

Food Security of Bangladesh: Status, Challenges and Strategic Policy Options

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Abstract *The paper is designed to make an overview of nutritional food security situation pinpointing the key challenges and potential areas for future development. It has analysed the status of food availability, access to food, food utilization and food stability with emphasis on balanced nutrition and food safety to address the problems of nutritional food security in Bangladesh. Attempt has been made to verify the food adequacy and work out strategic options for food security in the interface of production, consumption requirements and global trade situation. The paper has analysed the alternatives of self sufficiency and self reliance strategies for formulating appropriate food security policy options in the long run for Bangladesh. Focus has been given on redefining food security in terms of stable and adequate supply of balanced nutritious food for all. Emphaies has been on nutrition education among the general public especially among women.*

Key words: *Food security, Food utiliation, Nutrition.*

1. Introduction

1.1 Rationale of the Study

Food, in the hierarchy of needs, is the most basic need for sustenance of life and is the perennial problem issue for healthy and active life of mankind. Food security is not just an economic problem but also a social and political issue in as much as food insecurity can be a factor to create political instability in the country. Food security is a basic factor for development of human capital and starter for overall development of the society. Right to adequate and stable supply

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of safe food is a constitutional right of the people in Bangladesh. The Government of Bangladesh is firmly committed to the progressive realization of the right to food, as enshrined in the Constitution.

Food security, as put by FAO, involves four dimensions: availability, accessibility, food utilization and stability of components of food security. Nutrition, food safety and quality have attained considerable importance recently in Bangladesh.

Ensuring food security for all is one of the major challenges that Bangladesh faces today. Despite significant achievements in food grain production and food availability, food security at national, household and individual levels remains a matter of major concern for the country and its Government. Since Independence, Bangladesh has made significant progress in increasing domestic production of food grains. This, to a large extent, helped in overcoming the constraints of insufficient national food availability. Adequate food availability however was not a sufficient condition for ensuring national food security. Ensuring food security for all reportedly require a major effort at enhancing access to food and subsequent utilisation of food by the poor and distressed households.

Though hunger is the number one issue, malnutrition has become emerging problem for treatment. Along with underweight, overweight including obesity has become another problem of health related to food intake. In this situation, providing adequate, stable, safe and nutritious balanced food to all becomes a challenging task in the way of development ahead, and there is a serious need to develop a road map to achieve this visionary goal for a healthy society.

In view of all these, the present paper is designed to make an empirical analysis on components of food security to discern the deficiencies and pinpoint the challenges in the way of food security in Bangladesh. The author has tried to consult the important works and make empirical analysis of balance sheet and household data for the last 40 years to see the status of components of food security in Bangladesh. The paper tries to highlight the food gap against the normative of balanced food composition and verify self sufficiency status of individual food items and tries to highlight challenges and sort out appropriate strategic policy measures and work out a road map for sustained food security system in the context of Bangladesh

1.2 Structure of the Report

The paper is structured as follows:

- i. Introduction
- ii. Objectives and Methodology of the Study
- iii. Understanding the Conception of parameters and components of Food Security with their indicators for measurement and Monitoring and Importance of Food Security in development
- iv. Literature Review on Food Security and Nutrition;
- v. Availability and Consumption of Food in Bangladesh and Deficiencies relative to requirements of food supply;
- vi. Status of Access to Food , Quantity and Quality and Structure of Food Intake and Differences with Normative of Balanced Nutrition
- vii. Food Utilization-Nutrition Status and Food Safety in Bangladesh?
- viii. Challenges of Food Security
- viii. Strategies of Food Security and recommendations for future Food Policy actions
- ix. Conclusions

2. Objectives and Methodology of the Study

2.1 Objectives of the Study

Specific objectives of the study are:

