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CONCEPTUALIZATION AND MEASUREMENT OF FOOD SECURITY: THE CONTEXT OF BANGLADESH

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Abstract

Food security, traditionally identified and measured by availability, accessibility, and utilization and referred to demand failure as its origin, has been critically assessed in this paper focusing the context of Bangladesh. It argues that food security can neither be solely represented by aggregate or per capita availability, poverty, and nutritional status, nor can it be explained by market failure; it is a joint and coincident outcome of market, state and societal failure. Although Bangladesh has attained near self sufficiency in food production, about half of its population is still food insecure in terms of accessibility and utilization, and women are disproportionately affected by food insecurity. There is geographical variation in food security. Finally the paper suggest that not only traditional transfer programs and productivity gains, there is a strong need for institutional reform, favorable macroeconomic environment, proper government intervention and strong social capital to effectively address food insecurity of the country.

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I. INTRODUCTION

Food security is one of the central dimensions of human security. More than one billion people in the world do not have enough food to eat although annual global food production is quite enough to feed everybody. The current practice is to distribute food according to effective demand, not as per nutritional requirements of the poor and marginalized groups who do not have enough money to create effective demand over the supply side.¹ But right to food is a fundamental human right. In that sense, hunger and famine constitute offense and violation of human dignity. The Constitution of Bangladesh has a clear commitment on the part of the State to ensure access of food to those who are in greatest need of food.² Government has to create an enabling environment to ensure adequate food for all, *i.e.*, food security in order to meet the

¹ Euler's theorem, however, applies to the effective demand driven market mechanism of the distribution of food-grains. According to the theorem, if $Q = f(K, L)$ is linearly homogeneous, where Q, K and L are total output, capital and labor respectively, then $K \frac{\partial Q}{\partial K} + L \frac{\partial Q}{\partial L} \equiv Q$, that is, the total

output will be exhausted if it is distributed among the owners of the factors of production as per their marginal productivity. But there is evidence that substantial number of the poor are excluded from the markets (product, money and labor markets) and thus may well remain in hunger. For example, *World Development Report 2004* mentions that about 1.2 billion people are extreme poor, earn less than PPP US\$1 a day. Therefore, market mechanism of food-grain distribution is not sufficient for ensuring food security of every citizen of a country.

² It has been clearly committed in the Constitution of Bangladesh, Article 15: "It shall be a fundamental responsibility of the state to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people, with a view to securing to its citizens – (a) the provision of the basic necessities of life, including food, clothing, shelter, education and medical care".

constitutional requirement. But majority of the people in Bangladesh are still deprived of basic economic and social rights — right to adequate food and shelter, health, education and other basic needs. Poor people of Bangladesh do not have capability to meet even the minimum nutritional requirements to maintain a healthy body although government statistics reveals that the country has achieved self-sufficiency in food production.³ In this context the Interim Poverty Reduction Strategy Paper (I-PRSP)⁴ set three long-term social targets related to food security, and identified food insecurity as one of the major sources of human poverty. The consequent thematic papers of PRSP and very recently the Preliminary Draft PRSP⁵ have also given emphasis on various dimensions of food security and the possible measures to enhance it in the framework of “unlocking the potential of the country” in “accelerating” poverty reduction. However, despite setting achievement of food self-sufficiency as one of the key national priorities that gets necessary policy and program supports from the government’s end, hunger and ‘monga’⁶ along with pervasive poverty and increasing inequality between the rich and the poor still glaring.

Rights based approach is often talked about but a comprehensive view is currently absent in Bangladesh in conceiving food security

³ This is also called “self-sufficiency puzzle”.

⁴ ERD (2003): *A National Strategy for Economic Growth, Poverty Reduction and Social Development*; Ministry of Finance, Government of Bangladesh, March, which is equivalent to I-PRSP.

⁵ See, GED (2005): *Unlocking the Potential: National Strategy for Accelerated Poverty Reduction*, Planning Commission, Government of Bangladesh, January.

⁶ This is a kind of soft famine persisting in many districts of the country, particularly in the northern districts like Rangpur, Rajshahi, Kurigram, and Gaibandha particularly in the months of September, October and November.

and relevant policy formulation. The present practice of conceptualization and measurement of food security is to define dimensions of food security in terms of availability, acceptability and utilization and estimate these separately without reaching to an integrated conclusion for introducing effective policy measures to combat food insecurity. It is in such a broad context the present paper intends to explore and assess the conceptual and empirical aspects of food security in Bangladesh. After the brief introduction, Section II discusses development of the idea, dimensions and reasons behind food insecurity along with its reflection in the national poverty reduction strategy. Section III provides the analytical framework and empirical aspects of food security, and the reflection of food security. Section IV provides critical views on several policy issues related to elimination of food insecurity in Bangladesh, estimation and developmental concerns.

II. CONCEPTUALIZATION OF FOOD SECURITY

2.1 *EVOLUTION OF THE IDEA*

In terms of importance food security started to be much discussed in 1970s and since then it was able to draw substantial attention. In 1979, the World Food Programme (WFP) Report conceptualized food security in terms of supply and a balanced supply-demand situation of stable foods in the international market. The report also puts emphasis on increasing food production in the developing countries to enhance their food security. Nevertheless, food security would have been more meaningful if it could be perceived in line with (i) the legal commitments of the United Nations Universal Declaration of Human Rights 1948, which accepts the right to adequate standard of living, including food; (ii) International Covenant on Economic, Social, and Cultural Rights 1966, which ensures an equitable distribution of world food supplies in relation to need; and (iii) the Universal Declaration on the

Eradication of Hunger and Malnutrition 1974, which declares that every man, woman, and child has an absolute right to be free from hunger and malnutrition.

World Bank (1986) defined food security as the access by all people at all times to enough food for an active and healthy life. The definition deals with production in relation to food availability, concentrates on distribution in that food should be accessed by all, and covers consumption in the sense that individual food needs are met to remain active and healthy. World Food Summit 1996 defines food security as access by all people at all times to food needed for an active and healthy life. This definition has been improved upon the long-established notion of food security in three ways. *First*, food security is more than national aggregate or macro food-grain adequacy; it has an essential distributive aspect as well. The national food security has to filter through household level and individual level security. Therefore, food security may not be achieved even if bulk or majority would have access to food and a minority section would not have. *Second*, food security entails a capacity aspect, that is, everybody should have the purchasing capability of food. *Third*, food security is more than protection from starvation. Food should be good enough for active and healthy life and everybody should be able to utilize food. That is, the food will have to be safe and fresh, the intaker should have a good health to absorb it and the environment should be sanitary and healthy.

Sen (1981, 1987 and 1993) has shifted the idea regarding the origin of food security from supply side issues related to aggregate food availability to individual and household level availability and its utilisation. He says, "Famines imply starvation, but not vice versa. And starvation implies poverty, but not vice versa. ... Starvation ... does imply poverty since the absolute dispossession that characterizes starvation is more than sufficient to be diagnosed as poverty, no matter what story emerges from the view of relative

deprivation.” He pointed out three different states of food insecurity: (i) lowness of typical level of food consumption, (ii) declining trend of food consumption, and (iii) sudden collapse of the level of food consumption. He identified famine as the third and the worst state of food insecurity (Sen, 1981: 40-41). However, following his works, food insecurity is now attributed more to demand failure brought about by adversarial changes in macroeconomic and trade indicators, and entitlement failure.

