

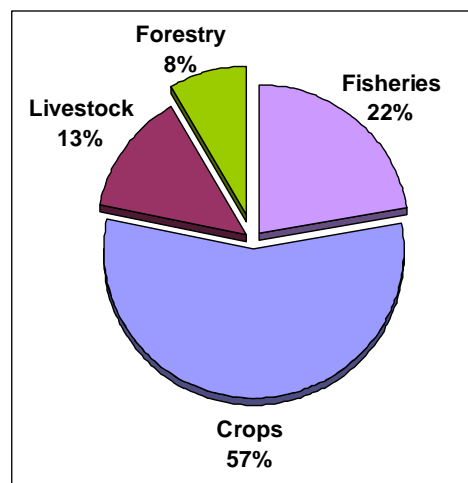
Country Paper: Bangladesh

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1. INTRODUCTION

Bangladesh is the fifth most populous country in Asia and ranks eighteenth in the global context. The country has a land area of 14.83 million hectares (Mha), population of over 149 million with a density of more than 1000 persons per km², which is one of the highest in the world. The effective land area of the country is roughly 12.31 Mha, about 0.98 Mha is occupied by rivers and 2.19 Mha are under forest cover (BBS, 2008). The country is predominantly flat with almost 80% of the land area occupied by floodplains and piedmont plains, about 8% by slightly uplifted fault blocks (terrace) and about 12% by hills. During the last three of decades the population has grown rapidly, which has put intense pressure on the scarce land resource of the country. The land-man ratio is decreasing at an alarming rate; the current estimated per capita arable land stands at 0.05 ha only.



The economy of Bangladesh is based on agriculture, industry and services. The gross domestic product (GDP) expressed as purchasing power parity is US\$209.2 billion. The agriculture sector contributes a major share in the GDP, which is about 20.0% and employs about 48.07% of the working force. Services is also an important sector in the economy of the country about 50% of the GDP is generated through this sector and engages 43.28% of the work force. Again, among the sub-sectoral contributions of agriculture sector is dominated by crops (57%), followed by fisheries (22%). Figure 1 depicts the sub-sectoral contributions to agricultural GDP.

Figure 1. Sub-sectoral Contributions to Agricultural GDP

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2. VULNERABILITIES

According to International Panel on Climate Change (IPCC), Bangladesh will be one of the worst victims of climate change. Sea level will be increased due to rise in temperature and the frequency of cyclone-storms will be increased. As a result, food security will be in jeopardy and different types of natural calamities will put lives at risk. On top of these, high population density in will make the problem more serious. The projected population growth, food grain requirement and production of Bangladesh is graphically presented in Figure 2.

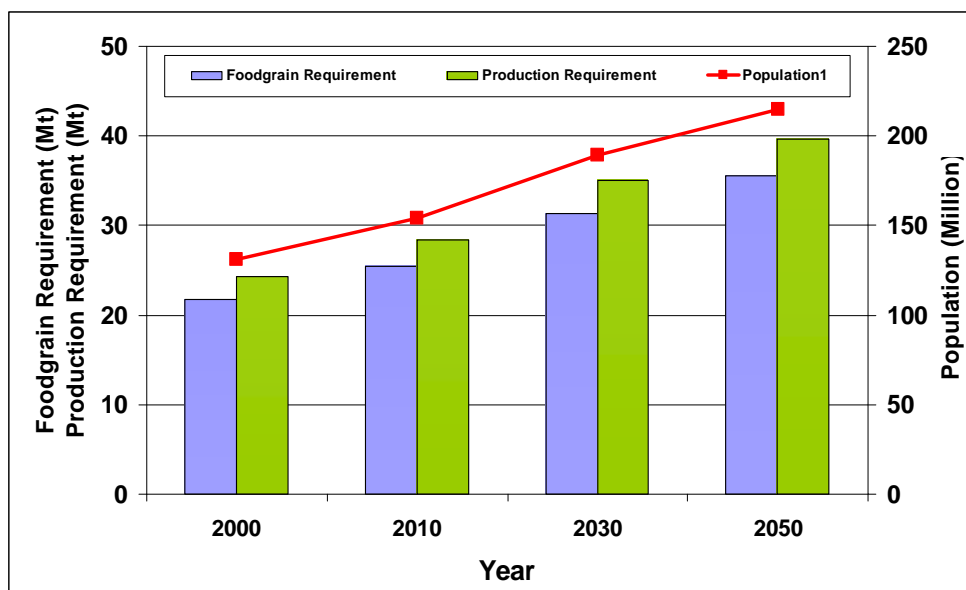


Figure 2. Population Growth Vs Food grain requirement and production of Bangladesh
 Source: Hussain 2008.

