e **J A D E**
electronic **Journal of Agricultural and Development Economics**

Agricultural and Development Economics Division (ESA) FAO
available online at www.fao.org/es/esa/eJADE

Vol. 2, No. 2, 2005, pp. 103-132

Food Security and Nutrition in Bangladesh: Progress and Determinants

Mahabub Hossain, Firdousi Naher[1] and Quazi Shahabuddin[2]

International Rice Research Institute
Manila, Philippines
m.hossain@cgiar.org

Abstract

For Bangladesh food security was synonymous with achieving self-sufficiency in rice production and stabilization in rice prices. The country has made good progress in increasing rice production through technological progress, facilitated by private sector investment in small scale irrigation. But, it is difficult to sustain the progress made in view of the growing pressure of population on scarce land resources. Domestic food grain production remains susceptible to floods and droughts thereby perpetuating the threat of major production shortfalls, inadequate food availability, and vulnerability from fluctuation in prices. The availability of other foods has not increased, and the progress in nutritional outcome has remained slow. Forty percent of the population lives below the poverty line, and income inequality has been worsening. This paper assesses the trends in factors that affect food production, availability of food and their impact on nutrition outcomes. It also probes into the trends in poverty and distribution of income and access to food through markets.

Key words: *Bangladesh, food security, nutrition, poverty, safety nets, natural disasters*

1. Introduction

Food security is defined as "access by all people at all times to enough food needed for an active and healthy life. Its essential elements are the availability of food and the ability to acquire it" (Reutlinger, 1985). It is important to view food security from both national and individual angles.

[1] Department of Economics, University of Dhaka, Bangladesh
[2] Bangladesh Institute of Development Studies, Bangladesh

At the national level food security means the availability in the country of sufficient stocks of food to meet domestic demand until such time as stocks can be replenished from harvests or imports. At the individual level, it means that all members of the society have access to the food they need, either from their own production, from market and/or from the government's transfer mechanism. Experiences from India and other countries have shown that even when the national level food security is achieved, individuals and groups in the country can still go hungry because they do not have the means to access food (Clay, 1989).

Bangladesh experienced famine in 1974 due to a) the destruction of infrastructure during the civil war with Pakistan in 1971 and b) consecutive natural disasters leading to substantial reduction in rice production. In view of that experience, for long periods, food security was synonymous with achieving self-sufficiency in rice production and stabilization in rice prices (Dorosh et al, 2004). A doubling of rice production from the mid-1970s to the turn of the last century, improvements in road and communication infrastructures and increased real incomes made possible by general economic development have transformed the Bangladesh food economy. Indeed, Bangladesh passed a major milestone in its efforts to achieve food security at the end of the 1990s, since for the first time in its history, food grain production exceeded target requirements (based on 454 gm/person/day). Yet food security has not been achieved, and whatever progress been made would be difficult to sustain in view of the growing pressure of population on extremely scarce natural resources. Domestic food grain production remains susceptible to floods and droughts thereby perpetuating the threat of major production shortfalls and inadequate food availability. Moreover, increases in cereals production have not been accompanied by significant increases in availability of other foods. Nearly 40% of the population lives below the food consumption-based poverty line, lacking sufficient resources to afford diet of 2,122 kilocalories (kcal) per person per day, along with other basic necessities.

Apart from the prevailing deficit in total calorie intake, the normal diet of Bangladeshi people is seriously imbalanced, with inadequate consumption of fat, oil and protein, and with more than 80 per cent of calories derived from cereals. Women and children are especially vulnerable due to their greater nutritional requirements. This dietary imbalance reflects insufficient domestic production of non-cereal foods (pulses, oilseeds, fruits, meat, milk and eggs), low incomes, food preferences and lack of nutrition education. Moreover, the general health and sanitary environment and caring practices compound the problem of translation of food consumption into nutrients, contributing to poor nutritional outcomes.

The purpose of this paper is to assess the trends in factors that affect food production, availability of food and their impact on nutrition outcomes. It also probes into the trends in poverty and distribution of income, and endowment of land that affects people's access to food. The paper also makes an assessment of the government's strategies and policies for food and nutrition security and safety nets for addressing food insecurity and vulnerability from price and production instability.

2. Production and Availability of Food

2.1 Trend in domestic production of food

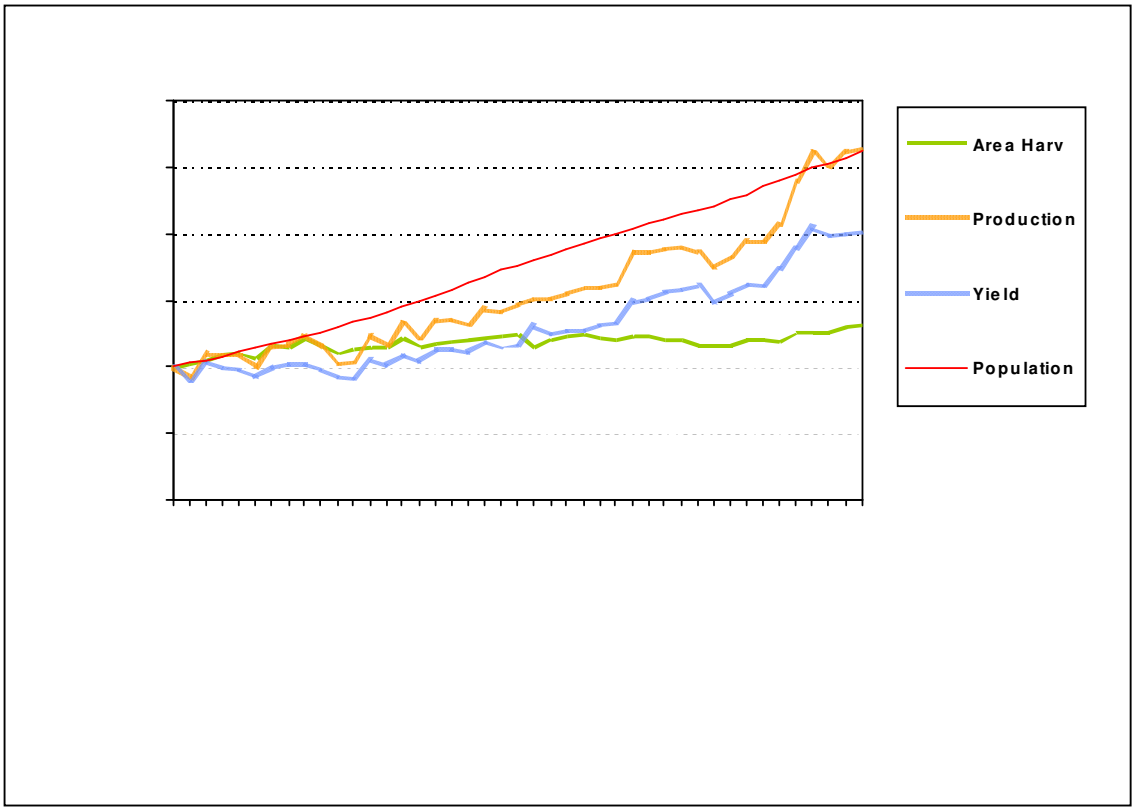
In a subsistence-oriented agrarian economy such as Bangladesh, domestic food production has an important role to play in the quest for food security. Major items in the food basket in Bangladesh are rice, wheat, pulses, potato, vegetables and fish. These food items account for almost 85 percent of the total calorie and protein intake. Rice and wheat alone contribute to 74 percent and 57 percent of the total per capita calorie and protein intake respectively (BBS 2003).

Rice occupies 71 percent of the gross cropped area and accounts for 94 percent of the food grain production. Most farmers with access to irrigation facilities grow two rice crops during the year. The net cultivated area in Bangladesh is about 8.0 million ha, but the total cropped area of rice is about 11.0 million ha; such is the importance of rice in agriculture in Bangladesh. The long-term trend in the production of rice vis-à-vis the population growth can be seen from Figure 1. Rice production declined in absolute terms immediately after the Independence in 1971 due to the destruction of infrastructure by the civil war and the consecutive natural disasters. Indeed, the country faced severe food insecurity and famine in 1974-75 due to the shortfall in domestic

production caused by floods, the government's incapacity to import, and mismanagement in distribution, which led to a skyrocketing of rice prices (Alamgir 1980; Sen 1982; Sobhan 1979). However the growth of cereal production resumed from 1976 and had almost an unhindered growth since then (except for a short period in the early 1990s). The growth in rice production kept pace with population growth in the 1980s, and surpassed population growth by a significant margin in the 1990s.

The respectable growth in rice production was propelled by adoption of high-yielding modern varieties of rice, facilitated by an expansion of irrigation infrastructure. Almost 56% of the cultivated land now has access to irrigation facilities, developed mostly by private investment on small-scale shallow tubewells and power pumps (Hossain, 2003). The adoption of modern rice varieties has reached 70% of rice cropped area. Only in the deep-flooded areas in the depressed basins, and in the salinity affected coastal areas farmers still grow low-yielding traditional varieties. Almost 90% of the growth in rice production came from the increase in yields made possible by the technological progress in rice cultivation **(Fig. 1**).

Figure 1. Trends in rice area, production and yield and population, 1960-2003.



Source of raw data: FAO, 2004.

The respectable growth in rice production was propelled by adoption of high-yielding modern varieties of rice, facilitated by an expansion of irrigation infrastructure. Almost 56% of the cultivated land now has access to irrigation facilities, developed mostly by private investment on small-scale shallow tubewells and power pumps (Hossain, 2003). The adoption of modern rice varieties has reached 70% of rice cropped area. Only in the deep-flooded areas in the depressed basins, and in the salinity affected coastal areas farmers still grow low-yielding traditional varieties.

Almost 90% of the growth in rice production came from the increase in yields made possible by the technological progress in rice cultivation (**Fig. 1**).

Bangladesh does not have favorable agro-climatic environments for growing wheat because of the short and mild winter season and heavy soils. Wheat is grown mostly in the north-western region of the country which has a relatively longer winter period. Till late 1960s wheat was an unimportant crop occupying less than one percent of the cropped area. The availability of high-yielding modern varieties in the late 1960s, however, induced farmers to grow more wheat. Hence, the area under wheat expanded exponentially from 126,000 ha in 1976 to 676,000 ha in 1985, while the production increased from 117,000 tons to 1.46 million tons. The expansion was halted over the next decade, but picked up again since 1996 due to a favorable trend in the price of wheat relative to rice. Over the last three decades wheat production increased at a rate of 10% per year but wheat still accounts for only 7% of the total cereal production.

