COUNTRY REPORT: BANGLADESH

STRATEGIC APPROACH TO THE IMPROVEMENT OF AGRICULTURAL PRODUCTIVITY TOWARDS FOOD SECURITY IN BANGLADESH

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Abstract

The climate change and bio-energy variables have worsen the already existing delicate food security issues in developing countries. Natural disasters like floods, droughts, tornadoes, cyclone etc. have been intensified recently threatening food security of the country more than ever before. Thus, strategic actions for food security and climate change adaptation and mitigation have invited some areas of intervention with respect to food grain production and nutrition. Technology generation, protection of agricultural lands, upholding soil health, mechanized cultivation of lands, sustaining irrigation water market etc. have been emphasized to face the challenges of food security. Interventions in problem areas like hills, saline and draught prone areas are needed. In most of the above activities, agricultural engineers can play vital roles and can contribute to agricultural development and food security of the country.

Background

The world has already experienced an unprecedented food crisis in the second half of the first decade of the twenty first country. This has been characterized by dramatic rise in almost all food prices to such a height that these went far beyond the purchasing power of the millions of poor consumers around the world, leaving them underfed and malnourished. The food price hike led to violent protests and political instability in many countries. As the FAO Director-General Jacques Diouf puts it, before food prices soared in 2007-08, there were 850 million malnourished people in the world, but that figure jumped by 75 million in 2007 alone, pushing off these additional people into hunger and poverty (FAO, 2008c). This has been very puzzling for the development practitioners and policy makers, particularly when the governments in many developing countries prepared their Poverty Reduction Strategy Paper (PRSP) and were in the process of implementing the PRS with a view to achieving Millennium Development Goals (MDGs) by 2015.

FAO's Food Price Index showed a 12 per cent increase between 2005 and 2006, but increased by 24 per cent in 2007 and further jumped by 50 per cent up to July 2008 (FAO, 2008). Although there have been bumper cereal harvests in the world in 2007-08, according to Diouf, food prices are likely to stay high for several years, putting the world's poorest countries at continued risk of food insecurity. Similar conclusions also[1] came earlier from the Director-General of International Food Policy Research Institute in December 2007. According to him, slow-growing supply, low stocks, and supply shocks at a time of surging demand for feed, food and fuel have led to such drastic price increases and that these high prices do not appear likely to fall soon (Braun, 2007).

[1] Paper for presentation in the meeting of the technical committee (4th session) of APCAEM of the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) to be held during 1-2 December 2008 in Chiang Rai, Thailand

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The climate change and bio-energy variables have further complicated the already delicate food security issues in developing countries. Many of these countries are resource poor and highly vulnerable to natural disasters, and are struggling hard to reduce poverty and improve livelihoods of the poor. Especially, climate change in South Asia will superimpose itself on the existing tenuous agricultural environment, significantly increasing production risk and rural vulnerability, particularly in regions that already suffer from poverty and hunger (Spijkers, 2008).

The soaring prices of food grains in the international market have been largely caused by the slow growth in world cereal production in recent years. Total cereal production has grown at about 1.9 per cent per annum since 2001. During this period, rice production grew at only 1.4 per cent annually from about 400 million tons in 2001-02 to an estimated amount of 435.2 million tons in 2007-08. Bad weather conditions in a number of countries led to poor harvests of rice and wheat, especially in 2007-08. Both rice and wheat grew at only 1.4 per cent over 2006-07. The prospect of world cercal production, especially wheat and rice, seem brighter in 2008-09 (Table 1).

Table 1: World Cereal Production and Trade (Million tons)

Production/ Trade	2001-02	2006-07	2007-08 (Estimated)	2008-09 (Forecast)	2008-09 as % of 2007-08
Production:					
All Cereals	1893.7	2013.3	2111.9	2191.9	3.8
Rice	399.4	429.1	435.2	445.3	2.3
Wheat	582.4	596.7	605.1	658.0	8.7
Coarse grains	911.9	987.5	1071.6	1088.6	1.6
Trade:					
All Cereals	237.6	255.5	261.9	251.8	-3.9
Rice	26.4	31.0	28.9	29.8	3.2
Wheat	106.9	113.1	110.0	110.5	0.4
Coarse grains	104.4	111.3	123.0	111.5	-9.4

Source: FAO: Food Outlook, December 2000 & June 2008

The declining stock of world cereal is also held responsible for food price escalation. An analysis shows that the world total cereal stock also declined during the 2000s, especially wheat stock dropped to its lowest level since early 1980s. The stock depletion is largely due to significant fall in stock in China between 2000 and 2004, which accounts for about 40 per cent of total world stock (Figure 1).