The people of Bangladesh have been adapting to the risks of floods, droughts and cyclones for centuries. High population density, very frequent occurrence of natural disasters, poor infrastructure and fragile economic resilience to shocks, makes the country especially vulnerable to climatic risks. Heavy reliance of rural people on agriculture and natural resources increases their vulnerability to climate change. Therefore, supporting rural and urban communities to strengthen their resilience and to adaptation to climate change will remain a high priority in coming decades.

Globally, the impact of climate change on agriculture has been studied extensively for various crops at many different scales. Available information shows that the tropical and subtropical countries would be more vulnerable to the potential impacts of global warming. Bangladesh is likely to be one of the worst hit countries of the globe, being an humid-tropical country. The occurrence of natural hazards and their significance with cropping seasons are shown in Figure 3.

Over the last decade, the direct annual cost (damage and lost production) of natural disasters to the national economy is estimated to be between 0.5% and 1% of GDP. As the economy

grows, these costs are likely to increase in absolute terms and as a proportion of GDP, if climate change is not factored into long-term economic planning.

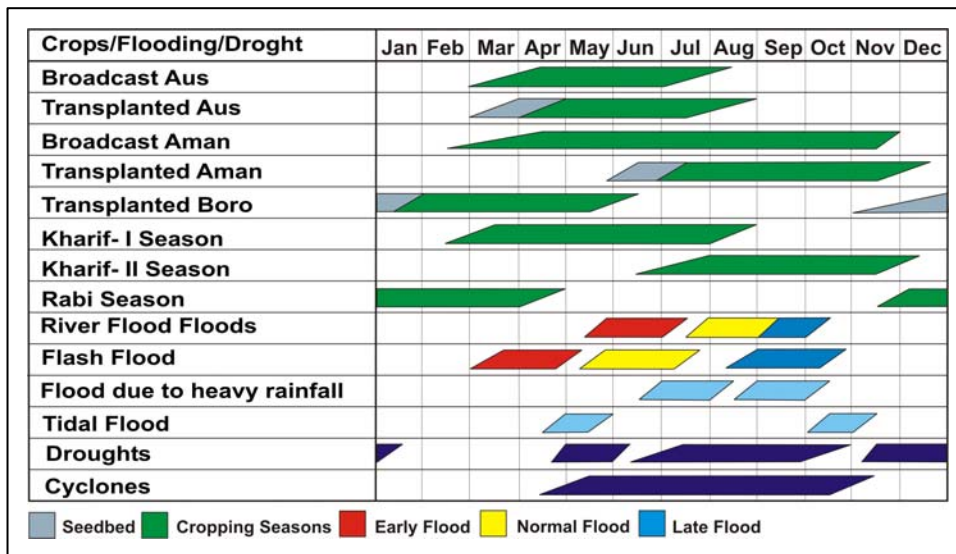


Figure 3. Occurrence of natural hazards and their significance with cropping seasons

Source: Hussain 2004

Aus, Aman and Boro are rice growing seasons. Rabi is winter or dry season, Kharif-II is wet or monsoon season and Kharif-I is transition between dry and wet seasons.

3. ADAPTATION TO CLIMATE CHANGE

Adaptation is the priority for Bangladesh in the short to medium term. The country is already a world leader in the research, design and implementation of adaptation strategies and this work will continue.

Not only cereals, but most of the other both tropical and temperate crops, that are grown in Bangladesh, will be affected by climate change. Depending on the local agro-climatic environment as well as the magnitude of the changes easing strategies has to be developed. With the available technologies it would be possible to increase food production substantially, which would depend on the dissemination of these technologies to the end-users and also on the availability and affordability of extra resources/inputs required for this purpose. However, under changed scenarios, new technologies need to be developed to combat climate change and sea level rise coupled with the great pressure of population increase.

The magnitude climate change impact on different resources would be varied. Simulation studies have shown that the impacts could result in significant reductions in crop yields, in most cases, and thereby production. It is obvious that effect of the changes would vary because of the differences in the variety and local differences in growing seasons, crop management etc. Existing technologies would not be adequate to address the problem. However, efforts are being made to avoid spikelet sterility through agronomic manipulations such as shifting the planting dates, using short duration, etc. In the tidally flooded ecosystem the ‘Sorjan’ (raised beds) system of cropping could be used. Rice + fish culture and organized fisheries, etc. are some of the options for water logged areas. Use double transplanting of Aman rice to avoid floods or use

older seedlings. The damages due to sea level rise would be colossal and the countries do not have the wealth to tackle this problem by structural means. Therefore, the problem should be combated by natural means.