Sumner (2000) has given a scientific definition of individual food security recognizing that it is more than a current absence of hunger or even the current possession of nutritional health. As per his conceptualization, food security concerns potential food intake into the future and thus it is inherently dynamic. More food intake contributes to more nutritional health up to some threshold after which more food does little for nutrition. Given this idea, he defined a threshold food intake above which a person has adequate nutritional health, and food security for an individual he defined as the likelihood that food intake remains above the threshold.

2.2 DIMENSIONS OF FOOD SECURITY

2.2.1 *Essential dimensions*

Current literature reveals that food security has three essential dimensions: availability, accessibility and utilization.⁷ Availability made up of production, import, food aid receipt, internal procurement gives the supply side of food security. Utilization is determined by health (nutritional status) and living conditions defines the demand aspects of it. Income determines accessibility and entitlement provides mediating mechanism between demand and supply. Routine emphasis is given only on availability or supply side

⁷ See, for example, Shahabuddin (2002), Dorosh *et al* (2004), Rahman *et al* (2003), and del Nino and Dorosh (1998).

and least emphasis is given on utilization. The idea behind this practice is that if food can be made available through income generating activities or transfer, hunger and malnutrition will be under control and food security would automatically be achieved. But this assumption is clearly misleading because if the consumer is ill, malnourished or lives in unhygienic environment, capability of intakers to absorb food will necessarily be weakened. But general health status, sanitation and other living conditions have hardly taken into account in the notion of food security.

Accessibility again has two sub-dimensions: physical and economic. Since the poor are generally food insecure, trends of poverty is considered to be a good proxy of economic accessibility. On the other hand, access to food to the most vulnerable groups indicates physical accessibility. Food consumption or the incidence of absolute poverty is the most crucial indicator in this regard.

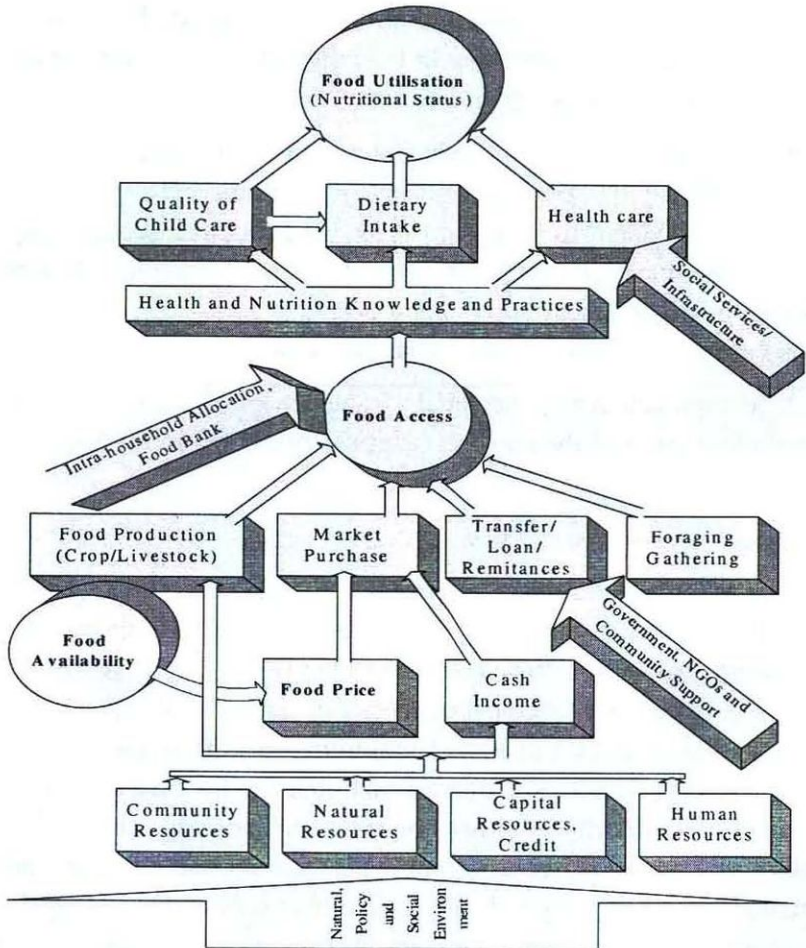
A comprehensive conceptual framework of food security incorporating most of the above concerns is presented in Figure I.

2.2.2 Cross-sectional dimensions

'Macro' or national food security is determined by the aggregate availability of food for the whole population, which is described as a satisfactory balance between food demand and food supply at reasonable prices. Sub-regional or 'meso' food security is measured by comparing regional nutritional requirements with availability of per capita dietary calories. However, national food security does not guarantee food security at either household or individual level. In a similar fashion, an increase in national food production does not guarantee food security of all the citizens. Food security at household or 'micro' level is defined by the access to adequate food by households over time, which implies that if the household in general has access to food then every member of the household is

food-secure. This definition is, however, incomplete because intra-household factors may well affect equitable and adequate access to food by all members due to the fact that household members do not

Figure I
Conceptual framework of food security



Source: FANTA (2003).

always share common preferences regarding resources allocation for income generation and food distribution within the household. The household head may have more power in determining the pattern of food utilization by the household members. Moreover, their nutritional requirements may vary if some put forth more energy in work than others.

2.2.3 *Temporal dimensions*

Time dimension is considered to be important in determining the nature of food security. This is again categorized by 'chronic' and 'transient' insecurity. Food insecurity is said to be 'chronic' if individuals or groups of people suffer from food insecurity all of the time. It affects the households that persistently remain unable to procure or produce adequate food. On the other hand, transient insecurity comprises 'temporary' and 'cyclical' or seasonal insecurity. Temporary food insecurity originates when unanticipated shocks affect a household's entitlements like drought or flood and sudden unemployment.⁸ Seasonal or periodic food insecurity is a form of transitory insecurity associated with seasonality in food production and the unpredictable events such as flood and drought. Seasonal food insecurity occurs when there is a regular pattern of inadequate access to food within a year often linked to agricultural seasons, particularly when it is difficult for households to borrow to even outflows of food over time. This is a common phenomenon for the food insecurity-prone households in some of the districts of northern Bangladesh.

There may also be periodic food insecurity in human life cycle. Children and the elderly are at greater risk since they have lower

⁸ Famine, an example of is the worst form of transitory food insecurity, which would stem from one or more shocks like flood, drought, crop and market failure, loss of real purchasing power by group of households, etc.

labor productivity and more exposed to illness or injury and consequently more dependent on transfers from others for their survival.

2.3 CAUSES OF FOOD INSECURITY

Poverty is the most important common source of food insecurity. Poor people who do not have income to meet minimum calorie requirement have to remain food insecure. Poorest of the poor generally remains chronically food insecure.