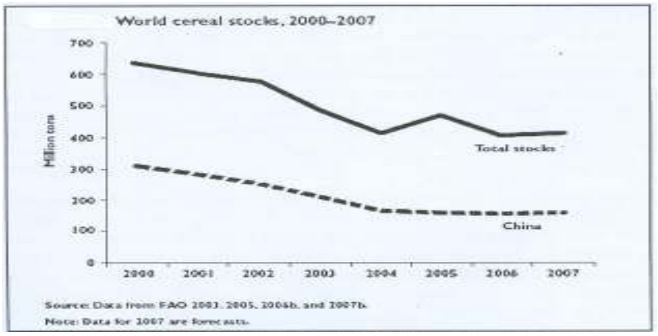

Fig.1 World serial stock, 2000-2007

Bangladesh food security situation

National Food Policy (NFP) 2006 has declared its overriding goal of ensuring a dependable sustained food security system for all people of the country at all times by ensuring availability of food, access to food and utilization of food. Three objectives of NFP are to ensure: (i) adequate and stable supply of safe and nutritrious food; (ii) accessibility to food through enhancing people's purchasing power, and (iii) adequate nutrition for all, especially woment and children (MoFDM, 2006). The Food Planning and Monitoring Unit (FPMU) of the Ministry of Food and Disaster Management formulated a National Food Policy Plan of Action for (2007-2015) with the technical assistance of an FAO project 'National Food Policy Capacity Strengthening Programme (NFPCSP)' (MoFDM, 2008).

Production scenario

Bangladesh has achieved remarkable progress in increasing domestic production of food commodities as the principal means to ensuring adequate food availability for its people, especially the poor. Figure 2 shows the rice production trends since 1981-82. Total production of food grains, as per official statistics, increased from 19.32 million tons in 1991-92 to 29.78 million tons in 2007-08 (1.51 million tons of Aus, 9.66 million

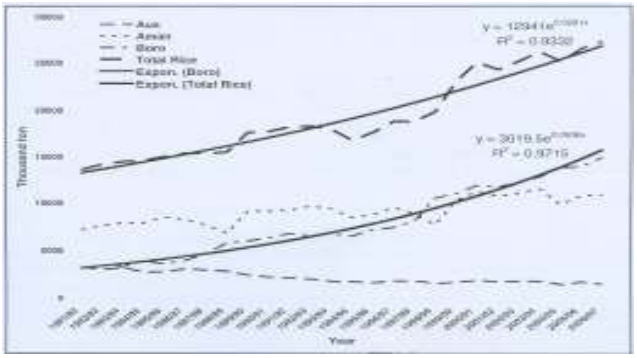

Fig. 2 Rice production trend, 2000-2007

The main contributor has been the irrigated Boro rice production, which showed about 6.3 per cent annual growth during the same period. Currently, Boro rice accounts for about 60 per cent of total food grain production. While Aus rice production declined over time, moderate growth in Aman rice, accounting for around 30 per cent of food grains, also contributed to the accelerated production. It is notable that Boro production in 2007-08 increased by 18.87 per cent over the previous year and this largely contributed to the rise in total food grain (rice and wheat) production by 6.13 per cent during this time. Wheat production in 2007-08 also increased by 14.5 per cent over 2006-07, indicating a reversal to the decreasing trend of the past. The significant jump in 2008 Boro production was mainly due to favorable weather conditions, timely planting, better care for input application and inter cultural operations by farmers, hard work and vigilance of the Agricultural Extension officials, diesel and electricity supply, and above all extra efforts and constant monitoring by the Ministry of Agricultural (Mondal, 2008).

Climate change and food security

Sustainability of agricultural production systems in Bangladesh are already challenged by declining land and water resources, high input and energy costs, increasing food prices, depressing effective demand by the poor, slow technology generation and so on. On the top of all these, challenges of climate change i.e. floods, droughts, cyclones etc. are superimposed, meaning that the country will be exposed to a range of disaster risk and vulnerability and that the ongoing efforts to reduce poverty and hunger might be slowed to some extent.

According to Intergovernmental Panel on Climate Change (IPCC) predication, global temperatures will rise between 1.8^0 C and 4.0^0 C by the last decade of the 21^{st} century. According to the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2008, rainfall will increase resulting in higher flows during the monsoon season in the rivers, which flow into Bangladesh from India, Nepal, Bhutan and China. Global warming will result in mean sea level rises between 0.18 and 0.79 meters, which could increase coastal flooding and saline intrusion into aquifers and rivers across a wide belt in the south of the country, although most of the area is protected by polders. Rainfall is predicated to become both higher and more erratic, and frequency and intensity of droughts are likely to increase, especially in the drier northern and western parts of the country". Bangladesh is ranked as one of the most vulnerable countries to tropical cyclones and sixth most vulnerable country to floods (MoEF, 2008). The BCCSAP report says that there will be increasingly frequent and severe floods, tropical cyclones, storm surges, and droughts, which will disrupt and displace millions of people from coastal regions, making them 'environmental refugees', unless existing polders are strengthened and new ones are built.