Some of the technologies have already been developed and some are in the pipeline. Some of which are presented below that could be used to combat climate induced changes scenarios.

Salinity tolerance: Incorporation of Saltol gene in BR11 and BRR1 dhan 28 through Marker Assisted Breeding is in progress (joint collaboration of IRRI, Bangladesh Rice Research Institute and Dhaka University). Some lines already released as varieties e.g. BRR1 dhan 47 in Bangladesh which can withstand 12 dS m^{-1} at seedling stage and up to 6 dS m^{-1} for rest of the growing period.

Submergence tolerance: With increased rainfall and flooding in many parts of Bangladesh, new IRRI developed breeds of rice benefiting from a trait that allows the plant to survive prolonged periods of submergence are already helping farmers on millions of hectares in the country. To tackle 1-2 weeks complete submergence due to flooding enhancing tolerance of BR11 has been done through introgression of Sub1 gene. Seeds multiplied at BRR1 were tested in the field during 2008. Sub1 lines showed yield advantage of $1-4 \text{ t ha}^{-1}$.

Heat-resistant cereals: Heat-resistant cereals currently under development at CGAIR centres will provide greater yield reliability, especially in the tropics and subtropics, where many crops are grown at or near their thermal optimum, and where a 1 degree Celsius increase in temperatures during the growing season can result in a decline in yields of up to 10 percent. Under these conditions, photosynthesis slows down or even ceases altogether, pollination is prevented, and dehydration sets in.

Drought tolerance: To combat droughts the researches at the International Maize and Wheat Improvement Center (CIMMYT) are using conventional breeding to develop drought tolerance in maize. They are also using tools from molecular biology to achieve even greater gains. The above mentioned crops and techniques are some of the options that are available or in the pipeline. To address all the issues that would evolve due to climate change will require more research and more in the field of plant breeding to develop climate-resilient crops. This will definitely call for more public sector investments to create sophisticated research facilities.

4. PUBLIC INVESTMENT IN AGRICULTURE

Poverty Reduction Strategy of Bangladesh has placed special emphasis on technological advancement, including development of new technology (biotechnology, hybrid seeds, and genetic engineering) through increasing investment in agricultural research and strengthening capacity of National Agricultural Research System (NARS) and through intensifying agricultural research- extension linkages.

In general, the allocations of development expenditures to agriculture and to the Ministry of Agriculture (MoA), as shares of total public development expenditures, appear highly inadequate. In most years since 1999/2000, the proportion of development budget allocation for agriculture has been around 20 percent. The share of MoA in ADP allocation has been mostly 2–3 percent, and has not gone above 15 percent in the last few years. The absolute allocation in most years has been below Tk 5 billion (US\$71.5 million). Agriculture has been accorded minimal support in terms of resource allocation, despite its critical role in keeping the nation fed and providing employment to the majority. Investment has been wholly inadequate in three critical areas of

public intervention in agriculture: research and technology generation, marketing, and extension. Figure 4 shows the total expenditures by research organizations for research and development.

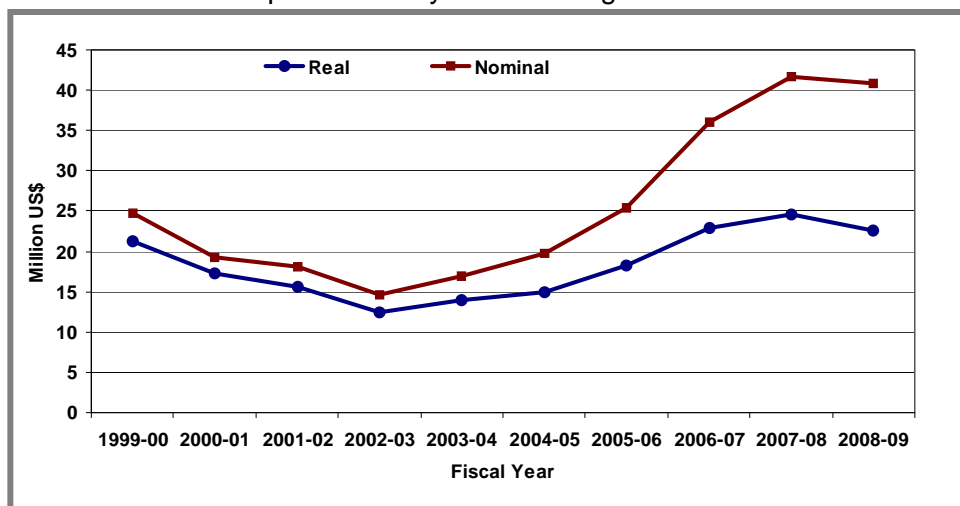


Figure 4. Nominal and Real Expenditures for R&D in Agriculture
 Source: Asaduzzaman, *et.al* (2010)

The fisheries and livestock sub-sectors contribute more than 10 percent of the total GDP, but its allocation share is only 0.63 percent of the national budget. The sector also receives very little out of the government’s huge subsidy bills; similarly, the sector gets little allocation of agricultural credit from various credit institutions (Karim et al 2010).