Variability in domestic production can notably increase low-income countries' food insecurity because they can have limited capacity of food import in enhancing aggregate food security for food deficit in the middle of their low export earning, high external debt service obligations and limited international borrowing capacity. On the other hand, rudimentary marketing infrastructure often makes many food items globally non-tradable. In this way food availability matters at the aggregate level and physical food deliveries or balance of payment assistance to support food import can enhance availability.

Food production, availability, income and food prices go through a kind of intra-annual cycle, with high food availability and low prices during harvest period, and low food availability and high prices before the harvest of main crops. Transient insecurity may lead to chronic food insecurity depending on its severity and frequency. Hence, if a household suffers two drought years successively and forced to sell some of its assets to survive, it may even move from transient to chronic food insecurity.

Food insecurity is referred more to demand failure as its origin brought about by losses in employment, production, adverse movements of the terms of trade or other forms of entitlement failure. Six structural aspects are widely recognized that may make individuals suffer from entitlement failure — low labor productivity,

adverse terms of trade, limited market access, poor asset possession, restricted borrowing capacity, and the absence of safety net provision of transfers. But other sources of demand failure particularly in Bangladesh are seasonal and disguised unemployment, unpaid labor, and inadequacy of transfer and safety nets programs in food insecure areas which cannot make food demand of the vulnerable groups much effective which as a demand failure amid availability of foodgrains in the market.

Majority of the world's non-food producer population depends on the market for access to food. Adverse movement in terms of trade between purchased food and the goods or services they sell in the market can lead to entitlement failure. Those who regularly suffer from shortfalls in purchasing power depend on transfer of food or cash, which may well explain why children and the old age citizens are asymmetrically food insecure.

Cultural factors can also deprive members of the household, *i.e.*, women and children, from getting an equitable share in available food within a household. Low and non-earning old age family members are also exposed to lower calorie intake than requirement due mainly to their lower or zero productivity and lesser dignity and importance in a household.

III. ESTIMATING FOOD SECURITY

3.1 LITERATURE REVIEW

There are many literatures that took initiative to estimate food security of a country using different approaches. For example, Ballenger and Mabbs-Zeno (1992) defined national food security as

$$X \in P[\text{needs} \in (\text{production} + \text{shocks} + \text{imports} + \text{aid})]$$

where P is probability, X is the minimum acceptable likelihood and needs is the subsistence level focusing only on the supply side.

On the other hand, Sumner (2000) has provided an operational index of individual food security as

$$FSin = probn(fit > fi^*); \quad t > n$$

where $FSin$ is individual food security, $prob$ is probability, n and t are is current (now) and future (a week or month) periods, fit is intake of food per unit of time t by individual I , and fi^* is threshold food intake. However, this index focuses on the probabilistic nature of food security and does not incorporate degrees of nutritional adequacy during a period as contributing to additional degrees of food security.

Apart from these formulations, Garrett and Ruel (1999) used a standard household utility model to examine the determinants of food security and nutritional status in the context of Mozambique by specifying a demand function for calories and a production function for child nutritional status respectively. In their formulation, demand for calories (K) is influenced by income (Y_n), vector of prices (P_h), and demographic characteristics and other exogenous factors (Z_h), where P_h includes food and other purchased and home-produced goods, such as nutrition and health. Maximizing utility subject to income constraints and the nutrition production function, they derived a reduced-form household-level demand function for calories (K_h) where income has been considered to be endogenous, and the reduced form assets (A_h) replaced income:

$$K_h = f(P_h, A_h, Z_h)$$

Nutrition for individual i they conceived of as the output of a production function in which a specific technology translates inputs into nutritional outcomes, *i.e.*, height-for-age. However, they claimed that nutrition (N) is produced by a set of inputs, including caring behaviors directed toward the individual (C_i), health status and the household environment (H_i), and dietary intake (K_i), to which calorie availability at the household level, K_h , contributes:

$$N_i = N(C_i, H_i, K_i)$$

The above formulations are mainly intended to estimate macro (national) and micro (individual) food security situation. However, considering individual utility in determining food demand may demonstrate its merit in measuring food security in Bangladesh because such initiative is still absent in this country.

The estimation of the above formulations requires pooled (mix of cross-section and time series) data both at individual and national level. But meso or regional level food insecurity, which may exist amid both national and household level availability of the specific large sample and accessibility and utilization by sample household is absent in the formulation. Further, data on individual food intake for a week or a month is not adequate for understanding food insecurity of the individuals because they may remain severely insecure during a few months of a year frequently.

3.2 BANGLADESH PERSPECTIVE

3.2.1 Availability, accessibility and utilization

The current practice of measuring food security in Bangladesh is mainly twofold: national or macro and individual. Macro level food security is measured by estimating food availability and micro level by nutritional status. Trend of poverty is, however, used as a proxy variable of measuring accessibility, while meso or regional food security is measured only by food production deficit-surplus situation compared to nutritional requirement of the population of that particular region.

Total national availability is measured by

$$\alpha_T = (1 - \lambda)G + D_p + I_p - P_D$$

where, α_T is total availability; G is gross production; λ is the rate of deduction from G for seed, feed and wastage; D_p is public

distribution; I_p is private import and P_d is domestic procurement. However, γ is considered as 0.1 while estimating food availability.

On the other hand, accessibility dimension of food security encompassing economic and physical accessibility is represented by the trends of poverty. Poverty in the cost of basic needs (CBN) approach is considered to be appropriate indicator of economic accessibility measured by

$$ZL_k = Z_{kf} + ZL_{kn} \text{ where } ZL_{kn} = E[y_i - x_i \mid y = Z_{kf}], \text{ and}$$

$$ZU_k = Z_{kf} + ZU_{kn} \text{ where } ZU_{kn} = E[y_i - x_i \mid x_i = Z_{kf}]$$

which are lower and upper poverty lines respectively, where, $Z_{kf} = \sum P_{jk} F_j$ is cost of fixed food bundle containing minimal nutritional requirements corresponding to 2,122 kcal per person-day, and ZL_{kn} and ZU_{kn} are lower and upper allowances for non-food consumption respectively. However, access to food for the most vulnerable groups indicates physical accessibility. The persons living in extreme poverty are those who are the most vulnerable nutritionally, and consumption of food is considered to be the most crucial indicator. According to direct calorie intake (DCI) method a household with a per capita calorie intake of less than 1,805 kcal and 2,122 kcal are considered to be "extreme or hardcore" and "absolute" poor respectively. Incidence of extreme poverty represents the physical accessibility of food security.

Utilization indicator is represented by the nutritional status of the citizens. Stunting, wasting and underweight are three standard indices of physical growth that describe the nutritional status of children; if a child is below -3 standard deviation (SD) and between -2 and -3 SD from the reference median, he or she is considered to be moderately stunted, wasted or underweighted. However, since women and children are more likely to be exposed to malnutrition particularly in the poor households, their nutritional status is taken into account as a proxy of utilization of food security.

Unavailability of time series data on poverty and nutrition is a serious problem in Bangladesh in understanding trends and nature of food security over time.