In the context of food security, an important point to note is that the cereal production has become more resilient to natural disasters over time because of the dramatic change in the seasonal composition of production. The area under the early-monsoon low-yielding *aus* rice (April to July) has been reduced from 3.5 to 1.2 million ha; so the loss of production from the late arrival of the monsoon rains is now substantially lower than in the pre-green revolution period. Similarly, the area under the direct-seeded deep-water *aman* rice (March- November) has been reduced from 2.2 to 0.7 million ha, substantially reducing the crop losses from floods. In the deeply flooded area farmers now keep the land fallow during the monsoon season, and grow high-yielding boro rice crop (January to June) with irrigation. The *boro* rice area has expanded from 0.5 million ha in the early 1970s to nearly 4.0 million ha by 2003. The *boro* rice together with wheat now brings over half of the cereal production during the March to June period; their share of the total cereal harvest was less than 10% in the early 1970s. The farmers can now recover the loss from the traditional monsoon season *aman* crop within six months, while earlier they had to wait for a year to recover the losses. This change in the seasonal composition of production also had a smoothening effect on the seasonal variation in rice prices, and the ability of the country to cope with disastrous floods such as in 1988 and 1998 (see below).

However, the green revolution in cereal production has not been an unmixed blessing. The rapid expansion in the area of *boro* rice and wheat was achieved partly through reduction of area and production of pulses and oilseeds. These two crops were important sources of protein and micronutrients, particularly for the poor. The production of sugarcane and fruits has also remained stagnant. Among other food crops, the growth was respectable only for potatoes and vegetables (**Table 1**), because of higher productivity and profitability compared to rice and wheat.

Table 1:Long-term trend in the production of major food crops; 1970-2001.

Food item	Production in '000 tons				Growth rate (%/yr)
	1970-72	1980-82	1990-92	1999-01	1971-2000
Cereals	10584	14929	19223	26002	3.2
Rice	10393	13916	18157	24126	3.0
Wheat	111	961	986	1807	10.1
Potatoes	1637	1733	1715	3343	2.5
Sugar	1367	1120	991	955	-1.2
Pulses	922	602	518	379	-3.0
Oil crops	448	428	466	486	0.3
Vegetables	1182	1081	1374	1794	1.5
Fruits	1384	1334	1338	1369	-0.1
Spices	149	115	138	141	-0.2
Fish	749	656	894	1544	2.5
Meat & eggs	301	282	404	588	2.3
Milk	1082	1182	1649	2116	2.3

Source: FAO 2004, Food Balance Sheet.

The fisheries sub-sector contributes 5.5% to the gross domestic product. It provides employment to more than 700 thousand people. Bangladesh has substantial biological and physical resource base for fish production. In terms of nutrition, fish also occupies a significant position in the dietary habits of the people. The growth in fish production was sluggish in the 1970s. The growth picked up in the 1980s, and was very rapid (7% per year) in the 1990s (**Table 1**). The growth in the production of meat and milk has been unsatisfactory, while their demand has been growing fast.

2.2 Trend in imports and availability of food

Availability of food at the national level depends not only on domestic production but also on imports and exports. Except shrimp, Bangladesh does not export any other food item in significant amounts. But the country is heavily dependent on imports of almost all food items to meet the demand from growing population. The long term trend in the imports of major food items can be seen from **Table 2**.

Table 2: Trend in imports (000 tons) of major food items, 1970-2001.

	Volume of imports '000 tons			
Food item	1970-72	1980-82	1990-92	1999-01
Rice	511	295	140	872
Wheat	971	1366	1413	1969
Maize	-	-	1	221
Sugar	23	56	65	230
Pulses	-	3	113	245
Soybean oil	51	38	234	662
Palm oil	-	66	63	242
Animal fat	26	33	20	25
Milk	56	211	291	334
Fruits	-	18	28	108
Vegetables	-	-	95	43
Cassava	-	-	-	59

Source: FAO 2004, Food Balance Sheet.

Despite the favorable trend in the domestic production over the last three decades, Bangladesh is not yet self-sufficient in cereal grains. The imports of rice remained stagnant at around 0.5 million tons per year, with substantial increase in imports in years following poor harvests due to floods and droughts. Bangladesh imported over 2.0 million tons of rice during 1973-75, 1988-89, and 1998-99; all these years followed years of disastrous floods or droughts. In a few odd years following bumper harvests (1991 and 2001), the government declared achieving self-sufficiency in rice production, only to find that it slipped back to import dependence due to increasing demand from growing population. Rice imports were negligible during 1991-94, and most recently during 2000-2001.

Bangladesh also receives substantial amount of wheat from outside the country, mostly in the form of food aid. Wheat imports increased consistently over time despite the rapid growth in domestic production and the reduction in food aid in recent years. The volume of imports increased from 1.0 million tons in the early 1970s, to 1.4 million tons in the early 1990s, and further to 2.0 million tons during 2000-02. Wheat is an inferior table food in the Bangladeshi diet, but the demand has been growing due to urbanization and the growing practice of eating away from home by the urban middle class.

The other food items for which imports have been growing very fast are oils, pulses, sugar, milk and fruits (**Table 2**). The rapidly rising import of these food items has become a major drain on the limited foreign exchange earnings of the country. The government has adopted a policy of promoting crop diversification to reduce the dependence on imports, but without much success.

Table 3.Changes in the availability (gms/person/day) of major food items, 1970-2001.

Food item	1970-72	1980-82	1990-92	1999-01*
Rice	411	387	431	452
Other cereals	45	68	59	68
Roots	56	46	35	59
Sugar	43	33	30	30
Pulses	14	17	14	13
Oils/fats	6	7	9	20
Vegetables	43	31	32	35
Fruits	50	38	30	29
Meat and eggs	12	8	9	12
Milk	31	32	37	40
Fish	30	20	21	32
Total	741	687	707	789

FAO, 2004.

*Estimated using the revised population estimate of Bangladesh

Food aid has played an important role in meeting the domestic food demand. In the early years after independence, the country faced major food deficits, most of which was taken care of through grain imports from the United States under the PL 480 program. Between 1975 and 1977, more than 1.3 million metric tons of food grains came into Bangladesh as food aid, which was more than 85 percent of the total inflow of food grain. Increases in domestic production and augmented capacity of the government to import food grains commercially have resulted in the downward trend in food aid in recent years. Presently, this share has come down to less than 35 percent of total cereal imports with wheat accounting for 98 percent of the total food aid.

The combined effect of domestic production, food aid, imports and population growth on food availability can be assessed from **Table 3**. It can be seen from the numbers that the food grain availability at the national level barely kept pace with the population growth till the late 1980s. The situation has improved somewhat in the 1990s, particularly for cereal grains, due to acceleration in the growth of rice production and the success in reducing the growth of population. The growth of population declined slowly from about 3.0% in the 1960s to 2.4% in the 1980s, but then sharply to 1.5% in the 1990s.

3. Trends in Food Consumption and Nutrition

3.1 Adequacy of food consumption

Food accounts for bulk of the household expenditure of the poor. According to the 2000 Household Expenditure Survey, the poorest 40% of the population spend 70 percent of their income on food, and 35% on rice alone. In spite of this, a large segment of the population consumes less than 1805 kcal per capita per day, which is much below the norm of the minimum energy intake of 2,110 kcal**,** for living a healthy productive life.

The level of consumption of different food items reached in 1990s as estimated in the Household Income and Expenditure Surveys (HIES) of the Bangladesh Bureau of Statistics (BBS) can be reviewed from **Table 4**. The table also compares the level of food consumption with the normative food requirement prescribed by the National Nutrition Council for the average Bangladeshis for having a balanced nutrition and living a healthy productive life (GOB, 1999). It can be noted that for rural areas the consumption of rice, the dominant staple food for Bangladeshis, reached a level much higher than the minimum requirement; there is a marginal deficit for tubers and vegetables and fish; and substantial deficits for pulses, oils and livestock products that are major sources of protein and micro-nutrients. The picture is almost the same for urban areas, except that the consumption of cereals is lower compared to rural areas while the consumption of most other food items is higher. It appears from the composition of the diet that the quality of the food basket is better for urban areas compared for rural areas.

The total consumption of food continues to increase in rural areas, but the total intake is still about 11% lower than the minimum requirement, and the deficit is mostly on account of non-cereal food as mentioned earlier. For urban areas, total intake has declined in the 1990s and the present level of intake is still about 13% lower than the minimum requirement. Over time, there has been substantial decline in the consumption of wheat and pulses but respectable increases in the consumption of vegetables (including potatoes), fruits and fish. The upward trend in the consumption of vegetables and fruits reported by HIES is in contrast to the declining consumption obtained from the food balanced sheet data (**Table 3**). It is a general perception that the official statistics under-report the recent growth in vegetables and fruit production.

An important observation in **Table 4** is that the decline in the food intake in the 1990s for urban areas is mostly on account of the decline in the consumption of rice. This is in contrast to the substantial increase in rice production in the 1990s, as reported earlier. The general pattern of consumption observed during the process of economic transformation is that the staple food has the lowest income elasticity of demand, which also declines with the growth of income. After a threshold level of income, when consumers can afford to have a diversified diet needed for balanced nutrition, the per capita consumption of staple food starts declining. In Asia, Japan and South Korea and Malaysia have experienced this trend with growing economic prosperity, and it is now taking place in China.

Does the declining rice consumption in urban areas indicate that Bangladesh has reached that level of consumption threshold at least for urban areas? This is a controversial issue. It could be argued that the decline in rice consumption is a reflection of the upward trend in the proportion of slum population in cities emanating from the rapid rural-urban push migration, and the higher pressure for expenditures on transport, education and healthcare which could reduce the income available for the purchase of staple food.

Table-4.Changes in consumption (gm/person/day) of different food items, 1983-84 to 2000.

	Minimum intake required for balanced	Rural area				Urban area			
Food item	nutrition	1983-84	1991-92	1995-96	2000	1983-84	1991-92	1995-96	2000
Rice	390	421	481	479	479	351	416	391	383
Other cereals	100	65	42	43	18	79	55	51	40
Vegetables & potatoes	225	140	176	201	193	179	209	206	198
Pulses	30	26	17	13	15	22	22	19	19
Oils & fats	20	7	9	8	11	11	16	17	18
Sugar	10	4	9	9	7	5	11	10	9
Fruits	50	17	16	25	27	21	23	39	34
Fish	45	29	32	42	37	39	48	52	42
Meat & eggs	34	10	12	12	14	22	20	30	34
Milk	30	22	18	27	29	34	23	36	32
Total	934	741	797	859	830	761	843	851	809

Sources: Bangladesh Bureau of Statistics (series), Report of the Household Income and Expenditure Survey, various years.
Bangladesh National Nutrition Council for the norm of minimum food intake required for balanced nutrition, as cited in GDB (1999)

A look at the consumption for the lower 40% of the population in the expenditure scale reveals that only rice intake has continuously increased, over the years (See Appendix Table A1 and A2). This contrasts with falling rice consumption for overall expenditure groups (**Table 4**). Thus, it appears that while the richer sections of the society are being able to gradually reduce their cereal intake and diversify their diet, the poor are still spending their incremental income on rice. For all the other food items, consumption for all income groups either stagnated or declined. From the nutritional point of view, this implies that the intake of an unbalanced diet has worsened over the years for the poorest sections of the population.