- i. To examine the status of food security in all its individual components of food security of People of Bangladesh;
- ii. To analyse the self sufficiency status and food gap of individual food items;
- iii. To analyse the structure of food intake and judge its deficiencies in terms of desirable dietary normative for healthy life;
- iv. To analyse food security and nutrition status of Bangladesh by socio economic categories;
- v. To highlight the major challenges in the individual components of food security in the way of ensuring food security in Bangladesh ; and

- vi. To analyse the standpoints of alternative food strategies in Bangladesh and attempt to formulate a desirable strategy of food security for Bangladesh;

2.2 Methodology of the Study

2.2.1 Approach of the Study

We have followed political economic approach to address the problems of food security under market economy environment and proactive government policy actions in Bangladesh. We have tried to work out and estimate different indicators under four components and dimensions of food security in Bangladesh to reveal its true status and pinpoint areas of vulnerability and sustainability of the present status and its improvement. We have tried to highlight food security and nutrition status by socio economic classes. We have tried to analyse the data for pinpointing the challenges and hinting on probable strategic options for sustainable food security in Bangladesh. We have tried to link up food security situation by different socio economic categories, by seasons and regions. We have covered the period of 1973-2013 for data analysis. We have looked into documents, research reports and articles of Government Departments, International Agencies, Research Institutes and individual researchers on the problems of Food Security.

2.2.2 Data Base

The study has been made basically on the base of secondary data of different sources, both national and international institutions and individual studies. We have used data of FAO. Its Balance Sheet data helped us in determining food availability by food items in Bangladesh. We have used data base of Bangladesh Bureau of Statistics and data of Ministry of Agriculture, Ministry of Food and Disaster Management of Bangladesh for determining trend of food availability and food security of the country. We have used data of BB and NBR for determining production, imports and exports of food to determine food availability over the years. For determining the consumption pattern at household level, data of Household Income and Expenditure Surveys of BBS have been used extensively. We have looked into estimates of standard consumption requirements of the country by using normative of World Bank, FAO , WHO, World Food Programme, BIRDEM, UNICEF, ICDDR,B, Institute of Public Health and Institute of Food Science and Nutrition. We tried to use data base of Bangladesh Demographic Health Surveys of NIPPORT and Food and Nutrition Surveillance Project of Ministry of Health and Welfare and Child and Mother Nutrition

Surveys of Bangladesh of BBS to determine anthropometric measures of food security and nutrition status of Bangladesh... For studying different dimensions of food security, we have used also data of individual studies of BIDS and IFRI.

2.2.3 Analytical Tools

Estimation of individual Indicators, ratio analysis, regression techniques, coefficient of variation and growth rates, Graphic and tabular analysis were main analytical tools of the study.

3. Conceptual Framework of Food Security

3.1 Definition of Food Security

Food security, as FAO stated following World Food Summit of 1996, “*is a situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life*.. (www.fao.org).” This profoundly important definition of food security has four elements:

- i. Enough food must be available to meet all people’s needs adequately,
- ii. People must have access to the food that is available under normal circumstances.
- iii. Volatility in production or prices must not threaten this availability at all times, i.e, stability of food supply is not hampered, and
- iv. The quality and safety of food that people consume must be ensured for their needs.

Food security needs to be redefined taking the nutritional balance in the fore. given the recent emergence of large incidence of overweight and micronutrient deficiency resulting in non-infectious diseases like cardiovascular disease and diabetics. At present 200 crores people are suffering from hidden hunger, while visible hunger has gone down to 80.5 crores people in the world. Thus food security can be redefined as a situation when all people at all times have economic and physical access to sufficient safe and balanced nutritious food to meet their dietary needs and food preferences for an active and healthy life. Here food of balanced nutrition is of utmost importance and food security need to be better renamed as nutritional food security...