3.2.2 Demand and supply

A host of variables needs to be included in the demand and supply functions of food security. Generally, implicit food demand function may take the following form:

$$F_{di}^j = f[P_{ik}, Y^j, H^j, PV]$$

where, F_{di} is demand for food items i by individual j , P_{ik} is price vector including price of item i and other items k given that F_{di}^j is an inverse function of P_{ik} , Y and H are income or entitlement and health status of the individual i , and PV is vector of peripheral variables like taste, education, religion, family members, geographical location of j , etc. On the other hand typical supply function is

$$F_{si} = f[P_{ik}, PV]$$

where, F_{si} is supply of food items i , P_{ik} is price vector defined above F_{si} is directly related to P_{ik} , and PV is vector of peripheral variables like technology, number of producers in the market, input price, technology, taxes and subsidies, etc.

However, entitlement or income and health status of the individuals are not generally important from suppliers' point of view, and thereby excluded from the supply function. This is one of the technical reasons that may lead to starvation and famine by relying on the market forces.

3.3 TRENDS OF FOOD SECURITY IN BANGLADESH

3.3.1 Availability

Bangladesh has indeed made considerable achievement in terms of national availability. Total food-grain production in the country nearly doubled 1980-81 and 2000-01. Most of the increase was accounted for by growth of rice production, but wheat production also did increase significantly. Over this period, national availability of food has increased from 1.4 to 2.5 million metric ton, that is, 89 per cent. Given that mid-year population increased from 89.9 to 131 million between 1980-81 and 2000-01, increase in per capita availability of food over this period was outpaced by population growth.

A closer look at the per capita availability of food-grain would reveal that it remained stagnant during the 1980s and the first half of 1990s but went up later due to successive bumper crops. Total crop production, food grain production in particular was not affected by the 1998 flooding.

Import dependence of food-grains, especially of rice, has declined in the 1990s compared to the 1980s. It is significant that the government permitted private food imports since 1992-93 which marked a three-fold increase between 1992-93 and 2000-2001.⁹ Liberalization of food trade impacted on foreign exchange reserve but its beneficial aspect has been evident in smoothening price fluctuations in times of food shortages due to seasonal factors and natural shocks.

⁹ See, details in Annex Table I.

Figure II
National versus per capita food availability

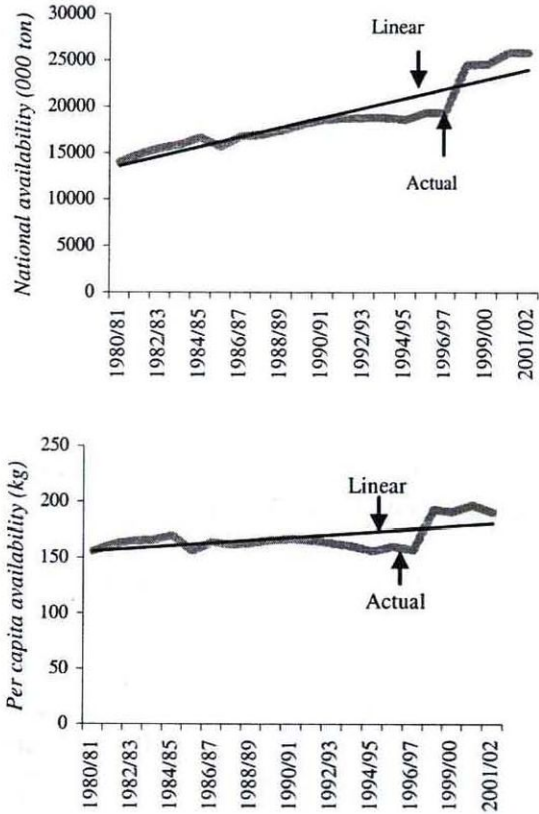
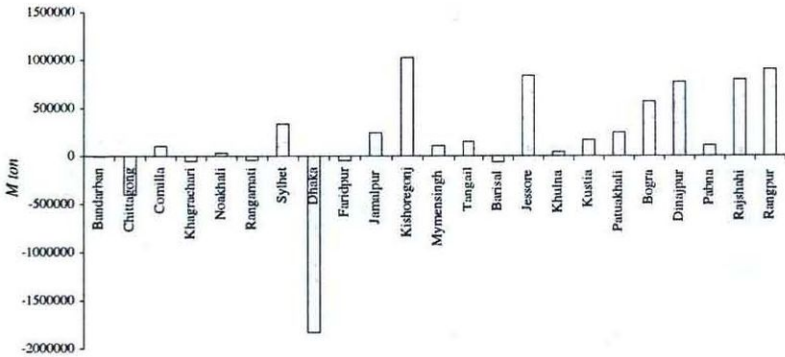


Figure II shows that although both national and per capita availability have been increasing over time, the latter has been increasing at a lower rate than the earlier. This has indeed a negative implication for the availability dimension of food security.

Figure III
Surplus/deficit situation according to region, 1999/2000



There is a correlation between regional dimension of poverty and distribution of food deficit pockets. There are pockets of severe distress associated with drought, river bank erosion, large scale and local flooding. The incidence of poverty appears to be highest in the Rajshahi region, which is much higher than Barisal, Khulna, Dhaka and Chittagong regions. On the other hand, taking the district level data on the basis of 1999-00 production and food requirement situation, it may be observed that in addition to Rajshahi region which is known as poverty stricken as well as food deficit area, Chittagong Hill Tracts regions, parts of Dhaka region, Faridpur, Barisal happen to be food deficit areas. In terms of 21 greater districts, it is observed that only 6 are food surplus while 15 are food deficit regions. Of these, 7 districts had a deficit of less than one lakh mt annually, 5 had a deficit of 1-3 lakh mt, one district had a deficit of 3-4 lakh mt while 2 districts had a deficit of more than 4 lakh mt annually.¹⁰

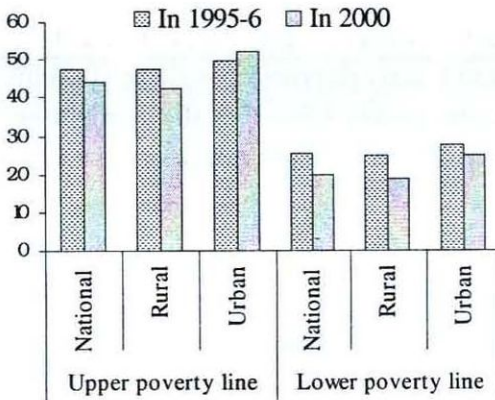
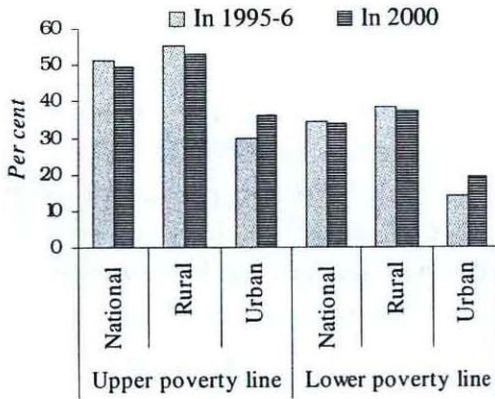
¹⁰ Annex Table 2 gives the details.