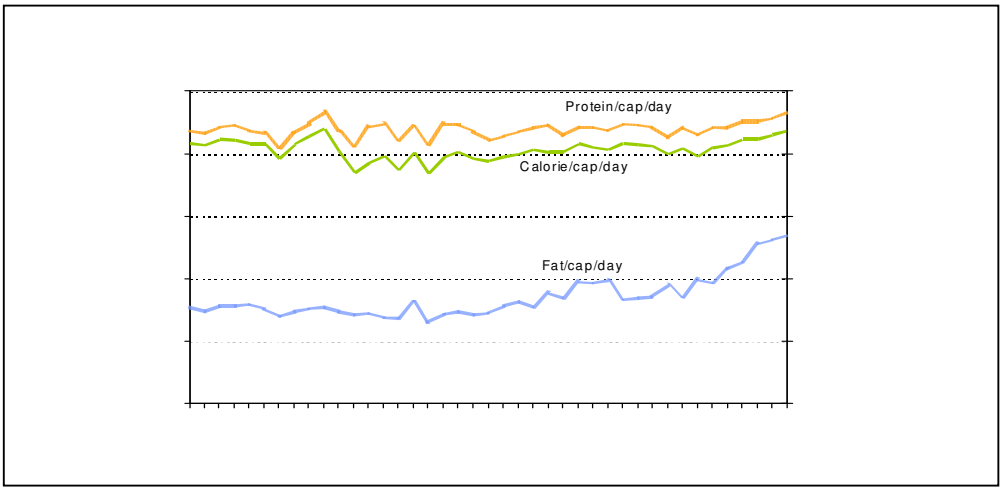
It is interesting to note that even that segment of the population belonging to the highest income quintile consumes barely half of the normative requirement of pulses. Indeed, the consumption of pulses has substantially decreased for the population belonging to upper expenditure quintiles, while for the lower quintiles the decrease has been dramatic (See Appendix Table A2 and A3). Consumption of fish has also declined between 1991-92 and 2000 for the lowest and the highest quintiles. This reduction in the consumption of protein rich foods may be attributed to a decline in the accessibility. A look at prices of pulses and fish relative to rice show that the prices of these two commodities have soared over the years - an indication of relative scarcity. During mid-1970s, the price of pulses was around one and half times that of rice, while fish was valued at four times the rice price. By the end of the 1990s, these price ratios had soared to 2.6 and 8.8 (**Table 5**. The production of oilseeds was also relatively stagnant, but the consumption has increased at a respectable rate for poor and the rich alike due to meeting the deficit from domestic production through rising imports of cheap soybean and palm oil. The price of oils relative to rice has in fact declined over time, indicating the relative abundance of this food item.

Table 5: Trend in the prices of pulses, fish and oils relative to rice, 1975-2000.

Commodity	1975-77	1980-82	1990-92	1998-00
Pulses/ Rice	1.55	1.88	2.33	2.59
Fish/ Rice	4.16	4.73	6.88	8.77
Oils / Rice	6.09	4.73	4.92	4.31

Source: Authors' calculations based on BBS (various years).

Figure 2. Trend in calorie, protein and fat daily per capita intake, 1961-2001.



Source: FAO, 2004.

3.2 Calorie and protein intake

The long-term trend in the calorie and protein intake estimated from the food balance sheet data can be seen from **Figure 2.** The data show a decline in the intake of the major nutrients in the 1970s, and moderate recovery since the early 1980s. The upward trend is quite pronounced since the mid-1990s. But the present level of the intake is almost the same as in the 1960s. During the 1999-2001 period, the energy intake was 2,284 kcal, and the protein intake 48.7 grams per capita per day; very low levels by international standards.

An alternative picture of the trend in energy and protein intake can be drawn from the national nutrition surveys, and the derived estimates from the HIES conducted by the BBS. Since the estimates are based on small samples, the data should be taken with a grain of salt. The national Nutrition Surveys report a consistent decline in the energy intake over the last four decades. The per capita energy intake for rural people reportedly has declined from 2251 Kcal during 1962-64 to 2094 Kcal in 1975-76, 1943 Kcal during 1981-82, and further to 1892 Kcal in 1995-96 (**Table 6**).

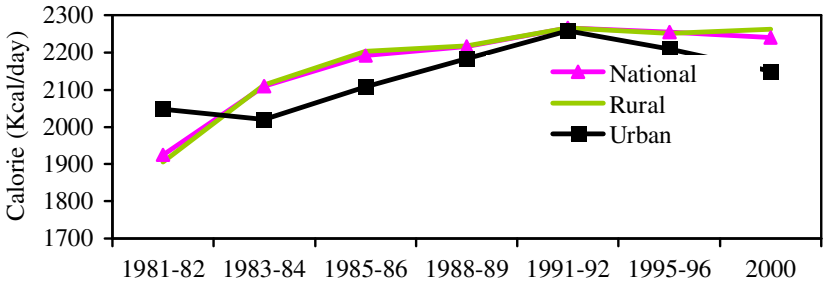
Table 6. Changes in nutrient intake in Bangladesh: estimates from national nutrition surveys.

Nutrient	Rural areas				Urban areas	
	1962-64	1975-76	1981-82	1995-96	1962-64	1995-96
Calorie (Kcal)	2251	2094	1943	1892	1777	1779
Protein (gm)	57.5	58.5	48.4	46.4	49.7	49
Fat (gm)	17.7	12.2	9.8	14.1	26.1	22.5
Carbohydrate (gm)	476	439	412	395	327	345
Calcium (mg)	304	305	260	328	239	363
Iron (mg)	9.7	22.2	23.4	11	8.7	12.7
Vitamin A (I.U)	1590	730	763	1571	1875	2017
No. of sample households	1752	674	597	975	588	270

Source: Jahan K. and Hossain Mosharraf, 1998. Nature and Extent of Malnutrition in Bangladesh. Institution of Nutrition and Food Science, University of Dhaka

The decline in the protein intake was even sharper. In contrast, the HIES data show that during the early 1980s and 1990s, per capita calorie intake went up steadily for the rural population but declined for the urban population due to the reduction in per capita cereal consumption (Figure 3). Between 1991-92 and 2000, urban per capita calorie intake fell by about 5 percent from 2258 kcal to 2150 kcal. Thus the picture on the trend in nutritional status obtained from different sources is confusing. It remains an issue of great controversy among the elites.

Figure 3: Trends in daily per capita calorie intake, Bangladesh, 1981-2000.



Source: BBS: Reports of the Household Income and Expenditure Surveys, various years.

3.3 Changes in nutritional status

During the last decade, Bangladesh has made significant progress in several areas such as higher child immunization rates, augmented life expectancy, lower infant mortality, declining total fertility rates, and access to safe water (BIDS, 2002). Despite these gains, the public health scenario is dismal in Bangladesh. Access to adequate healthcare still eludes many. Prevalence of malnutrition, particularly child malnutrition, though on a downward trend, is still at an alarmingly high level. More than 50 percent of all children between 6 and 71 months are underweight or low weight-for-age, while nearly 50 percent of them are stunted or low height-for-age (**Table 7**). In this context, reference may be made of the "Asian enigma"; the 'enigma being that even sub-Saharan Africa has a lower proportion of malnourished children (32 percent) than South Asia (more than 50 percent) despite the former having lower income and worse environmental health compared to the latter, and poor record with regard to the progress in poverty reduction.

Acute and chronic malnourishment is unusually high in Bangladesh with about 20 percent of both boys and girls severely stunted and about 12 to 14 percent boys and girls severely underweight.[4] Though the incidence of malnutrition is almost the same for boys and girls, its severity is higher amongst girls. Rural-urban disparity in child malnutrition is quite stark with the percentage of rural malnourished children being significantly higher than that of urban areas (**Table 7**). More than 50 percent of the rural children are stunted or underweight with about 20 percent severely stunted and about 13 percent severely underweight. Moreover within the rural areas, malnutrition is concentrated amongst children in the districts of Sylhet, Comilla, Faridpur, Tangail, Jamalpur, Noakhali and Chittagong. These regions account for 50 percent of all malnourished children in the country (Appendix Table A3). Bangladesh also has one of the highest prevalence of low birth weight children (less than 2500 grams) in the world (World Bank 2003).

Table 7. Rural - urban difference in child (6-71 months) malnutrition, 2000.

	Percent		
State of malnourishment	Wasted	Stunted	Underweight
Moderate / severe			
Rural	11.9	50.7	52.8
Urban	10.8	38.3	42.2
Severe			
Rural	1.0	19.7	13.2
Urban	1.8	15.1	9.6

Source: Child Nutrition Survey of Bangladesh, 2000.

The gender disparity in nutrient intake is more pronounced (Appendix Table A4). The

[4] Stunting is a long term measure pointing to past or chronic malnutrition and is the consequence of inadequate food intake over a long period of time and/or frequent illness, particularly diarrhoea. Wasting is a shorter term measure of child nutritional status and reflects substantial weight loss, usually as a consequence of acute food shortage in recent times and/or recent disease or current disease, especially diarrhea. Underweight is a composite indicator that reflects chronic or acute malnutritional status or both.

proportion of nutrients consumed by men is more than one and a half times that of females. A look at the intra-household distribution of nutrient intake depicts the worsening male-female nutrient intake ratio over a period of 15 years from 1981-82 to 1996. Indeed, the female members are known to take their meals only after the men and children of the family have eaten. Amongst the children as well, often it is the male child who is fed first. It is only in the 10-12 age group that a perceptible improvement has come about vis-à-vis the disparity in the early 1980s.

Bangladesh has however made considerable improvement in child malnutrition since the early 1990s (**Table 8**). Between 1992 and 2000, the incidence of stunting and wasting has declined at a rate of 3.3 percent and 4.3 respectively per annum. Since wasting results from acute food shortage in recent times, its faster decline vis-à-vis that of stunting is indicative of improved food security in recent years. It will consequently impact the long term malnutrition measure i.e. reduction in the number of children stunted. The nutrition surveillance project run by the Helen Keller Institute (HKI) observed that moderately malnourished women as measured by BMI index of less than 18.5 has gone down from 52% in 1996-97 to 36% in 2002. Similarly, the moderately malnourished children, as measured by their weight for height index, have declined from 62% in 1998 to 53% in 2002.

A potential threat to food security is the increasing number of HIV/AIDS infected people. A survey carried out in 1996 estimated 21,000 people (about 0.03 percent of the population aged between 15 - 49 years) infected with the virus. This was adjudged to be a nascent stage of HIV/AIDS epidemic. However, according to the fourth round of the national HIV and behavioural surveillance conducted in 2003, the HIV epidemic is starting in Bangladesh. The HIV infection among injection drug users has more than doubled since 2002 in Central Region. This is fast approaching the critical 5 percent level, marking a concentrated epidemic.