3.2 Pillars of food security

The WHO states that there are three pillars that determine food security: food availability, food access, and food useⁱⁱ. The FAO adds a fourth pillar: the stability of the first three dimensions of food security over time.ⁱⁱⁱ In 2009, the World Summit on Food Security stated that the “four pillars of food security are availability, access, utilization, and stability^{iv}”

Food availability relates to the supply of food through production, distribution, and exchange^v. Determinants of food availability at the national level are domestic food production, public and private food stockholding, food imports and food aid, food exports and wastage in the way of distribution, storage and consumption... With the liberalization of international trade, global availability of food is of increasing importance for national food security. Availability of food at the household level depends on the household’s own production including homestead one, household food stock and availability of food in the local markets.

Availability of food at household level depends on the household’s capacity to produce or acquire food, household food stockholding, and availability of food at local markets.

Food security is the availability of an adequate supply of safe food, which people can access to obtain their food needs at prices they can afford. These food needs have been generally defined as the basic requirements of food rather than the satisfaction of all food wants..

Access to Food

Food access refers to the affordability and allocation of food, as well as the preferences of individuals and households. The UN Committee on Economic, Social, and Cultural Rights noted that the causes of hunger and malnutrition are often not a scarcity of food but an inability to access available food, usually due to poverty^{vi}. Poverty can limit access to food, and can also increase how vulnerable an individual or household is to food price spikes. Access to food depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food. Households with enough resources can overcome unstable harvests and local food shortages and maintain their access to food.

Household’s access to food depends on household income, assets, remittances, gifts, borrowing, income transfers and food aid. Increased income of household can improve household food security in terms of improved access to food. In

addition, expanded asset bases reduce the vulnerability of households to short-term disruptions in income flows and help prevent degradation of household food security in times of adversity. Increased food prices also results in transitory food insecurity of the low-income households by lowering their real income and, hence, eroding their purchasing power.

Food Utilization

The third pillar of food security is food utilization, which refers to the metabolism of food by individuals. Once food is obtained by a household, a variety of factors impact the quantity and quality of food that reaches members of the household. In order to achieve food security, the food ingested must be safe and must be enough to meet the physiological requirements of each individual. Food safety impacts food utilization and can be impacted by the preparation, processing, and cooking of food in the community and household. Nutritional values of the household determine food choice. Access to healthcare is another determinant of food utilization, since the health of individuals controls how the food is metabolized. For example, intestinal parasites can take nutrients from the body and decrease food utilization. Sanitation can also decrease the occurrence and spread of diseases that can affect food utilization. Education about nutrition and food preparation can impact food utilization and improve this pillar of food security.

Food Stability

Food stability refers to the ability to obtain food over time. Food security can be transitory, seasonal, or chronic^{vii}. In transitory food insecurity, food may be unavailable during certain periods of time^{viii}. At the food production level, natural disasters and drought result in crop failure and decreased food availability. Civil conflicts can also decrease access to food. Instability in markets resulting in food-price spikes can cause transitory food insecurity. Other factors that can temporarily cause food insecurity are loss of employment or productivity, which can be caused by illness. Seasonal food insecurity can result from the regular pattern of growing seasons in food production. Food production instability, price instability, employment instability, import flow instability and political instability may affect persistence of food security.

Chronic (or permanent) food insecurity is defined as the long-term, persistent lack of adequate food^{ix} in this case; households are constantly at risk of being unable to acquire food to meet the needs of all members. Chronic and transitory food insecurity is linked, since the reoccurrence of transitory food security can make households more vulnerable to chronic food insecurity.

3.3 From food adequacy to balanced nutrition

While both macronutrients and micronutrients are necessary, usually macronutrients were emphasised so far, but now foods rich in micronutrients containing vitamins and minerals are getting increasing attention. Again, among macronutrients, proportion of carbohydrate, protein and fats is getting changed to decrease of carbohydrate and increase of protein and fats. Food Composition Table so far talked of ratio as 60:15:25. But now with the emergence of overweight, food composition table is designed to reduce carbohydrate, increase protein and decrease fats. Such as 40: 40:20. Once sufficiency of food availability was the main concern, but with the establishment of food entitlement thesis of Prof Amartya Sen, focus has got shifted to food access. Now the shift of focus has been to balanced nutrition. Thus now food security is to ensure all access to adequate food of balanced nutrition for healthy and active life. So long we were perturbed with double burden of under nutrition and overweight, now micronutrient deficiency or hidden hunger came to prominent focus. It has been found that not only malnourished people but also over weighted people are found to suffer from micronutrient deficiency. Thus food insecurity now is associated simultaneously with three burdens: under nutrition, overweight and micronutrient deficiency. And food security in essence has become nutritional food security for healthy and active life.