3.3.2 *Accessibility*

National household surveys show that relative economic accessibility, represented by the trend of poverty, has been improving day by day although the absolute number of poor increased from 56 to 63 million — an increase of 7 million from 1984/85 to 2000, and population increased by about 34 million. In that sense the absolute number of food-insecure people has been increased over the last two decades. However, the divisional poverty scenario reveals that Rajshahi division has been the highest poverty-stricken region regarding both lower and upper poverty lines.

In terms of physical accessibility, the incidence of extreme poverty though increased during the late eighties (1988/89) and early nineties (1991/92), declined sharply to 20 per cent in 2000. That is, one per five people had no physical access to food in 2000. However, the sharp decline in the relative food insecurity led to a decline in the absolute number of food-vulnerable people in 2000 by about 2 million compared to that in 1985/86. But the number of food-insecure people increased in the urban areas over the same time period.

Figure IV
National incidence of poverty under CBN (left) and DCI (right) methods



One important issue pertaining to access to and consumption of food is the distribution of food among members of the household. Conventional food intake patterns suggest that women and children have less access to food than adult males. Non-pregnant and non-lactating women consume approximately the same percentage (more than 90 per cent) of their requirement as men, but children up to 6

years of age receive, on an average, only 68 per cent of their calorie requirement (del Nino and Dorosh, 1998).

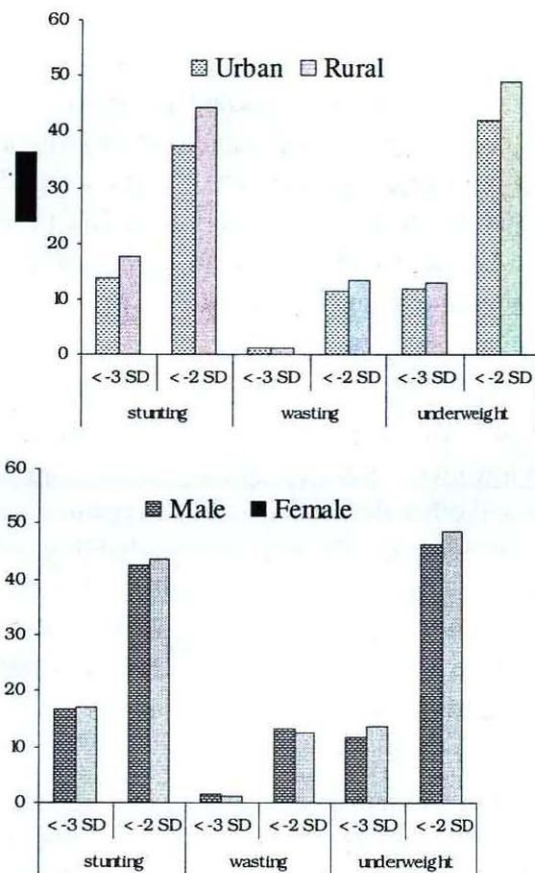
3.3.3 Utilization

Improving availability and accessibility are necessary but not sufficient conditions to ensure food security leading an active and healthy life. Thus there is a need for paying attention to utilization of food, which is directed by a number of factors such as peoples' food preference, general health status and the environment in which food is prepared and consumed. All these factors have an impact on the absorption of food and the consequent nutritional status of people.

Dietary imbalance and unavailability of micronutrients are the most important factors responsible for poor nutritional outcomes in Bangladesh. High intake of carbohydrate but low intake of fat, protein and vitamin lead to low level of absorption of micro-nutrients and a high level of anemia and other deficiencies. As for anemia, an average woman of 55 kg weight has 50 per cent probability of developing iron deficiency if she gets less than 25 milligram (mg) and 25 per cent probability if she gets less than 32 mg iron per day. Since the average intake is between 24 to 30 mg per day, it is not surprising that between 31 and 62 per cent of all non-pregnant women are anemic (ibid.).

The effects of poor nutrition are more severe among children and women. For example, under-five mortality rate is 102 and maternal mortality rate is 4.3 per 1000 live birth. The incidence of low birth-weight is 30 to 50 per cent. Low birth-weight and poor nourishment reduce the resistance power of children against infectious diseases. Roughly two-third of deaths among under-five children is attributed to malnutrition. About one-fourth of maternal deaths are associated with anemia and hemorrhage. Apart from loss of lives, there is a heavy loss in work output associated with malnutrition.

Figure V
Nutritional status of children, 2004



As of Figure V, about 38 per cent of urban and 44 per cent of rural children suffered from stunting in 2004. Again, 42 per cent of urban and 49 per cent of rural children had lower weight for their age. Overall, percentage of children suffering from stunting, wasting

and underweight were recorded to be about 43, 13 and 48 per cents respectively. However, stunting and underweight are the highest in Barisal and Chittagong divisions respectively while the lowest in Khulna.

3.3.4 *Spatial aspects*

Recently, Government of Bangladesh and World Food Programme (WFP) jointly carried out a study (2004), which identifies six highly food insecure regions in-Bangladesh. These are (i) north-west, (ii) northern chars, (iii) drought zone, (iv) Sylhet haor basin, (v) coastal belt, and (vi) Chittagong Hill Tracts (CHT). The North-west, bound by Jamuna and Tista rivers, is a food-surplus production area where agriculture is the principal source of employment. But a large portion of population remains food insecure due primarily to low food access resulting from unequal land distribution, low agricultural wage, and vulnerability to natural disasters. Monga exists in this region from October to November every year. The northern chars are unstable lands concentrated around the river Brahmaputra and Jamuna, characterized by high flooding, river-bank erosion, and instability of lands. Low crop yield, unemployment during non-agricultural season, low access to proper sanitation and safe water, and natural hazards are the principal sources of food insecurity here. The drought zone is concentrated in the north of Padma river, consisting in the westernmost part of Chapai Nawabganj, Rajshahi and Naogaon districts. Low cropping intensity, unbalanced land ownership pattern, lower diversity in dietary intake, and drought are mainly responsible for high food insecurity in this region. High food insecurity in the Sylhet haor¹¹

¹¹ Haor is a low lying area which remains under water for nearly half of the year.

basin is due to low food cultivation, high seasonal unemployment, low access to safe water and sanitation, flash flooding, severe storms and nor'westers. The coastal belt suffers from river erosion, salinity, and repeated natural disaster. Bad cropping pattern, landlessness, malnutrition due to high dependence on rice and fish, limited access to safe water and sanitation, and high natural hazards are sources of food insecurity in this region. Finally, CHT, the forested area in southeast Bangladesh suffers highly from food insecurity due to low cultivable land, underdeveloped marketing facility, large unemployment, and low dietary intake.

In contrast, if we consider district-wise per capita production and consumption-requirement at a pint of time, say 1999/2000 (shown in Figure III and Annex Table 2), only CHT area appears to be food-insecure, which contradicts the GoB-WFP estimation. This is because they considered availability, accessibility and utilization dimensions of food security.