Table 8. Trends in child malnutrition, Bangladesh, 1985–2000.

Malnutrition manifestation	1985-86	1989-90	1992	1995-96	2000
Stunting	68.7	65.5	64.2	51.4	48.8
Wasting	14.8	14.7	16.7	16.6	11.7
Underweight	71.5	66.5	68.3	57.4	51.1

Source: Child Nutrition Survey of Bangladesh, 2000

3. Factors influencing access to food

Sen (1982) introduced the concept of "food entitlement" as a key element in the study of food insecurity and famine. According to him the food supply statements say things about a commodity or the group of commodities, while the food insecurity statements are about the relationship of the people to the commodity or the group of commodities. In a private ownership market economy, food entitlement depends on four elements: a) production- based elements which depends on ownership of productive assets, b) trade-based entitlement which depends on market prices of food, c) Household labour-based entitlement which depends on the productivity and the opportunity cost of labour power owned by an individual or household, and d) inheritance- and transfer-based entitlements which include relief and subsidies obtained from the government. The distribution of income and an individual's ability to access food is the outcome of the complex operation and interactions of all those elements. In this section we report some information on the entitlement of land, the dominant factor of food production, the behaviour of food prices, and the distribution of income and incidence of poverty to understand the forces affecting the distribution of food and its access to the households and individuals.

3.1 Growth and distribution of income and alleviation of poverty

The dominant determinant of food entitlement of a household is obviously the level of income. The estimate of income separately for rural and urban areas is only available from the reports of the HIES. The estimates are reported in **Table 9**. As can be noted from the table, the per capita expenditure (often used as a measure of permanent income) was still very low in Bangladesh in 2000, at US$189 for rural households, and US$329 for urban households. For rural areas, the per capita expenditure remained almost stagnant in the 1980s but increased at a moderate rate of 2.5% per year

in the 1990s. The growth of income for urban areas was much faster, at 1.9% per year in the 1980s, and 3.5% in the 1990s. The data indicate growing urban-rural disparity in incomes. The ratio of the expenditure for the urban households relative to rural households increased from 1.40 in 1983 to 1.74 in 2000.

The incomes are also highly unequally distributed and have been continuously worsening. The concentration of income, as measured by Gini coefficient, was estimated at 0.30 for rural areas and 0.38 for urban areas. The increase in income inequality was moderate in the 1980s, but was very fast in the 1990s, both for rural and urban areas. So, the growth of income was faster in 1990s compared to 1980s, the distribution of that was growth was more unequal.

Table 9. Growth and distribution of per capita income, 1983-2000.

	Annual per capita expenditure		Gini Coefficient	
Year of survey	Rural	Urban	Rural	Urban
1983-84	137	189	0.246	0.298
1988-89	163	261	0.265	0.326
1991-92	162	260	0.255	0.319
2000	189	329	0.297	0.379

Source: BBS, Household Income and Expenditure Survey, and Sen, 2003.
Note; The nominal expenditure were deflated by the wholesale price index and converted to US dollars using the 2000 exchange rate.

The status with regard to the level of living of the low-income sections of the population is reflected by the measures of poverty. The measurement of poverty involves: a) specification of the income level below which a person is considered poor (poverty line), and b) construction of an index to measure the incidence, the intensity and the severity of poverty. The most commonly used measure of poverty is the so-called head-count index which measures the percent of people living below the poverty line. Two other measures, the poverty gap index (Proportionate Poverty Gap), and the Squared Poverty Gap Index (Weighted Poverty Gap) measures respectively the distance of the income of the poor from the poverty line, and the poverty gap weighted by changes in the distribution of income among the poor.

For Bangladesh, the poverty line is measured with reference to the cost of basic needs method. This method takes a normative consumption bundle of food items recommended for the average Bangladeshi population that gives a per capita daily energy intake of 2,112 kcal and protein intake of 58 gm. The required minimum expenditure of food items is estimated by valuing them at prices prevailing in the reference year. An additional 40% allowance is then made for income needed to satisfy non-food basic needs. The estimates of poverty line, and the various measures of poverty for selected years of HIES conducted by the BBS are presented in Table 10. The results show considerable progress in poverty reduction over the last two decades. However, the progress was greater during the 1990s than during the 1980s. Between 1991-92 and 2000 the incidence of poverty declined from 53 to 44% for rural areas and from 34 to 26% for the urban areas, indicating a reduction rate of one percent per year. The reduction in poverty is insensitive to the choice of the poverty measure (**Table 10**).

Table 10. Trend in poverty indices, 1983-2000.

	Poverty line (US$/person/year)		Head-count index		Squared poverty gap index	
Year of survey	Rural	Urban	Rural	Urban	Rural	Urban
1983-84	129	145	53.8	40.9	5.9	4.4
1988-89	142	170	49.7	35.9	4.8	2.8
1991-92	149	170	52.9	33.6	5.6	2.8
2000	146	167	43.6	26.4	4.0	2.3

Source: Ravallon and Sen (1996) and Sen and Hume (2004).

An alternative indicator often used to assess the changes in the living conditions of the poor is the trend in the real wage rate for the agricultural labour. It should however be noted that that wage rate may reflect the changes in income of the extreme poor and not necessarily the moderate poor. The latter group may earn their livelihood more as marginal and small farmers while the former may get the major portion of their income from the agricultural labour market. Also, the use of the deflator for measuring the real wage rate is problematic. The use of the cost living of index for deflating the nominal wage rate may not be appropriate in view of the substantially larger share of food grains in the consumption bundle of the poor as compared to the general population. **Table 11** presents the estimated real wages using two alternative deflators: a) the cost of the normative food consumption bundle used for the estimation of poverty, and b) the index of rice prices. It can be seen that the rice prices increased at a much slower rate than the prices of the food bundle, indicating a favourable trend in prices for those who spend a larger fraction of their income on staple grains (the poorer among the poor). Both measures show a sustained increase in real wages over the last two decades. The increase in real wages was faster in 1990s than in 1980s. The trend in real wages is consistent with the trend in the reduction of poverty.

Table 11. Trend in real agricultural wages, 1983-84 to 2003.

Year	Nominal wage rate (Tk/day)	Poverty line deflator (2003=100)	Rice price deflator (2003=100)	Real wage (Tk/day)	
				With poverty line deflator	With rice price deflator
1983-84	19.58	38.7	54.5	50.59	35.92
1988-89	32.71	55.7	72.6	58.73	45.05
1991-92	41.77	67.8	82.8	61.6	50.45
1995-96	45.58	78.2	103	58.29	44.25
2000	63.6	91.5	96.8	69.51	65.7
2003	72.23	100	100	72.73	72.73

Source: Sen and Hume (2004).

3.2 Entitlement of land

The entitlement of food based on household's own production, which is relevant for the farm population, would depend on the access to land. In Bangladesh, the land resources are extremely scarce and have been shrinking under pressure of growing population. The reports of the Agricultural Censuses (GOB, 1987, 1999) show the land area operated by rural households has declined from 9.2 million ha in 1983-84 to 8.2 million ha in 1996, indicating that on average 82,000 ha of land is going out of cultivation every year. During the period, the physical area under municipalities and cities increased by 607,000 ha accounting for 60% of the decline in arable land. At the same time, the number of farm households increased from 11.0 to 12.7 million, leading to an

agrarian structure dominated by small and marginal farmers. The average size of farm holding has declined from 1.70 ha in 1960 to 0.91 ha in 1983-84, and further to 0.68 ha in 1996.

The changes in the structure of landownership can be seen from **Table 12**. The picture depicted here is that of growing pauperisation rather than concentration of landholdings. Only 28,000 households owned land in sizes of over 10.0 ha in 1983-84; the number declined to 19,000 by 1996. At the other end, in 1983-84 nearly 5.4 million households (46% of all rural households) owned land in sizes of less that 0.2 ha, which cannot be a significant source of food production or income. By 1996, the number of these "functionally landless" households increased to 10.0 million (56% of all households). Only about 13.3% of the households owned land in sizes of over 1.0 ha, just enough to produce food needed by a six-member family and stocks of a few months requirements to tide over temporary crisis.

Table 12. Changes in the distribution of landownership, 1983-84 to 1996.

Size of land-ownership (acre)	1983-84		1996		Annual rate of growth (%)
	No. of house-holds (000)	Percent of households	No. of house-holds (000)	Percent of households	
Nil	1,198	8.7	1,815	10.2	3.4
0.01 to 0.20	5,200	37.6	8,172	45.8	3.7
0.20 to 1.00	4,639	33.6	5,473	30.7	1.4
1.00 to 2.00	1,598	11.6	1,458	8.2	-0.8
2.00 to 3.00	650	4.7	541	3.0	-1.6
3.00 to 10.00	504	3.6	350	2.0	-3.0
10.00 & above	28	0.2	19	0.1	-3.2
Total	13,818	100.0	17,828	100.0	2.1

Source: Bangladesh Bureau of Statistics, Report of Agricultural Census, 1983-84 and 1996

The change in the structure of operated holdings can be seen from **Table 13**. Large farms are very few, only 2.3% operating more than 3.0 ha in 1996. The medium and large holdings are getting subdivided under population pressure, leading to an increase in the number of small and marginal farms. In 1996, small and marginal farms with holdings of less than 1.0 ha accounted for 87% of farms, operating 41% of the cultivated area. The total number of farms operating some land was 12.7 million, compared to the total of 17.8 million rural households. Thus, 5.1 million rural households did not have access to land for producing food for the family. Besides another 10.3 million households operated land in sizes of below one ha, who would need to purchase food from the market to cover deficits from the household-based production. For this segment of the population, income avenues are extremely limited. They depend heavily on selling labour in both agricultural and non-agricultural labour markets for their livelihoods. The seasonal nature of agricultural employment and limited opportunities for non-farm employment cause millions to suffer from chronic and transitory food insecurity. The access to food for these people depends on the trade-based entitlement relationships, i.e. on the wage rate and food prices and their fluctuations in the market.

Table 13. Changes in the pattern of distribution of landholdings, 1983-84 to 1996.