4. Associated Links

4.1 Link of Food insecurity with Poverty

A direct relationship exists between food consumption levels and poverty. Families with the financial resources to escape extreme poverty rarely suffer from chronic hunger; while poor families not only suffer the most from chronic hunger, but are also the segment of the population most at risk during food shortages and famines.

For deeper development of Bangladesh, there is no more important policy challenge than ensuring food security for all. This is a difficult challenge. It involves not just ensuring the availability of adequate food in total, but that all people have access, at all times, to safe, nutritious food. Reducing poverty is a key element in a policy for food security, because poor people spend such a large share of their incomes on food, leaving them vulnerable to high food prices, and many poor people obtain much of their income from farming, leaving them vulnerable to declines in agricultural output. But reducing poverty is not sufficient, because of the many risks to the food security of the near-poor from a wide range of shocks.

Food insecurity may take the form of endemic hunger while famine is acute hunger happening abruptly. Frequent incidence of hunger may lead to malnourishment of the people. Food insecurity can be categorized as chronic or transitory, seasonal or locational or centric to a definite class or classes.. Chronic food insecurity translates into a high degree of vulnerability to famine and hunger. Ensuring food security presupposes elimination of that vulnerability^x.

5. Link between Food Security, Nutrition and Health

Food security, as put by WHO, is a complex sustainable development issue, linked to health through balanced nutrition, but also to sustainable economic development, environment, and trade. In many countries, health problems related to dietary excess are an ever increasing threat, In fact, malnutrition and food-borne diseases (especially diarrhea) are becoming double burden. Issues such as whether households get enough food, how it is distributed within the household and whether that food fulfils the nutrition needs of all members of the household show that food security is clearly linked to health. Access to adequate food may go together with malnutrition if food intake is not of balanced nutrition. Both under nutrition and over nutrition are problems of malnutrition which may not be solved just by adequate food in imbalance of nutritional composition.

5.1 Link between Poverty and Malnutrition

Poverty and malnutrition are intimately interrelated in as much as poverty exacerbates malnutrition and malnutrition exacerbates poverty. Poverty increases the risk of malnutrition through lower purchasing power, which results in inadequate food access, leading to inadequate diets intake. Poor households are also more likely to have large family size with high dependency ratios, frequent pregnancies and infections, and unhealthy environments; members being engaged in hard physical labor requiring larger energy intake. Low food intake but high energy exhaustion and poor environment of living of poor households contribute to an increased risk of malnutrition of their members.. Conversely, malnutrition that underlies poor health status leads to poor cognitive development and poor quality of schooling, and increased health care expenditure and increased health hazards. Frequent health hazards because of malnutrition result in productivity losses, which further exacerbate poverty. This cyclical relationship perpetuates poverty within and across generations, because malnutrition is intergenerational in nature, passing from mother to child.

6. Main Debatable Issues on Food Security

As put by WHO, there is a great deal of debate around food security with some arguing that:

- There is enough food in the world to feed everyone adequately; the problem is distribution.
- Future food needs can - or cannot - be met by current levels of production.
- National food security is paramount - or no longer necessary because of global trade.
- Globalization may - or may not - lead to the persistence of food insecurity and poverty in rural communities.