3.3.5 Limitations of food insecurity measurement

Nevertheless, there are some limitations of food security measurement in Bangladesh. Economic and physical accessibility are represented by upper and lower poverty lines in CBN method, which have identical cost of minimum food consumption and cannot differentiate extremely food-vulnerable group from general poor people live under upper poverty line. In fact, poverty in CBN method is not a good indicator of accessibility of food, since poverty income may or may not be translated into food intake. Many households' income may be very close to upper and lower poverty lines and the rests may stay away. Direct Calorie Intake (DCI) poverty may, therefore, be a good indicator since it is directly related to food utilization.

Again, food security is intrinsically a dynamic notion, and it cannot be solely represented by national, meso or micro level availability, state of poverty, and malnutrition status in a certain point of time. Dynamic analysis of poverty and malnutrition is required in this regard. There is also a need for composite food security indices (both static and dynamic) for Bangladesh.

IV. POLICY ISSUES

Only either demand or supply failures should not be referred to as origin of food insecurity, it is an outcome of three types of fundamental failures: (i) market failure, *i.e.*, both demand and supply failures; (ii) government failure, *i.e.*, failure of government intervention to correct and re-establish market forces; and (iii) societal failure, *i.e.*, failure of society in bridging gaps of market and government forces and/or revive them. Supply failure arises mainly if suppliers fail to bring adequate food to market to meet market demand. Market failure is an outcome of the mismatch between effective demand and supply. Hence, if the poor do not have entitlement to procure adequate food from market, then food insecurity will occur amidst plentiful supply. Government failure will arise if government intervention or transfer would not come out as sufficient so as to enable poor people food secure. Then the question of efficacy of societal force — social capital; the last resort. Societal failure arises in the absence, inadequacy and ineffectiveness of voluntary social works (*e.g.*, feeding the food insecure vulnerable groups in certain periods like September to November in the northern poverty-stricken districts of Bangladesh, advocacy for intra-household equitable food distribution, campaign against defective government policy and offer strategy for corrective measures, etc). Therefore societal failure helps prolonging and deepening chronic food insecurity among the vulnerable groups. Therefore food

security is a joint and coincidental outcome of market, government and societal failure.

The national development and poverty reduction strategy of Bangladesh, popularly known as PRSP that replaced the earlier five year plans, has made its position clear to combat food insecurity. The Thematic Papers of Final PRSP¹² recognized various dimensions of food security and suggested a few short- and long-term strategies and instruments to increase food availability, stabilize food price and consumption, and farm price support so as to ensure food security of various food-insecure people. It has suggested 'smoothing fluctuations in food consumption' as short and 'access to adequate food by all' as long term policy objectives of food security. These incorporate instruments like increasing farm productivity, assuring input availability, introducing new agricultural technology, infrastructure development, and ensuring government security stock, as traditional instruments like employment generating economic growth, support to processing and trade, fiscal and monetary policy, private stocks, agricultural trade liberalization, private sector food imports, food and cash transfer, sustainable income generation, and natural and forced stabilizers.

Based on the Thematic Paper, Preliminary Draft of Final PRSP has suggested only one policy agenda for fiscal year 2005-07 namely 'implementing national plan of action for nutrition' and two future priorities: (i) ensure continuous and low-cost food supply through productivity gains and (ii) increase purchasing power of the poor through employment generation in agriculture, by stating that the government has given the highest attention to ensure food security.

The instruments suggested in the PRSP Thematic Papers would, however, not necessarily impact positively on the state of food

¹² Particularly the Thematic Paper on Agricultural and Rural Development, Government of Bangladesh, June 2004.

security. For example, increased farm productivity, assured input availability, introduction of new agricultural technology, agricultural trade liberalization, private sector food imports, and infrastructure development are not adequate in making monga-affected people food secure. They need to be reached by separate program package specially designed for the months of monga. On the other hand, trade liberalization and private food import may not be an effective instrument for food grain price stability during and right after natural disasters like devastating flood in 2004. In fact, in spite of the existing natural and forced stabilizers food (particularly rice) price has been excessively high compared to regular income of the poor and marginalized groups.

Again, increasing purchasing power of the poor may be improved by employment generating economic growth in farm and non-farm sector, support to processing and trade, and fiscal and monetary policy incentives. But there are caveats that fiscal and monetary policies are not always effective for improving the poor's purchasing power mainly because of the political economy of contemporary Bangladesh — agricultural subsidies hardly reach to the poor and marginal farmers, and increasing money supply leads to inflation, reducing further the real income of the poor.

In the short run, food security may be made possible through smoothening fluctuations in food consumption through maintaining adequate private stock and government security stock; targeted food operation through VGD, VGF, and the transfer programs like; dampening price peaks through natural stabilizers like trade liberalization in food grains and government's open market sale; and government's price support like public procurement and credit support to farmer and traders. But private stock is dependent on the real income of the farmers, and a zero-sum game situation exists between government and private stock due to unwillingness of paying the cost price of food grain by the government procurement

system. In addition, credit support cannot reach to the poor and marginal farmers due to institutional barriers, and open market sale is not always effective in dampening price peaks due to rationing.

However, the both policy agenda and future priorities in the Preliminary Draft of the final PRSP are indeed appropriate, but the priorities are too inadequate and have limitations as well. Therefore, a number of issues have to be incorporated in the food security agenda of any further national strategy related to food. An effective price regulation and control mechanism has to be implemented for short run. In addition, an in-built mechanism needs to be created in the food subsidy so that it may reach to the small farmers. A mixed policy initiative, that is, expansionary fiscal and contractionary monetary policy and institutional reform towards good governance may enhance food security as a whole. Fruitful partnership between public and private sectors should be facilitated in production and delivery of food-stuffs may also be effective in this case. Also, pro-poor and gender-sensitive institutional reform is strongly needed in implementing all types of interventions.

V. CONCLUSION

Food security is an issue which has complex developmental characteristics and implications. Despite nearly food self-sufficiency in terms of production, about half of the population is still food insecure. Trade liberalization in food grain helped stabilize food grain price leading to reduce possible threat to real income decrease of the consumers with opposite effect on the food grain producers.¹³ A bulk of women and children are still malnourished, although there are number of government and non-government programs of food

¹³ For example, farmers' income index has been increased less than the rate of increase in the other groups' income indices as measured in 1969/70's price index.

and cash transfer for the poor and marginalized groups. Per capita availability was outpaced by population growth during the previous two decades. Yet there are still seasonal and regional food problems including monga — the recent widespread cases of starvation indicates that food security has not been yet achieved due mainly to an inefficient official distribution system and the fact that the poor do not qualify for unemployment benefit.

Conceptualization and measurement of food security in Bangladesh incorporate national and regional level availability and acceptability, and individual level utilization. Although recent diagnosis indicates demand failure, stemming from macroeconomic, external linkage and entitlement failures, as the most influential reason behind food insecurity, the paper argues that a combination of market, government and society failure leads to food insecurity. Entitlement or income of the individuals is excluded from the supply function which can explain starvation and famine originated from market forces. National, meso or micro level availability, state of poverty, and malnutrition status in a certain point of time cannot represent food security and therefore dynamic analysis of poverty and malnutrition is required to have a complete situation of food security over time.