Farm size (ha)	1983-84			1996			Annual rate of growth (%)
	No. of holdings (000)	Percent of total holdings	Percent share of operated land	No. of holdings (000)	Percent of total holdings	Percent share of operated land	
Marginal farms (0.01 to 0.20)	3,373	30.7	3.1	4,277	33.6	4.9	1.9
Small farms (0.20 to 1.00)	4,659	42.3	26.2	6,066	47.7	36.5	2.2
Medium farms (1.00 to 3.00)	2,483	22.6	44.9	2,078	16.3	41.3	-1.4
Large farms (3.00 & more)	496	4.5	25.8	298	2.3	17.3	-4.0
Total	11,002	100.0	100.0	12,719	100.0	100.0	1.2

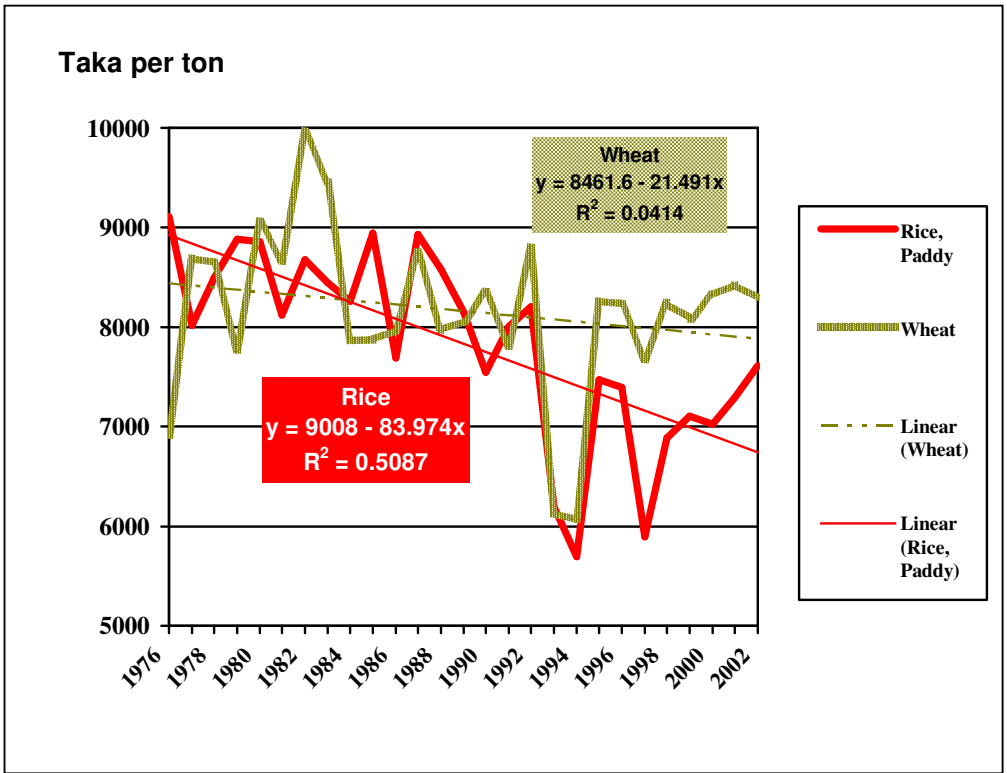
Source: Bangladesh Bureau of Statistics, Report of Agricultural Census, 1983-84 and 1996.

3.3 Trend and seasonal fluctuations in food grain prices

Maintaining prices of staple food grains within affordable limits of low-income consumers and ensuring stability in prices are important elements of food policy of the government in low-income countries. Given the level of income, the lower the prices, the higher is the purchasing capacity of that income. Sharp increase in food grain prices significantly lower the real income of poor households, a large proportion of whose income is spent on staple food. At the same time, the instability in producer prices increases risks and uncertainty, and discourages the subsistence farmer to invest in agriculture.

Figure 4 shows the long-term trend in the producer price of paddy and wheat deflated by the wholesale price index. There was a substantial downward trend in prices of rice and a moderate decline in the price of wheat, indicating an adverse terms of trade for the farmer but a favourable price regime for the consumer. The downward trend in prices of both crops is partly the result of the technological progress that helped reduce the unit cost of production. There was also a large temporal fluctuation in prices indicating risks in cultivation of these crops that subsistence farmers cannot afford.

Figure 4. Real farm level prices of paddy and wheat, 1976-2001 at 2001



Source: Authors' own calculation from BBS, various issues.

Prior to the liberalisation of food grain trade in early 1990s, the government influenced prices through its "food grain stock maintenance policy" that involved public procurement, public distribution, and imports. During this period, the domestic market was largely insulated from the world market. As a result, the domestic prices were often divergent from the world market prices (**Figure. 5**). The opening up of the economy in 1992 saw a gush of private sector imports into the country that have brought about a structural change in the determination of food grain prices in Bangladesh. During times of production shortages, timely imports of rice by the private sector helped avoid transitory food insecurity (Dorosh et al 2002). This has prevented wild price fluctuations in the economy and has resulted in a more stable price regime. A look at the variability in the consumer price (**Table 14**) shows an appreciable reduction in rice price variability in the post-liberalisation period i.e. from 1993 onwards, as compared with the pre-liberalisation period. In the case of wheat, however, variability has increased during the post-liberalisation period.

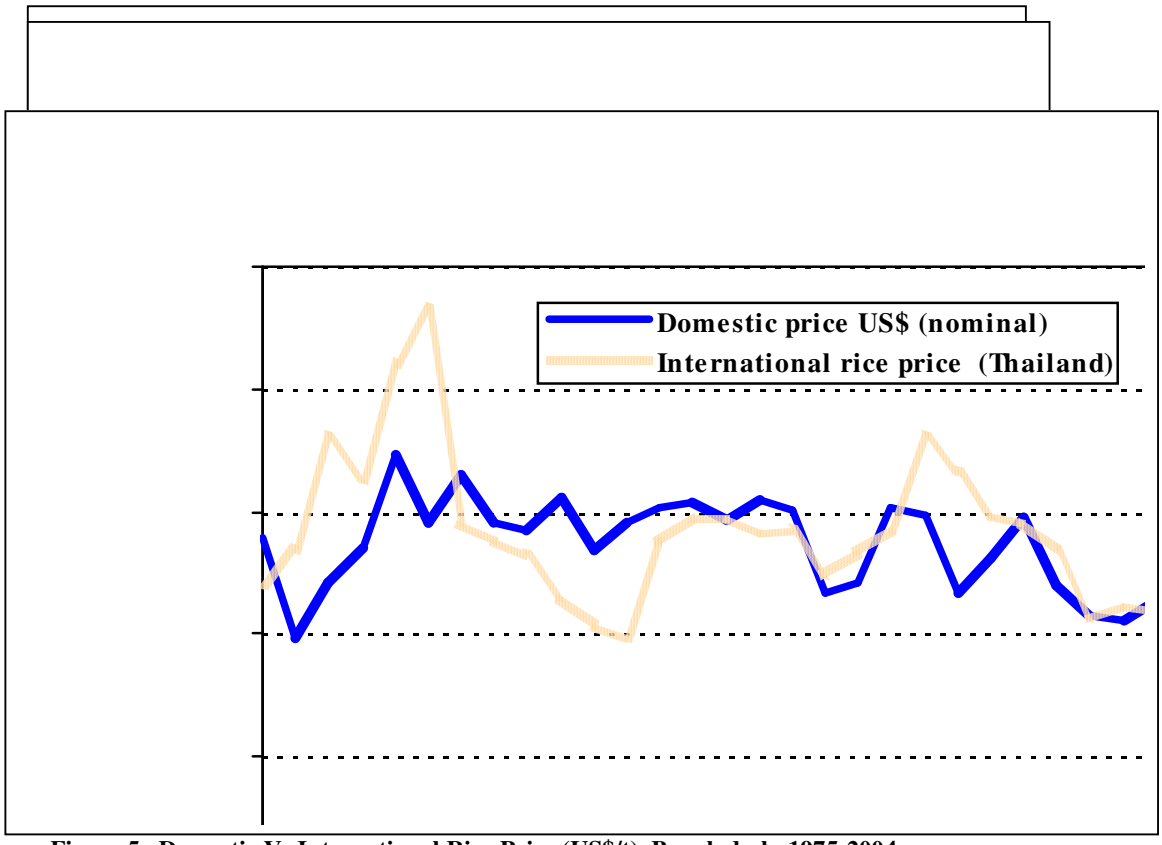


Figure 5. Domestic Vs International Rice Price (US$/t), Bangladesh, 1975-2004.

Source: Authors' estimate based on data reported in Dorosh et al (2004) and WFP, 2004.

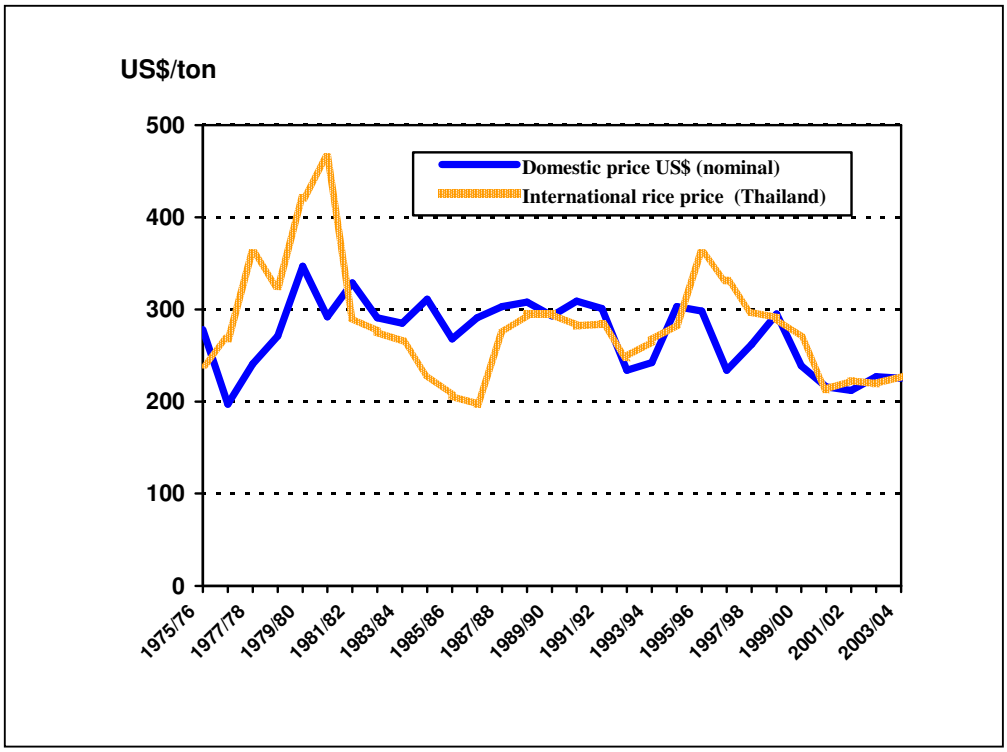


Table 14: Variation in the wholesale prices of rice and wheat, 1975/76 to 2001/02.#

Period	Variation in rice prices		Variation in wheat prices	
	Nominal	Real	Nominal	Real
1975/76 – 1992/93	12.19	9.95	8.72	5.83
1993/94 – 2001/02	10.00	7.40	10.20	11.0
1975/76 – 2001/02	14.58	9.26	12.70	7.47

De-trended coefficient of variation
Note: Nominal prices have been deflated by consumer price index to obtain real prices

The seasonal variation in rice prices has also been reduced over the years (**Table 15**). A severe drought in 1979 caused rice prices to fluctuate heavily – more than 4 times that of the previous year. The year following the drought saw price fluctuation lessen somewhat but was still high. However, subsequent natural disasters in Bangladesh, such as disastrous floods in 1987, 1988 and 1998, saw seasonal variation of much lesser magnitude. Thus, the capability of the economy to smoothen out price fluctuations in the event of shortfalls in production and thereby insulate the poor from price shocks has improved over the years.