To combat the forthcoming climatic risk, the Ministry of Environment and Forest has formulated Bangladesh Climate Change Strategy and Action Plan-2009. Besides, in FY 2008-09 the Government has created a fund of Tk.300 crore or roughly US\$43 million to combat climate change risk, adaptation and mitigation.

In early 2000 Bangladesh started to implement some of the UNFCCC initiatives. A National Adaptation Programme of Action (NAPA) document has been prepared in November 2005. NAPA document identified 15 immediate and urgent priority projects. The first priority project, “Community Based Aforestation in Coastal Areas” is being implemented by Forest Department. The 4.5 million US\$ fund for implementing the project is being provided from Least Developed Countries Fund (LDCF). Other NAPA projects are expected to be funded by LDCF, Adaptation Fund (AF) or other bilateral or multilateral funds.

In 2002 Bangladesh prepared her initial National Communication, which included among others Green House Gas inventory. At present Bangladesh has started implementing the project activities of Second National Communication, which is expected to incorporate, apart from Green House Gas inventory, adaptation and mitigation activities in the country and will also try to incorporate potential project concepts for both adaptation and mitigation activities.

As NAPA addressed immediate and urgent adaptation needs it didn't cover the major concerns of all the sectors. Government of Bangladesh felt the need to develop a comprehensive package to address climate change issues. Accordingly, Climate Change Steering Committee, which is headed by Environment and Forest Minister, took decision to develop a Climate Change Strategy

in early 2008. Finally, Bangladesh Climate Change Strategy and Action Plan, 2009 (BCCSAP, 2009) [MoEF, 2009] was prepared drawing experts from all the respective fields. Though field level consultation was absent while preparing the document. Extensive discussion was held exclusively with government officials, civil society representatives and private sectors and even with Development Partners. The document was finalized through a National Consultation. BCCSAP has proposed six pillars based on 6 thematic areas and under six thematic areas has proposed 44 programmes to be implemented by respective line Ministries and Departments.

- Food security, social protection and health
- Comprehensive disaster management
- Infrastructure
- Research and knowledge management
- Mitigation and low carbon development
- Capacity building and institutional strengthening

BCCSAP to date is the single most comprehensive document that will be the guide while implementing any kinds of Climate Change related projects or activities. The time horizon for BCCSAP has been suggested 10 years but periodic review can be made and readjusted according to the needs of the time.

Financial support to address adaptation activities in the country is crucial for our survival in the foreseeable future. Unfortunately, flow of financial resources from the UNFCCC process is insignificant compared to our needs. Realizing the situation, Government of Bangladesh has created a Climate Change Trust Fund (CCTF). A Multi Donor Trust Fund was also created which has been recently named as Bangladesh Climate Change Resilience Fund, where some development partners have pledged a considerable amount of fund. Government has already allocated US\$ 100 billion to the CCTF from 2009-2010 budget from own resources. MoEF has already approved 36 projects worth 50 million US\$ and rest of the amount will be allocated to different organizations and NGO to implement adaptation projects. Though experts consider the amount still insufficient, compared to what will be required in the future to address adaptation activities. Bangladesh needs approximately US\$ 10 billion to implement the BCCSAP in the next 5 years.

5. CONCLUSION

Climate change is now a reality and inevitable. Adaptation through agronomic manipulation techniques would be able to reduce the negative impact of climate change up to certain limit. Business as usual research would not be enough to meet the growing demand for food. Therefore, coupled with agronomic adaptation climate-resilient crops will be required. Plant breeders will continue to develop new and more reliable cultivars of food crops that are capable of withstanding increased temperatures, drought, and submergence. Again, there are limits to the ability of new varieties to counteract these effects. More public investment in agriculture R&D would be required enhance the capacity of the researchers and infrastructures. People should be made aware of the anticipated problem and prepare for the consequence of climate change and the Government should have some contingency plans so that the impact could be minimized.

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