Food security needs to be addressed from multidimensional aspects, not only from traditional transfer programs, productivity gains and employment generating growth targets. There is a strong need for pro-poor and pro-women institutional reform, favorable macroeconomic environment, good governance, proper and adequate government intervention, and strengthening social capital.

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Annex
Table 1
Availability of Food-grains in Bangladesh, 1980/81-2000/01

| Year | Domestic Production (Gross) | | | Mid-year Population (million) | Private Imports (000 ton) | Public Distributio n (000 ton) | Domestic Procuremen t (000 ton) | National Availabilit y (000 ton) | Per Capita Availabilit y (kg) | Moving Average (kg) |
|---------|-----------------------------|--------------------|--------------------|-------------------------------------|---------------------------------|--------------------------------------|---------------------------------------|--|-------------------------------------|---------------------------|
| | Rice (000 ton) | Wheat (000 ton) | Total (000 ton) | | | | | | | |
| 1980/81 | 13880 | 1092 | 14972 | 89.9 | - | 1542 | 1017 | 14000 | 155.7 | - |
| 1981/82 | 13629 | 967 | 14596 | 91.9 | - | 2067 | 303 | 14901 | 162.1 | 161.0 |
| 1982/83 | 14215 | 1095 | 15310 | 93.9 | - | 1953 | 192 | 15522 | 165.3 | 164.5 |
| 1983/84 | 14509 | 1211 | 15720 | 96.0 | - | 2051 | 266 | 15933 | 166.0 | 167.1 |
| 1984/85 | 14623 | 1464 | 16087 | 98.1 | - | 2562 | 349 | 16692 | 170.1 | 164.1 |
| 1985/86 | 15038 | 1042 | 16080 | 100.3 | - | 1541 | 349 | 15664 | 156.2 | 163.3 |
| 1986/87 | 15506 | 1091 | 16497 | 102.5 | - | 2120 | 188 | 16779 | 163.7 | 160.6 |
| 1987/88 | 15413 | 1048 | 16461 | 104.7 | - | 2503 | 375 | 16943 | 161.8 | 162.9 |
| 1988/89 | 15544 | 1021 | 16565 | 106.8 | - | 2941 | 416 | 17433 | 163.2 | 163.7 |
| 1989/90 | 17856 | 890 | 18746 | 108.9 | - | 2164 | 960 | 18075 | 166.0 | 165.5 |
| 1990/91 | 17852 | 1004 | 18856 | 111.0 | - | 2372 | 783 | 18559 | 167.2 | 166.3 |
| 1991/92 | 18252 | 1065 | 19317 | 113.0 | - | 2345 | 1016 | 18714 | 165.6 | 165.3 |
| 1992/93 | 18341 | 1176 | 19517 | 115.0 | 355 | 1073 | 233 | 18761 | 163.1 | 163.1 |
| 1993/94 | 18041 | 1131 | 19172 | 117.0 | 312 | 1376 | 166 | 18777 | 160.5 | 159.9 |
| 1994/95 | 16833 | 1245 | 18078 | 119.0 | 1013 | 1573 | 277 | 18579 | 156.1 | 158.9 |
| 1995/96 | 17687 | 1369 | 19056 | 121.0 | 850 | 1759 | 422 | 19373 | 160.1 | 157.7 |
| 1996/97 | 18882 | 1454 | 20336 | 123.0 | 237 | 1392 | 615 | 19317 | 157.0 | 161.1 |
| 1998/99 | 19905 | 1908 | 21813 | 127.0 | 3480 | 2134 | 753 | 24493 | 192.9 | 183.1 |
| 1999/00 | 23067 | 1840 | 24907 | 129.0 | 1234 | 1900 | 967 | 24583 | 190.9 | 193.5 |
| 2000/01 | 25086 | 1673 | 26759 | 131.0 | 1063 | 1762 | 1088 | 25820 | 197.1 | - |
| 2001/02 | 24300 | 1606 | 25906 | 133.0 | 1,289 | 1455 | 780 | 25820 | 190.1 | - |
| 1980s | 15011 | 1092 | 16103 | 99.3 | 0 | 2143 | 442 | 16194 | 163.02 | n.a. |
| 1990s | 18772 | 1400 | 20172 | 120 | 862 | 1758 | 585 | 20189 | 163 | n.a. |

Source: Dorosh *et al* (2004), and Rahman *et al* (2003).

Table 2
Food Production and Surplus/Deficit Situation according to region, 1999/00

| Regions* | Production of Major Cereals (Rice & Wheat), 1999/00 (metric ton/mt) ¹ | | | | | Population in 2000 ² (approximate) | Food-grain Requirement (0.173 mt/year) | Deficit (-) /Surplus (+) (mt) |
|--|---|--------|--------|--------|---------|---|---|-------------------------------------|
| | Aus | Aman | Boro | Wheat | Total | | | |
| Bandarban | 17580 | 17550 | 7210 | - | 42340 | 288565 | 49921.7 | - 7581.7 |
| Chittagong (Chittagong, Cox's Bazar) | 80160 | 570110 | 362880 | 90 | 1013240 | 8179523 | 1415057.4 | - 401817.4 |
| Comilla (Brahmanbaria, Chandpur, Comilla) | 117650 | 538360 | 849410 | 99860 | 1665280 | 9027310 | 1561724.6 | + 103555.4 |
| Khagrachari | 1680 | 23800 | 10200 | 10 | 35690 | 524961 | 90818.3 | - 55128.3 |
| Noakhali (Feni, Lakshmipur, Noakhali) | 125550 | 466820 | 326330 | 1820 | 920520 | 5131891 | 887817.1 | + 32702.3 |
| Rangamati | 7320 | 21650 | 12930 | 10 | 41910 | 499674 | 86443.5 | - 44533.5 |
| Sylhet (all districts) | 212600 | 750870 | 709800 | 3640 | 1676910 | 7782899 | 1346441.4 | + 330468.6 |
| Dhaka (Dhaka, Gazipur, Manikganj, Munshiganj, Narayanganj, Narsingdi) | 40990 | 241720 | 736570 | 82530 | 1101810 | 16945356 | 2931546.5 | - 1829736.5 |
| Faridpur (Faridpur, Rajbari, Gopalganj, Madaripur, Sariatpur) | 133270 | 265530 | 456050 | 118930 | 973780 | 5897497 | 1020266.9 | -46486.9 |
| Jamalpur (Jamalpur, Sherpur) | 28300 | 295220 | 419870 | 66960 | 810350 | 3286506 | 568565.5 | +241784.5 |
| Kishoregonj | 81420 | 380920 | 960670 | 32030 | 1455040 | 2487847.7 | 430397.7 | +1024642.3 |
| Mymensingh (Mymensingh, Netrokona) | 100660 | 467410 | 602130 | 22610 | 1192810 | 6282434 | 1086861 | +105949 |

