provide a vital resource for economic activities such as forestry, agriculture, fisheries and tourism as well as having significant aesthetic, and cultural values.

Now, an example, South African Addo national park. While the park covers a large area with a range of elevations, microclimates, and ecosystems, by protecting such a variety of diverse habitats, the park's planners have factored in the effects of climate change, by ensuring that species can migrate to another safe habitat if climate change adversely affects their present one.

In Vietnam, a project to rehabilitate 12,000 hectares of mangrove forest along the northern coast is serving both as a large carbon reservoir and a valuable habitat. Local communities benefit, too, from new fisheries for crabs, shrimps, and mollusks, while the mangroves offer vital protection from tropical storms to villages and ecosystems alike.

Energy production is another area with a strong potential for reducing human impacts on climate while protecting biodiversity. Currently, about 80 per cent of the global carbon dioxide emissions arising from human activities originate from the generation and use of energy from fossil fuels. Renewable energy is widely seen as a desirable alternative. Indeed, in countries where people use wood for fuel, promoting fuel-efficient stoves and biogas can significantly reduce pressure on forests, and thus conserve carbon.

However, some projects that promote renewable energy also have an impact on biodiversity. Large-scale hydropower schemes, for example, can trigger losses of terrestrial and aquatic biodiversity, inhibit fish migration, and lead to mercury contamination. They can also be net emitters of greenhouse gases, as submerged soils and vegetation decay and lead to the release of carbon dioxide and methane. Similarly, biodiversity conservation should factor in to the design and location of wind turbines. Birds, including several threatened species, have been killed in wind turbines, but simple design modifications can limit these mortalities. Such risks make it important to consider biodiversity issues when formulating policies on alternative energy sources.

In our country, if we will be for setting park projects like our national Botanical Garden then we will have benefited in the forestation and plant diversity areas. At present, government is talking much but result is not apparent. We want government implementation tasks for all sectors. However, we must prioritise the following areas: (1) Greening -- such as forestation plant diversity conservation including park programme, plant a tree per person programme, eco-mind eco-thinking activities; (2) Renewable energy; (3) Energy efficiency; (4) Bio-materials; (5) Sustainable water systems; (6) Waste management and recycling; (7) Saving rivers and canals from pollution and grabbers.

We see that governments and civil societies include environmental activities and anti-global warming activities in their programme around the world and are committing to bio-diversity conservation and marine resources conservation because people, even private sector corporations and companies have benefited greatly from animals, plants, marine waters and foods and rivers. In fine, it is high time eco-development for food security is paid attention in Bangladesh.

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# Planting a billion trees

PRESS RELEASE

The 'Billion Tree Campaign', the combined campaign for tree plantation by Art of Living Foundation and United Nation's Environment Programme (UNEP) has been launched in Bangladesh. Marico Bangladesh has supported the phase one of the project as part of their 'Go Green' campaign.

The campaign is raising awareness of the inter-dependence between humankind and the planet's ecosystems, as well as the linkages between tree planting and climate change mitigation, the restoration of biodiversity, air and soil quality and food security.

The Billion Tree Campaign offers hope and a simple solution for climate change mitigation, while enriching biodiversity.

The Art of Living Foundation, established by Sri Sri Ravi Shankar in 1981, is a unique global service project that formulates and implements lasting solutions to conflicts and issues faced by individuals, communities and nations.

As a non-government organisation, Art of Living Foundation works in special consultative status with the Economic and Social Council of the United Nations, participating in a variety of committees and activities relating to health, education, sustainable development and conflict resolution. The Foundation has accredited representatives at the United Nations in New York, Geneva and Vienna.

The Art of Living Foundation had already planted millions of trees as part of the campaign in more than 100 countries.

'Billion Tree Campaign' in Bangladesh in the first phase had pledged 32,000 coconut trees in 64 districts of Bangladesh with the support of Marico Bangladesh and more to go. Coconut tree is a 'three generation' tree, which can support three generations and can bind soil in coastal areas and prevent climate change.

As part of the pilot project 5,000 coconut saplings have already been planted in 10 districts. SMKK, ADI, AID Comilla, Janoseba Kendra, Shushilan and AVAS, all these organisations were instrumental in implementing this project.

As a continuation of this project, the Art of Living Foundation will launch organic farming, agribusiness management, rural development programmes and their 5H programmes in Bangladesh, the Foundation's Country Director Mr. Bazlur Rahman Khan and the Country Coordinator Mr Sajeev Menon, said in a combined statement.


Planting cocount sapling as part of pilot project