Table 15: Seasonal variation in rice prices around abnormal years,

Years	Type of Year	Coefficient of variation
1977-78	Normal	5.8
1978-79	Drought	**17.7**
1979-80	Normal	8.4
1980-81	Normal	6.1
1981-82	Drought	**17.2**
1985-86	Normal	6.7
1986-87	Flood	**12.1**
1987-88	Flood	**8.3**
1996-97	Normal	6.3
1997-98	Flood	**15.7**
1998-99	Normal	6.1
1999-00	Normal	3.1

Source: Dorosh et al. 2004.

4.4 Safety Nets

Bangladesh is a disaster prone country. By virtue of its geographical location, the country is often at the mercy of natural calamities such as floods and cyclones. Riverine Bangladesh also witnesses frequent land erosion causing thousands to lose their land every year. Against such a backdrop, despite the gains achieved by Bangladesh in augmenting food availability, safety net programs are a must to insulate the poor from systematic and idiosyncratic shocks and help them to be food secure.

There are a number of food assistance programs in operation, each with its own specific objectives and target population. Some are relief programs that aim primarily at relieving immediate distress, generally due to natural disasters – these interventions are typically mobilized for a limited period and are targeted at the directly affected households. Other programs have explicit development objectives such as rural infrastructure development (Hossain and Akash 1993), boosting primary school enrolment rates and human capital development. Although relief provision remains an important objective, most targeted programs have gradually shifted in emphasis from relief to development.[1]

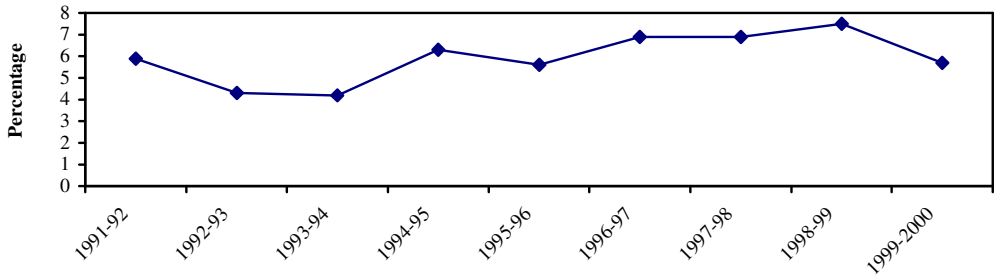
A welcome improvement in targeting came in early nineties when, in an effort to reorient food transfers to the poor, the Government abolished the poorly targeted urban and rural ration channels. A number of the safety net programs have evolved from being purely relief measures to having a development and growth dimension. These include the Food-for-Work, Food-for-Education and Vulnerable Group Development (See **Table 16** for details). Since 1993-94, about 1 million metric tons of food grains are being allocated every year to the various food-assisted programs (Appendix Table A5). During the 1999 floods, this quota had gone up to 1.8 million metric tons, equivalent to a whopping US dollar 300 million. Two of the largest safety net programs (FFW and VGD) have expanded substantially since early 1980s. During 1982-83 food grain distribution under FFW and VGD were 422,000 and 67,000 metric tons respectively. During 1999-2000, the figure had almost doubled for FFW while for VGD the increase was more than four-fold. The share of resources allocated to targeted food-assistance programs has increased through 1990s; almost 80 per cent of the total food grains channelled through the PFDS are now directed towards these programs. The remaining 20 per cent passes through the so-called untargeted, "monetized" channels of the PFDS: Essential priorities (subsidized food grain sales to defence and paramilitary forces, hospital and jail inmates), other priorities (subsidized sales to workers of government institutions, fire and civil defence departments) and Open Market Sales (to stabilize domestic prices).

The quantum of public expenditure on safety net programs in Bangladesh have more than

[1] The change in orientation of food transfer programs from relief to development objective has been a general process since the early 1980s and is in line with one of the main recommendations of the 1988 Joint Task Force of the Government and Aid Donors on Strengthening for Food-assisted Development

doubled over the last decade.[2] In 2001-02 this was about 1% of the GDP and 5.7% of the total government expenditures. Ninety five percent of the total safety net program expenditure is on targeted food transfer while the remaining 5% is towards assistance to specific vulnerable groups such as the elderly, distressed, widowed or divorced female household heads, orphans and freedom fighters. **Figure 6** shows the share of spending for targeted programs in the total government expenditure over the past decade. Though a clear trend is not discernible, it is worth mentioning that the public sector expenditure for targeted programs have expanded vis-à-vis the hardcore poor. The number of hardcore poor declined by 17% from about 30 million in 1991-92 to about 25 million in 2000. During the same period the expenditure on safety net programs increased in real terms from Taka 9,734 million to Taka 16,316 million.

Figure 6: Share of public expenditure on targeted programs, Bangaldesh, 1991-2000.



Source: Authors' own estimates

Table 16: Allocation of Food to public sector development and relief programs, Bangladesh, 1999-2000.

Program	Functions	1999-2000 Program off-take (000 M. Tons)
Food for Work (FFW)	Employment generation for the poor, mainly in the dry season. Development and maintenance of rural infrastructure.	755
Food for Education (FFE)	Promote primary school enrolments and attendance, reduce drop-outs and improve quality of education.	286
Vulnerable Group Development (VGD)	Assistance to disadvantaged women in rural areas; training in market based income generating activities, functional education.	217
Vulnerable Group Feeding (VGF)	Disaster relief: food grain distribution to needy families in periods of distress.	149
Test Relief	Employment generation for the poor, mainly in the rainy season (similar to FFW except with lighter labour requirements).	25
Gratuitous Relief	Disaster relief: food grain distribution according to perceived need.	20
Others		58
Total: 1999-2000		1,609

Source: World Bank (2003)

VGD, FFE and VGF programs appear to be reasonably well targeted to the poor. The poorest-fifth of the population, for instance, was nearly 5 times as likely to participate as the

[2] This is largely because of the expansion of FFW and introduction of FFE since the mid-1990s.

richest-fifth. Targeting outcomes can be improved by using geographic targeting to concentrate resources in areas with a greater share of the poor or of the target population. Of the various government food assisted programs, only the VGD and FFW and to a limited extent the FFE attempt regional targeting. Under the VGF and GR – the two main disaster-coping programs – food is distributed only among areas that are affected by a disaster. Areas that are more severely affected may be assigned a greater share of the resources as was done in the VGF programme following the 1998 floods (del Ninno and Roy, 1999).

4. Review of Agricultural Policies

4.1 Policies to promote growth of food production

Bangladesh has striven to attain self-sufficiency in rice production for decades. Since there is little scope for extensive farming, most of the increased production is expected to come from the application of modern agricultural inputs and adoption of improved varieties and crop management technologies. It is, therefore, worthwhile to examine the policy interventions in the input market aimed at stimulating growth in rice production.

Fertilizer, irrigation and improved seeds are three important inputs, whose procurement and distribution had once been under the sole control of the Bangladesh Agricultural Development Corporation (BADC), a semi-government organization. Policy reforms since the early 1980s aimed at reducing government interventions as well as subsidies have completely transformed the market for these inputs (Hossain 1996). Changes in privatizing the marketing system of fertilizer began in 1978 and were pursued vigorously in the early 1980s. Beginning in July, 1987, private dealers were allowed to procure fertilizer in bulk at higher discount rates from factories as well as from the large BADC supply centres known as transport discount points (TDP). By 1992, BADC withdrew from wholesale trade, allowing the private sector to procure, import (except urea), and distribute fertilizer in domestic markets. Subsidies on phosphate and potash were also eliminated in 1992. However, small amount of fertilizer subsidies were reintroduced in the 1996 budget, following an acute fertilizer crisis in the domestic market during the 1995 boro season. The government virtually overtook the wholesale distribution from the private sector and started operating a buffer stock in order to stabilize fertilizer prices.

Private sector participation in the market for irrigation equipment also began during the late 1970s. The private importation and sale of minor irrigation equipment, mostly shallow tube wells, were allowed in 1978-79. However, such imports were subject to the "standardization" requirement and a Groundwater Ordinance was introduced to control the placement of shallow as well as deep tube wells. Since 1988, the government has withdrawn all restrictions on the importation of irrigation equipment by the private sector, eliminated import duties on agricultural machinery, and removed restrictions on standardization and placement. Along with these policy changes, subsidies for minor irrigation have been eliminated. More importantly, irrigation management has gone through a gradual metamorphosis: from public ownership with bureaucratic management to public ownership with cooperative management and finally, to private ownership with private management. Along with expansion of minor irrigation, a market for transactions in irrigation water was developed, which provided small and marginal farmers access to irrigation. The terms and conditions for water transactions have also changed over time to improve efficiency in the irrigation equipment.[3] However, the government retains control on the management of deep tube wells, which it found difficult to transfer to the private sector. Some subsidy for irrigation is provided through the provision of electricity and diesel, as power for irrigation has become a major input in dry-season

[3] Initially, the predominant practice in water pricing was to collect a fixed proportion of the harvest (25% of gross produce) in exchange for irrigation water in which the farmer did not have any incentive to save water. The current practice in many areas is to charge an hourly rate depending on the duration of renting the irrigation equipment. Since this practice provides incentives to save water, the capacity use of irrigation machines has increased. Moreover, the system of renting irrigation equipment on an hourly basis is convenient for supplementary irrigation during the wet season to cope with late-season droughts and has thereby reduced the risk of crop failure. This development has stimulated incentives to grow modern varieties during the aman season on flood-free and shallow flooded lands. Thus, the areas under modern varieties has spread very rapidly and reached 65% of rice-cropped areas in 1999-2000. Rice production grew at a respectable rate of 3.0% per year from 1985 to 2000 despite several disastrous floods (1987, 1988, 1998).

rice cultivation.

The seed market in Bangladesh has a dual structure in which major crops such as rice, wheat, jute, potato and sugarcane are classified as notified crops. For these crops, variety development, evaluation, maintenance, multiplication, quality control and distribution are done by different public agencies. The private sector's role in the seed business has been restricted to the distribution of non-notified crops, mainly brand-name hybrid vegetable seeds. In 1999, the government allowed the private sector to import seeds of hybrid rice under the condition that it should produce the seed in the country within the next three years. Recently, some NGOs have signed a memorandum of agreements with the Bangladesh Rice Research Institute (BRRI) to obtain breeder seeds so that they can produce the foundation and certified seeds of rice for distribution among the members. As a result, the marketing of the seeds of the recently released high-yielding rice varieties has increased substantially (Hossain et al, 2001).