| | | | | | | | | |
|---|--------|---------|---------|--------|---------|---------|-----------|-----------|
| Tangail | 26660 | 229520 | 388080 | 56790 | 701050 | 3205802 | 554603.8 | +146446.2 |
| Barisal (Barisal, Bhola, Jhalakati, Perojpur) | 170860 | 532150 | 206120 | 19220 | 928350 | 5743854 | 993686.7 | -65336.7 |
| Jessore (Jessore, Jhenaidah, Magura, Narail) | 134770 | 691260 | 811770 | 136810 | 1774610 | 5414056 | 936631.7 | +837978.3 |
| Khulna (Bagerhat, Khulna, Satkhira) | 32700 | 740020 | 234800 | 5360 | 1012880 | 5609033 | 970362.7 | +42517.3 |
| Kustia (Chuadanga, Kustia, eherpur) | 110540 | 262220 | 242990 | 108810 | 724560 | 3231591 | 559065.2 | +165494.8 |
| Patuakhali (Barguna, Patuakhali) | 111820 | 518740 | 3730 | 10 | 634300 | 2248517 | 388993.4 | +245306.6 |
| Bogra (Bogra, Joypurhat) | 17560 | 441180 | 708770 | 56490 | 1224000 | 3776647 | 653359.9 | +570640.1 |
| Dinajpur (Dinajpur, Panchagarh, Thakurgaon) | 34120 | 630180 | 547180 | 351820 | 1563300 | 4575018 | 791478 | +771822 |
| Pabna (Pabna, Sirajganj) | 21880 | 239230 | 458180 | 219350 | 938640 | 4788990 | 828495.3 | +110144.7 |
| Rajshahi (Noagaon, Natore, Nowabganj, Rajshahi) | 104380 | 800330 | 955430 | 227570 | 2087710 | 7468498 | 1292050.1 | +795659.9 |
| Rangpur (Gaibandha, Kurigram, Lalmonirhat, Nilphamari, Rangpur) | 21440 | 1181190 | 1015910 | 229260 | 2447800 | 8939907 | 1546603.8 | +901196.2 |

Sources: 1. BBS (2003): *Yearbook of Agricultural Statistics of Bangladesh, 2000*; Ministry of Planning, Government of Bangladesh, Dhaka.

2. BBS (2001): *Population Census 2001: Preliminary Report*; Ministry of Planning, Government of Bangladesh, Dhaka. The number of population of 2000 has been calculated by using the rate of decay, 1.48% since the population growth rate in 2001 was 1.48%.

* BBS (1984): *Statistical Pocketbook of Bangladesh 1983*; Ministry of Planning, Government of Bangladesh, Dhaka.

** Food grain requirement has been calculated according to 2204 kcal intake.

Table 3
National and regional incidence of poverty

| | <i>Population below poverty line (CBN method) (%)</i> | | | | | | <i>Population below poverty line (CBN method) (%)</i> | | | | | |
|------------|---|-------|-------|--------------------|-------|-------|---|-------|-------|---------|-------|-------|
| | Upper poverty line | | | Lower poverty line | | | Absolute | | | Extreme | | |
| | Total | Rural | Urban | Total | Rural | Urban | Total | Rural | Urban | Total | Rural | Urban |
| | 2000 | | | | | | | | | | | |
| Barisal | 39.8 | 40.0 | 37.9 | 28.8 | 29.6 | 19.5 | | | | | | |
| Chittagong | 47.7 | 48.4 | 44.0 | 25.0 | 25.3 | 23.3 | | | | | | |
| Dhaka | 44.8 | 52.9 | 28.2 | 32.0 | 41.7 | 12.0 | | | | | | |
| Khulna | 51.4 | 52.2 | 47.1 | 35.4 | 36.8 | 27.5 | | | | | | |
| Rajshahi | 61.0 | 62.8 | 48.1 | 46.7 | 48.8 | 32.3 | | | | | | |
| Bangladesh | 49.8 | 53.1 | 36.3 | 33.7 | 37.4 | 19.1 | 44.3 | 42.3 | 52.5 | 20.0 | 18.7 | 25.0 |
| | 1995-96 | | | | | | | | | | | |
| Barisal | 49.9 | 50.2 | 44.4 | 39.1 | 39.6 | 29.5 | | | | | | |
| Chittagong | 52.4 | 54.0 | 40.8 | 28.6 | 30.3 | 16.7 | | | | | | |
| Dhaka | 40.2 | 48.5 | 18.4 | 27.8 | 35.5 | 7.6 | | | | | | |
| Khulna | 55.0 | 56.0 | 48.7 | 36.4 | 37.8 | 27.4 | | | | | | |
| Rajshahi | 61.8 | 65.0 | 36.8 | 46.9 | 50.4 | 18.6 | | | | | | |
| Bangladesh | 51.0 | 55.3 | 29.5 | 34.4 | 38.5 | 13.7 | 47.5 | 47.1 | 49.7 | 25.1 | 24.6 | 27.3 |

Source: BBS (2003) and Islam (2004).

Table 4
Nutritional status of children

| Background characteristic | Height -for-age (stunting) | | Weight-for-height (wasting) | | Weight-for-age (underweight) | |
|---------------------------------|----------------------------|--------------------|-----------------------------|--------------------|------------------------------|--------------------|
| | Percentage < -3 SD | Percentage < -2 SD | Percentage < -3 SD | Percentage < -2 SD | Percentage < -3 SD | Percentage < -2 SD |
| <i>Sex</i> | | | | | | |
| Male | 16.6 | 42.5 | 1.4 | 13.2 | 11.9 | 46.4 |
| Female | 17.2 | 43.5 | 1.2 | 12.5 | 13.7 | 48.7 |
| <i>Residence</i> | | | | | | |
| Urban | 13.6 | 37.6 | 1.2 | 11.5 | 12.0 | 42.2 |
| Rural | 17.7 | 44.3 | 1.3 | 13.2 | 13.0 | 48.8 |
| <i>Division</i> | | | | | | |
| Barisal | 20.2 | 48.9 | 0.4 | 7.2 | 12.4 | 46.3 |
| Chittagong | 19.4 | 46.2 | 1.5 | 14.1 | 16.2 | 49.9 |
| Dhaka | 18.5 | 44.7 | 1.1 | 11.7 | 12.6 | 47.6 |
| Kaulna | 8.6 | 31.7 | 1.9 | 14.2 | 8.3 | 40.3 |
| Rajshahi | 14.5 | 40.3 | 1.3 | 14.2 | 12.0 | 48.1 |
| Sylhet | 20.1 | 46.2 | 1.0 | 12.2 | 13.1 | 49.8 |
| <i>Mother's height</i> | | | | | | |
| < 145 cm | 28.0 | 62.3 | 1.1 | 16.0 | 23.5 | 63.6 |
| > 145 cm | 14.6 | 39.3 | 1.3 | 12.4 | 10.9 | 44.6 |
| <i>Mother's Body Mass Index</i> | | | | | | |
| < 18.5 kg/m ² | 21.3 | 50.4 | 2.0 | 17.9 | 18.5 | 58.9 |
| > 18.5 kg/m ² | 14.0 | 38.5 | 0.8 | 10.0 | 9.5 | 40.8 |
| Total | 16.9 | 43.0 | 1.3 | 12.8 | 12.8 | 47.5 |

Source: NIPORT (2004).