Negative impacts of climate change on Bangladesh agriculture as reported in various documents can be summarized as follows; (i) extended flooding of arable land narrowing scope for crop production, especially in the vast low land areas; (ii) increased temperature will lead to increased evapotranspiration and droughts, causing water scarcity for irrigation and domestic uses in north-west Bangladesh; (iii) increased inundation and

salinity intrusion, limiting crop cultivation with the existing varieties, especially in the coastal regions. Loss in terms of land degradation and arsenic contamination of soil and water is becoming a major concern (Heikens, 2006; Ahmed, 2007); (iv) increased intensity of flush floods in Meghna basin and north eastern Haor region, damaging standing Boro rice crop; (v) increased loss of land to river erosion, reducing land-based livelihood opportunities, and increased drainage congestion and water logging due to sedimentation of rivers, limiting production options for the char dwellers.

In quantitative terms, IPCC estimates that, by 2050, changing rainfall patterns with increasing temperatures, flooding, droughts and salinity (in coastal belt) could cause decline in rice production in Bangladesh by 8 per cent and wheat by 32 per cent, against 1990 as the base year (MoFE, 2008). At the country level, studies using crop models with various assumptions about temperature and CO_2 level predicted a general decline in yields and output of rice crop in all seasons in 2050, compared to base year 1990, the rate of reduction varying between crops and models used (Karim, et al., 1996). The recent estimates using different models with changed assumptions predicts for 2050 reduction in production by 1.5-25.8 per cent for Aus rice, and 0.4-5.3 per cent for Aman due to the effect of high temperature. For Boro rice, production could be increased by 1.2-9.5 per cent, assuming the temperature would not exceed the 35^0 C threshold limit for rice production (Hussain, 2008).

Strategies actions for food security and climate change adaptation

The detailed strategies and actions on food security enhancement and climate change adaptation in Bangladesh are provided in two major documents of the government–the National Food Policy Plan of Action (2007-2015) and the Bangladesh Climate Change Strategy and Action Plan, 2008. The overriding objectives of these initiatives are to ensure sustainable food security, social protection, health and improved livelihood development. For ensuring food security for all in an era of uncertain and volatile international food grain market, domestic food production must be accelerated for moving from self-reliance to self-sufficiency in food (Hossain, 2008; Deb, 2008; Planning Commission, 2008).

a. Technology generation

Agricultural technology generation must be given the top most importance, energizing the agricultural research system, and especially developing new crop varieties adaptable to changing climatic conditions. Some successes are already reported in the development of new crop varieties, soil health, disease management and production processes. Agricultural engineers working in water management, farm mechanization and process engineering are making significant contributions. These are promising ventures for supporting climate adaptation efforts, which deserve up-scaling of laboratory support, skill development, manpower mobilization and retention, and operational finance. Side by side with the national research systems, to counteract rising food prices, international research systems including CGIAR, should be ready to invest more heavily in agricultural science and technology to increase agricultural production on a global level.

b. Protection of agricultural lands

Bangladesh already faced formidable challenges of keeping up the present momentum of food production in a declining land and water resource situation. Arable land is decreasing at about 1 per cent annually, although a proportion of cultivable land is being shifted from crop cultivation to more profitable enterprises such as pond fishery, livestock farming and agro-forestry. This is the kind of transformation encouraged in the past in order to bring about diversification of agriculture. But the looming food crisis forces the people to think hard about how best to protect rice lands from being converted into non-agricultural uses. Possibilities of earth filling along the sea, organized community housing and enactment of laws restricting conversion of agricultural land for other purposes can be explored (Ahmed, 2008).

c. Upholding soil health

Soil health is in jeopardy due to loss of organic matter content and continuous use of unbalanced chemical fertilizers for irrigated rice production. Fertilizer shortage is held responsible for the looming food crisis (Bradsher and Martin, 2008). The recent jump in fertilizers prices are likely to discourage millions of Bangladeshi small farmers to apply required does of fertilizers, especially the essential soil nutrients like phosphate and potash, whose prices have sky rocketed to such a level that their uses are bound to fall. To ensure optimum use of TSP and MP fertilizers for maintaining food harvests in the coming seasons, additional subsidy or at least recasting subsidy on urea should be attempted along with further improvement of fertilizer delivery mechanism.