The above policies contributed substantially to the expansion of market for agricultural inputs, stabilization of input prices, and adoption of improved technologies, particularly in the rice sector. The acceleration in the growth in rice production since the late 1980s is partly attributed to these policy changes.

5.2 Policy options to enhance food security

Ironically, within less than one year from the massive floods of 1998 and the concerns of imminent food shortages, excessively low prices rather than high prices dominated the food policy debate. Bumper crops of wheat and *boro* rice in the first half of 1999 suddenly brought large surpluses to markets, leading the government to increase the procurement targets and resulting in a large build-up of government stocks. These rapid changes in production environment, market conditions and public perception illustrate both the natural instability of food grain production and markets in the country. This also highlights the need for public intervention in food grain management and operation in Bangladesh.

Recent evidence suggests that private food grain trade can contribute significantly to price stability. In fact, with trade liberalization, private sector imports have effectively provided a price ceiling at import parity levels following poor rice harvests in 1994/95, 1997/98 and more recently, in the aftermath of flood in 1998. This positive experience with private sector imports, however, does not completely eliminate the need for rice stocks. Import parity prices in years of tight world markets may be unacceptably high particularly for rice whose world market is volatile due to a small fraction of the global production (6% to 7%) traded internationally. In such cases, subsidized sales of rice stocks (build up from domestic procurement and imports) may be needed. Thus some security stocks needs to be maintained, equal to at least about three months of planned distribution, because of delays in import arrivals (Dorosh et al, 2004). However, rice price stability remains a concern since export parity does not provide an effective floor price. Investments in mechanical graders and the establishment of grades and standards consistent with current international market could help prevent large price decline by making exports possible following bumper harvests.

The domestic procurement program, therefore, has retained its importance. However, farmers' participation in the program has been disappointingly low, and there are significant problems with the program's implementation.[4] Procurement prices substantially above market prices increase the potential for rent-seeking behaviour and corruption of public officials connected with procurement.[5] Open tendering has included some domestic procurement following unexpected domestic production shortfalls in 1998 and 1999. Technical problems remain, but if these are overcome, costs could be reduced and reliability of procurement could be increased.

Although stabilization of prices constitute an important element of production incentives and consumer welfare, price stabilization (especially upswing of prices) is also important politically.

[4] For a comprehensive evaluation of domestic procurement programme, see Shahabuddin and Islam (1999).

[5] Fixing the procurement price at an appropriate level is critical for providing incentive to producers, allowing maximum scope for operation of private traders and preventing excessive destabilizing impact on either the budget or the financial market (Ahmed, Chowdhury and Ahmed, 1993).

High rice prices in Bangladesh are treated as crisis situations and are often interpreted by critics as the government failure to ensure food security. As such, high prices point to the need for government intervention, even though this intervention can sometimes be costly and ineffective. Typically, in Bangladesh, high rice prices create pressure for high public stocks regardless of the fact that high stocks are no guarantee that food security of the poor will be addressed.

As production has increased and private markets have expanded, the importance of the Public Food Distribution System (PFDS) in price stabilization has diminished.[6] Maintenance of stocks in the public sector still serves a useful dual purpose: a) supplying food grain for routine public distribution and b) ensuring a minimum availability of food grain for safety net programs. With a long term decline in the amount of food grain distributed through the PFDS, stock levels may also need to be reduced unless storage losses are reduced or explicit mechanisms for stock rotation are put in place. Continued efforts are needed to minimize economic rents in domestic procurement, reduce leakages in distribution and maintain grain quality for consumer so that food security objectives are met at minimal costs.

Short-term stabilization and relief efforts can assume critical importance during emergencies due to natural disasters, but the chronic problem of food insecurity of nearly 40% of the population living below the poverty line remain perhaps the major challenge of food policy in Bangladesh. Targeted distribution programs attempt to address this problem through direct distribution of food grains, (mainly wheat) combined with training and infrastructure development. Unlike price stabilization efforts, most of these programmes are donor-funded, with food grains supplied by food aid.

As mentioned earlier, Bangladesh has made substantial progress in terms of ensuring availability of food, in the face of growing population, especially in recent years. However, poor households in Bangladesh do not have food security because they lack access to food i.e. they lack sufficient food from own production, cash income and other resources to acquire enough food. Direct transfer of food grains provided through food aid is one mechanism used to increase access of poor household to food in Bangladesh. The declining trend in food aid simply illustrates fewer resources available for targeting to poor households under the safety net programs.[7]

As mentioned earlier, floods and droughts are common phenomenon in Bangladesh. Floods and droughts cause fluctuations in food availability, employment and prices. Abnormal increases in food grain prices and the non-availability of jobs affect the food entitlement of the poor and thereby create transitional food security problems. Hossain (1990) observed that the effect of the floods on production has not been severe at the national level because (a) shortfalls in production in affected regions is to a large extent compensated by above-normal production in non-affected regions and (b) farmers try to make up the loss through above-normal production in the post-calamity season. The government responded to a natural disaster by importing food grains more than what was needed to mitigate the adverse effects, which inflated the public stocks and depressed prices in subsequent seasons. While this helped ease the short-term food insecurity problems, it had dampened farmers' incentives to sustain the growth of food grain production in the

[6] It may be mentioned here that changes in production pattern have reduced the need for government interventions to stabilize rice prices. The increase in the size of the boro harvest has largely reduced the seasonality of production and prices in Bangladesh and along with it, the susceptibility of total production to adverse weather conditions. For example, a poor aman harvest is usually followed by bumper harvests in the subsequent boro and aus seasons. This increased stability of production has been translated into increased price stability as well (Shahabuddin, 2001).

[7] The critics of food aid often raise concern about the possible disincentive effects on domestic production, especially production of wheat. True, very high levels of food aid and government commercial imports can lower domestic prices below world price levels. This was particularly relevant in the early 1990s (1990/91 and 1991/92) when food aid and commercial imports averaged 1544 thousand MT per year. Dorosh and Haggblade (1997) showed that food aid distribution in-kind during the harvest season of Bangladesh had significant price disincentive effects during these years. However, over time private sector demand for wheat has increased and at current world wheat prices, domestic prices and levels of food aid, there is an overall excess market demand for wheat (Dorosh, 1999).

long run. A rational and efficient policy response to transitional food insecurity in response to natural disasters is yet to be developed.

6. Concluding remarks

Despite impressive achievements in increasing food grain and reducing instability in prices, long-term food and nutrition problems remain. Bangladesh has yet to achieve comprehensive food security that resolves the problems of inadequate food intake and chronic malnutrition among poor people. Solving these problems will require decisive action by the government, the private sector and individual households. A more efficient PFDS can play a central role in government's food policy and make a significant contribution to the food security of households who receive transfers. Several steps could be taken to increase efficiency of food grain procurement and distribution. Increasing flexibility in setting (and revising) procurement prices is one option. Using domestic tenders for food grain procurement could be even more efficient, particularly if tenders are designed with significant penalties for non-delivery and appropriate specifications of food grain grades and standards.

A better understanding of poverty dynamics and linkages between adverse shocks (such as massive floods and droughts), rural income, credit markets and nutrition is important. Appropriately targeted income transfers, credit programs and insurance mechanisms in times of crisis may have very high payoffs in reducing poverty and improving food security in the medium terms through minimizing debt and the effects of large decline in income in both the short and the medium term. These interventions should be part of a broader social protection strategy of safely nets that is both cost-efficient and achieves maximum coverage.

Agriculture continues to occupy a dominant position in Bangladesh economy and is likely to remain so during early decades of the 21st Century. More than 75 per cent of the population lives in rural areas and a significant proportion of them remain vulnerable to food insecurity (both seasonal and chronic). A basic limitation of the agricultural sector in Bangladesh remains in terms of its lack of diversification.[8] Recent studies have shown that Bangladesh enjoys comparative advantage in the production of wide-ranging crops (Shahabuddin, 2000, Shahabuddin and Dorosh, 2002). To achieve the desired diversification along the lines suggested by the comparative advantage, there is a need for critical public support measures. Under the dictates of Structural Adjustment Program, Bangladesh has brought down its level of public support to agriculture to an absolute minimum. Recent estimates of Aggregate Measurement of Support (AMS) to agriculture put this around 1-1.5 per cent of agricultural output, although the permissible limit of such support under the Agreement of the Agriculture (AoA) of WTO is 10 per cent (Asaduzzaman, 2001). Bangladesh also provides very little support for the elements under the green box and blue box that are admissible under WTO regulation.

In view of the extreme pressure of population on limited natural resources, development and dissemination of improved production technology must continue to sustain the growth in food production. Within food grains, research emphasis could benefit by including improvements in grain quality as well as with yield, and developing shorter maturity rice varieties to facilitate expansion of area under pulses, oilseeds and vegetables that might address the issue of un-balanced nutrition in the diet. Among crops, the research strategy must accord higher priority to high-valued, non-food grain products. Continued facilitation of the import of new seeds and production technologies will be necessary for Bangladesh to capitalize on technological advancement made in international agricultural research centres. Public investment in agricultural research in Bangladesh has remained low compared to India, Pakistan, Sri Lanka and other East Asian countries.[9] Increased spending on

[8] In response to the changing pattern of demand, the future strategy for agricultural growth must contain elements to promote non-cereal crops and fish and livestock production. Faster development of livestock and fisheries may promote both equity and food security by focusing attention on disadvantaged social groups and regions where the crop production environment is unfavourable (Hossain and Shahabuddin, 1999).

[9] Bangladesh spends only about 0.25 per cent of its gross domestic product from agriculture on agricultural research compared to 0.50 per cent in India, 0.58 per cent in Pakistan; more than 1 per cent in Malaysia, Taiwan and Thailand and more than 3 per cent in high-income countries (Pardey, Roseboom and Fan, 1997).

agricultural research appears to be necessary given the importance of agriculture to income growth and poverty reduction (Hossain, Rahman and Sen 1997).

Major efforts are still needed to address nutritional issues more directly. Coordinated programs involving nutrition education, food fortification, improvements in water quality and public health are needed. Increases in food availability and household access to food alone will not be adequate to address the malnutrition problems in Bangladesh.

References

Ahmed, K. and N. Hassan (eds.). 1983. *Nutrition Survey of Rural Bangladesh 1981-82*, Institute of Food and Nutrition Science, University of Dhaka

Ahmed, R., Chowdhury, N. and Ahmed A. 1993, Determination of Procurement Price of Rice in Bangladesh Food Policy, No. 6, International Food Policy Research Institute.

Ahmed, R., and T.W. Chowdhury (eds), 2000. Out of the Shadow of Famine: Evolving Food Markets and Food Policy in Bangladesh, Baltimore, U.S.A., Johns Hopkins University Press.

Alamgir, M. 1980. Famine in South Asia. Cambridge MA: Oelgeschlager, Gunn and Hain.

Asaduzzaman, M. 2001, Bangladesh Agriculture in the era of Globalization: Constraints and Opportunities, in Bangladesh Economy 2000: Selected Issues edited by A.A. Abdullah, Dhaka, Bangladesh Institute of Development Studies.