Our stand is that there is a need to boost food production, but distribution need to be adequately addressed for ensuring food security for all. Government need to be pro-active, because food insecurity is very often result of market failure. Globalisation may not help always problem of national food security, because of limited volume of food trade by few exporters for large number of importers big or small in the global market. When there is a shortfall of food for the large producers like China and India and when they require to make adequate imports or they need to make big stock without exports in times of exportable surplus, there is a likelihood of non-availability of food in sufficient quantity in the global market. Adverse climate change disrupts domestic production and if there is price spiral or non-availability of food in global market, national food crisis is inevitable. International trade liberalization may help import of food regularly in case of shortfall of trade from the surplus producers in normal situation. Globalisation may not per se lead to food insecurity. Problem arises when export ban or export restrictions are imposed by the large exporters abruptly. Again import liberalization may dampen domestic price creating disincentive to the farmers engaged in food production, and in the situation of lack of alternative employment this may endanger their livelihood and food security. Judicious policy actions need to be in order to balance interests of both farmers and consumers. WTO regulations are yet to address the interests of net food importing countries.

6.1 Food Self Sufficiency and Food Security

Food security is not synonymous with food self-sufficiency. Many developed countries such as England and Japan are not self-sufficient in food but are food

secure, as they are able to import their requirements of food. There are countries that are food secure even without producing any food e.g. Singapore. Food security is the capacity to obtain the required quantum of food, by producing the requirements or accessing them through imports, rather than the ability to produce all the food needed for consumption. Again, there may be food insecurity with food self sufficiency.

The food balance sheets indicate that many countries have a positive balance, but a significant proportion of their populations have inadequate access to food. The availability of adequate food stocks does not necessarily ensure food security at country or household levels. This is owing to prevalence of people in the countries or households being unable to access adequate food. This is the principal and germane issue in food security in the rice producing country like Bangladesh.

6.2 Identification of Components and Indicators of Food Security

Conceptualisation of food security as in Government document is good enough.^{xi} However, it is felt that in the set of indicators, under food access domain, employment expansion and under food utilization domain, level of nutrition consciousness and education need to be emphasised. Again, component of Food Stability and its indicators are missing. We have proposed a modified version of indicators of four dimensions for monitoring food security covering its four pillars as developed by FAO.

6.3 Food Availability and Consumption Gap and Difference with Normative

One of the important aspects of food security is to ensure sustained availability of food to meet all people's demand at prices commensurate with their income. Food security is then achieved when all people can buy adequate good quality food sufficient for maintenance of an active and healthy life. It is essential to achieve an overall development of agriculture to ensure production and marketing of food grains as well as non-food grain items, to create employment opportunities and increase real income of the poor, ultimately to improve their nutritional status. In the Bangladesh context, domestic food production, public and private stocking and international trade determine food availability at the national level. With the liberalisation of trade, global availability and prices of food are of increasing importance for ensuring national food security.

The main constraint in the way of improved availability is highlighted by the lack of significant progress in food diversification. Limited increase in rice import dependency is only a result of the imports needed to be carried out by the GOB

Table 3.1 Proposed Set of Indicators for Monitoring Food Security

Type of Indicators
Availability
Average per capita dietary energy supply adequacy
Average per capita Protein Adequacy
Average per capita Fats Adequacy
Adequacy of Micronutrients (vitamins and minerals)
Share of dietary energy supply derived from cereals, roots and tubers
Average supply of protein of non-cereals and of animal origin
Average supply of fats of non-cereals and of animal origin
Average quantum of food production in aggregate and of different types-cereals, non-cereals and of animal source
Structure and growth of Food Production and Availability by Food Items
Sources of Growth of available dietary energy over Time by food Items
Status of Self Sufficiency of Food by items with emphasis on staple food
Level and change of Import Dependency Ratio of Staple Food (cereals)
Quantum of Wastage of Food in different stages from production to consumption
Quantity and Quality of Storage Facilities-Warehouse, Godown and Cold Storage Facilities
Quality of food storage measured at the stage of availability for final consumption
Status of Preservation of unprocessed, semi processed and Processed Food
Growth and share of Public expenditure on agricultural R&D to total fiscal budget
Food Access
Gross domestic product per capita (in purchasing power equivalent)
Domestic food price index
Incidence and depth of poverty in the country in terms of needs
Incidence and Depth of Food Poverty in terms of dietary calorie intake
Share of food expenditure of the poor
Incidence and Depth of the food deficit
Prevalence of food inadequacy as per normative requirements at household level
Rate of unemployment and underemployment
Inflation and Inflation Differential between General CPI and Food CPI
Level of Wage rate and Growth of Real Wage Rate in kilogram of staple food (rice)
Access to Credit facilities in general and for the food insecure people in particular
Prevalence of undernourishment
Percent of paved roads over total roads
Road density
Rail lines density