d. Sustaining irrigation water market

Profits squeeze in irrigated rice farming is likely due top rise in input cost. The current high price of paddy gives a reasonable incentive to farmers with marketable surplus but those who are the net buyers of rice are hard hit by high rice price (they are 62 per cent in number but operate only 27 per cent of land). Bayes and Hossain (2008) identified the surplus farmers as those cultivating more than 1 acre, and those below 1 acre are deficit producers. Recent Sample Survey of Agriculture, 2005 shows that farmers above 1 acre constitute 38 per cent of total number of farm households but they cultivate 73 per cent of land and thus produce about three-fourths of total rice in the country. Therefore, for sustaining high incentives of surplus rice farmers and for maintaining the current rice production growth momentum, paddy price must not fall much below the present level. Otherwise, the sustainability of irrigation water market that has proved to be the key driver in accelerating Boro rice production in Bangladesh will be hampered.

For long term sustainable growth in food production, there must be technological support to achieve productivity gains through reducing yield gaps, supplying quality inputs, and assuring good price of output. Especially, water productivity, which is much less than in neighboring countries, has to be increased through dissemination of water saving

technologies, on-farm water management training and wherever possible promoting rain water harvest.

e. More efforts for constraint areas

Sustaining production in favorable ecologies and modernizing production system in unfavorable eco-systems call for massive technological support. Bangladesh has 41 per cent of land as agro-ecologically constrained regions, which include deeply flooded areas, char land, flash flood areas, coastal tidal surge and salinity prone areas and hill agriculture. These areas have difficult soils, poor communication infrastructure, disperse agricultural extension network, poor marketing facilities and high incidence of poverty, and thus these areas need special investment priorities (Mandal, 2003). Attempts must be made to increase cropping intensity by bringing huge seasonal fallow lands available in the north east, southern and some parts of northern regions.

f. Ensure food security for all

Since food grain prices are going to stay high for some time, the country has to scale-up and broaden its safety net programmes to rural areas to protect the poor consumers and ensure food security for all.

g. Upholding food nutrition

The current National Food Policy Plan of Action emphasizes supplementation and fortification for balance nutrition. While this can be there, more important approach to ensuring food security will be to pursue food-based approaches through production as well as dietary diversity (Tontisirin, et al., 2002).

h. Management of coastal zone

The country's climate change action plan stresses on adaptation to climate change. No doubt, structural measures like cyclone shelters, coastal embankment and polders are needed to protect life and properties from natural disasters. Simultaneously, best practices from programmes like HKI homestead food production system for char land dwellers, BARI homestead vegetable production in droughty high brand areas, and UNDP–DFUD community based adaptation programme should be widely replicated in similar areas. Other programmes like tree plantation, coastal forestation, agro-forestry, water conservation, and rain water harvest should be promoted. In such awareness building and technology dissemination, the huge potential of Agriculture Extension Department should be properly utilized.

i. Agricultural engineering for food security

Most agricultural engineers are spending their toils to improving the existing low income generation activities of the farmers in agriculture sector. They are, presently, involved in irrigation and water management, farm power machinery and post harvest process engineering research, development and implementation activities. Many of the success

stories of agricultural engineers have been proclaimed by the end users and decision makers. Agricultural engineers, in Bangladesh, have been contributing to food production of the country to a large extent. Agricultural Engineers in research organizations and at fields have proved their ability to bring changes in crop irrigation, farm operation and post harvest processing systems by introducing improved technologies. Organizations like Bangladesh Agricultural Research Institute, Bangladesh Rice Research Institute, Barind Multipurpose Development Authority, Rural Development Academy, Bangladesh Agricultural. Development Corporation etc. are all trying to change the existing crop production techniques by developing and introducing new and appropriate technologies to farmers. But, still these efforts are scant. For wider contribution of agriculture engineers, extended cooperation from the decision makers need to be reassessed. Such cooperation will help them work more efficiently and effectively to boost production and ensured food security of the country.

Conclusions

Bangladesh is strongly committed to ensure food security and food safety. In order to do that, the country has to pay keen attention to technology generation, uphold soil health, proper irrigation and water management activities, farm mechanization, post-harvest loss reduction and to work in constraint areas. Many of these can be accomplished by agricultural engineers. The only thing is to utilize their expertise properly giving them adequate working facilities and maintaining favorable environments. Further, regional cooperation for food security can be attained through regional cooperation, integration of resources, sharing of knowledge and experience.

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