Bangladesh Bank. Various years. *Economic Trends*, Statistics department, Bangladesh Bank.

Bangladesh Bureau of Statistics, BBS. Reports of the Household Income and Expenditure Survey (various years). Statistics Division, Ministry of Planning, Dhaka.

Bangladesh Institute of Development Studies, BIDS. 2001. Human Development Report of Bangladesh 2000. Dhaka: Bangladesh Institute of Development Studies.

del Ninno, C. and Roy, D. 1999, "Impact of the 1998 flood in Labour Markets and Food Security and Effectiveness of Relief Operations in Bangladesh", FMRSP-IFPRI, Dhaka.

Dorosh, Paul. 2000, 'Food grain production and imports: towards self-sufficiency in rice?' in Raisuddin Ahmed, Steven Haggblade and Tawfiq-e-Elahi Chowdhury (eds.) *Out of the shadow of famine*, IFPRI, John Hopkins University Press.

Dorosh P. and Haggblade, S. 1997, Shifting Sands: The Changing Case for Monetizing Project Food Aid in Bangladesh, Cornell University Press, U.S.A.

Dorosh, P. 1999, Foodgrain Markets and Policy in the Aftermath of the 1998 Flood, FMRSP Working Paper, Mimeo.

Dorosh, P., del Ninno, C. and Shahabuddin, Q. 2002. The 1998 Floods and Beyond: Moving Towards Comprehensive Security in Bangladesh (edited volume), International Food Policy Research Institute.

Dorosh, P., del Ninno, C. and Shahabuddin, Q. 2004. Food Policy in Bangladesh in the 21st Cenntruy: From Crisis Response to Comprehensive Food Security. Dhaka: The University Press Ltd.

Government of Bangladesh. Various years. *Agricultural Yearbook of Bangladesh*, Bangladesh Bureau of Statistics.

Government of Bangladesh. 2003. *Bangladesh Economic Review 2003*, Ministry of Finance, June.

Government of Bangladesh. Various years. *Bangladesh Economic Survey*, Ministry of Finance.

Government of Bangladesh. 2000. *Child Nutrition Survey of Bangladesh*, Bangladesh Bureau of Statistics.

Government of Bangladesh. 2003. *HIV in Bangladesh: Is time running out?* Background document for the dissemination of the fourth round (2002) of national HIV and behavioural surveillance, Ministry of Health and Family welfare, June.

Government of Bangladesh. Various years. *Household Expenditure Survey*,

Government of Bangladesh. Various years. Statistical Yearbook of Bangladesh, Bangladesh Bureau of Statistics. Bangladesh Bureau of Statistics.

Hossain, M. 1990, Natural Calamities, Instability in Production and Food Policy in Bangladesh, The Bangladesh Development Studies, Vol. XVIII, No. 4.

Hossain, M. 1996, Agricultural Policies in Bangladesh, Evolution and Impact on Crop Production in State, Market, and Development, Essays in Honour of Rehman Sobhan, edited by Abu Abdullah and Azizur Rahman Khan, University Press Limited.

Hossain, M. 2003. "Development of Boro Rice Cultivation in Bangladesh: Trends and Policies" in R.K. Singh, M.Hossain and R. Thakur (eds) Boro Rice. New Delhi: Fine Grains Private Ltd.

Hossain, M., Rahman, H.Z., and Sen, B. 1997, Income Distribution and Poverty in Rural Bangladesh, 1987-94, Dhaka, Bangladesh Institute of Development Studies, Manila: International Rice Research Institute, Mimeo.

Hossain M. and Sen, B. 1992. Rural Poverty in Bangladesh: Trends and Determinants. Asian Development Review (10).

Hossain M., and M. Mokaddem Akash. 1993. Rural Public Works for Relief and Development: A Review of the Bangladesh Experience. Working Papers on Food Subsidies (No 7). Washington DC: International Food Policy Research Institute.

Hossain, M. and Shahabuddin, Q. 1999, Sustainable Agricultural Development in Bangladesh: Challenges and Issues in Increasing Rice Production in Bangladesh: Challenges and Strategies edited by S.I. Bhuiyan and ANM Rezaul Karim, IRRI/BRRI.

Hossain, M., Janaiah, A., Hussain, M and Naher, F., 2001, The Rice Seed Delivery System in Bangladesh: An Evaluation, The Bangladesh Development Studies.

Jahan, K. and Hossain, Mosharaff, 1999. *Nature and Extent of Malnutrition in Bangladesh*: *Bangladesh National Nutrition Survey, 1995-96*, Institute of Food and Nutrition Science, University of Dhaka.

Pardey, P., Roseboom, J. and Fan, S. (1997), Trends in Financing Asian Agricultural Research: Washington, D.C.: International Food Policy Research Institute, Mimeo.

Ravallion M, and Sen, B. 1996. When Methods Matters: Monitoring Poverty in Bangladesh. Economic Development and Cultural Change, 44 761-792.

Reutlinger, S. 1985. Food Security and Poverty in LDCs. Finance and Development 22 (4); 7-11

Sen,A. 1982. Poverty and Famine: An Essay on Entitlement and Deprivation. Oxford: Clarundon Press.

Sen, B. 2003. Drivers of Escape and Descent: Changing Household Fortunes in Rural Bangladesh. World Development 31 (3); 513-534.

Sen, B. and Hulme, D.(eds) 2004. Chronic Poverty in Bangladesh: Tales of Ascent, Descent, Marginality and Persistence. Dhaka: Bangladesh Institute of Development Studies (in process).

Shahabuddin, Q. 2000. Assessment of Comparative Advantage in Bangladesh Agriculture, The Bangladesh Development Studies, Vl. 24, No. 1.

Shahabuddin, Q. 2001. Review of Food Sector and Policy Options for Food Security in Bangladesh Economy 2000: Selected issues edited by Abdullah, A. Bangladesh Institute of Development Studies.

Shahabuddin, Q. and Dorosh, P. 2002. Comparative Advantage in Bangladesh Crop Production, Markets and Structure Studies Division Discussion Paper No. 47, Washington D.C., International Food Policy Research Institute.

Shahabuddin, Q. and Islam, K.M. (1999), Domestic Rice Procurement Programme in Bangladesh – An Evaluation, FMRSP Working Paper, Mimeo.

Sobhan, R. 1979. Politics of Food and Famine in Bangladesh. *Economic and Political Weekly*, 14.

Appendix Tables

Table A1. Trend in per capita consumption (gm/day) of cereals and vegetables by expenditure quartile groups, 1983-84 to 2000

Rank in the expenditure scale	Cereals				Vegetables and tubers			
	1983-84	1991-92	1995-96	2000	1983-84	1991-92	1995-96	2000
Rural areas								
Bottom 20%	332	368	398	404	98	119	163	150
20-40%	442	467	486	471	118	144	185	175
40-60%	493	534	526	505	142	170	199	197
60-80%	566	587	555	533	168	207	217	211
Top 20%	665	647	541	563	228	261	263	245
Urban areas								
Bottom 20%	315	413	421	386	107	142	174	158
20-40%	405	466	458	437	141	186	193	196
40-60%	450	506	440	429	186	230	204	203
60-80%	480	490	439	431	209	243	226	222
Top 20%	516	470	432	397	282	282	265	230

Source: Authors' estimates based on the Reports of the Household Income and Expenditure Surveys, conducted by the Bangladesh Bureau of Statistics

Table A2. Trend in per capita consumption (gm/day) of pulses and fish, by expenditure quartile groups, 1983-84 to 2000

Rank in the expenditure scale	Fish				Pulses			
	1983-84	1991-92	1995-96	2000	1983-84	1991-92	1995-96	2000
Rural areas								
Bottom 20%	12	13	23	18	5	8	8	9
20-40%	23	22	32	28	9	14	10	13
40-60%	28	30	38	38	12	17	12	15
60-80%	35	42	50	45	15	21	15	17
Top 20%	51	60	73	59	24	28	21	21
Urban areas								
Bottom 20%	18	25	30	23	11	16	13	13
20-40%	28	37	42	35	15	20	15	17
40-60%	37	48	52	40	19	23	20	20
60-80%	46	62	64	52	21	26	23	22
Top 20%	62	81	84	62	33	29	30	27

Source: Authors' estimates based on the Reports of the Household Income and Expenditure Surveys, conducted by the Bangladesh Bureau of Statistics

Table A3. Prevalence of child malnutrition by region, 2000

Percent

Region	Wasted			Stunted			Underweight		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Barisal	13.8	9.5	13.6	60.3	47.6	59.6	58.2	44.0	57.4
Chittagong & Sylhet	11.5	11.5	11.5	52.5	46.8	51.7	52.3	48.2	51.8
Dhaka	11.4	11.7	11.5	51.1	33.0	46.5	53.7	38.9	50.0
Khulna	8.0	3.3	7.4	39.8	37.0	39.5	39.4	33.1	38.6
Rajshahi	14.0	10.7	13.7	50.0	42.5	49.2	56.3	49.1	55.65
NATIONAL	11.9	10.7	11.7	50.7	38.4	48.8	52.8	42.2	1.1

Source: Child Nutrition Survey of Bangladesh, BBS, 2000.

Table A4 Gender differences in nutritional intake, rural areas, 1995-96.

(male intake as percent of female intake).

Age in years	Energy	Protein	Calcium	Iron	Vitamin A	Vitamin C
10-12	1.10	1.09	0.96	1.20	1.44	0.97
13-15	1.18	1.19	1.35	1.15	1.21	1.00
16-19	1.44	1.41	1.50	1.39	1.37	1.32
20-39	1.44	1.47	1.50	1.40	1.02	1.34
40-49	1.43	1.45	1.65	1.29	1.69	1.58
50-59	1.53	1.51	1.53	1.40	1.44	1.51
60-69	1.37	1.41	1.44	1.59	1.85	1.40
70+	1.32	1.32	1.45	1.43	1.73	1.59

Source: Jahan and Hossain (1999).

Table A5. Trend in Public Expenditure for Targeted Programs in Bangladesh

(million Taka at current prices)

Year	FFW	GR/TR	VGD	VGF	FFE	Others	Total	Percentage of GDP
1990-91	4248	0	3870	0	0	0	8118	0.73
1991-92	4327	3938	0	0	0	0	8266	0.69
1992-93	3739	2678	0	0	0	0	6417	0.51
1993-94	3843	3026	0	0	683	0	7553	0.56
1994-95	7517	3465	0	0	1935	20	12937	0.85
1995-96	5585	4008	0	0	2675	17	12668	0.74
1996-97	8108	2561	2153	0	3295	152	16270	0.9
1997-98	8360	2587	2251	762	3750	15	17726	0.89
1998-99	7155	2102	2089	5848	3954	659	21808	0.99
1999-00	8060	2720	2280	2290	3936	10	19296	0.81

Source: GOB, Ministry of Finance.