Public Distribution System

Nature and quality of Social Safety Nets Measures

Share of Public Expenditure for Food Protection

Food Utilization

Access to improved water sources

Access to improved sanitation facilities

Percentage of children under 5 years of age affected by wasting

Percentage of children under 5 years of age who are stunted

Percentage of children under 5 years of age who are underweight

Percentage of adults who are underweight

Percentage of Children, women and men who are overweight

Prevalence of anemia among pregnant women

Prevalence of anemia among children under 5 years of age

Incidence of low birth weight of infants

Prevalence of vitamin A deficiency

Prevalence of iron deficiency

Prevalence of Zinc Deficiency

Status of Iodine Deficiency

Access to Safe Food

Access to Safe Drinking Water

Level of Consciousness of the people regarding nutrition and health

Cooking Practices-Incidence of substandard practices from nutritional point of view

Quantum of Nutrition Loss

Status of Food Quality

Status of Diversity of food

Adequacy of Nutritional Balance in Food Composition Table compared to norms

Food Stability

Cereal import dependency ratio

Percent of arable land equipped for irrigation

Value of food imports over total merchandise exports

Political stability and absence of violence/terrorism

Domestic food price volatility

Per capita food production variability

Per capita food supply variability

Coefficient of Variation of staple food (Rice) Production –year wise and season wise

Source: Developed by the Author as modification of Sets of indicators prescribed by FAO.

for stabilizing domestic supply and stabilizing domestic rice price in some years. Target indicators of 2015 seem to be not very far from attainment, but require proactive measures for their complete realisation. Monitoring Report 2012^{xii} recommended further intensification, sustainability and resilience of rice production, adjusting interventions to favour more diversified food production, including promotion of investments in processing and marketing, investments in agricultural research to tackle risks associated with climate change and promoting the valorization of unused land in coastal areas, updating/implementing policies on sustainable management of natural resources and facilitating agricultural mechanization in the context of increasing labour scarcity.

6.4 Availability and Adequacy of Food for Consumption

6.4.1 Availability and Adequacy of Food Grain for Consumption

One of the indicators of food availability is adequacy of food available as per consumption requirements. Food grain predominates the food consumption basket with 77% of total food intake and hence adequacy of food grain deserves prior attention in ensuring food security of Bangladesh. Adequacy is needed to be computed with reference to consumption requirements as per age, physical activity, seasons, sex, locations, individual preferences and metabolic capacity,. At national level, only average figure of consumption requirements by individual items is usable for determining the adequacy of quantum of food available. As indicated in the Table-5.2. Food grain production has more than doubled during 1980-2013 and has grown @2.61% p.a.. Rice with 71% gross cropped land constitutes 97% food grain production and has grown @2.74% p.a. Wheat production remains stable in the same period. Domestic food grain production was in shortage upto 2000. After 2000, food grain production was in surplus after meeting consumption requirements. However, imports , specially of wheat also increased in the same period to address requirements of food industry and for fear of uncertainties of supply and to cope with emergencies. Adequacy ratio of food grain availability at national level increased from 0.78 in the eighties to 1.39. Per capita food availability reaches the level of consumption requirements in the nineties and showed surplus of 80 grams in 2000-10 and 120 grams of food grain availability for consumption in 2010-13. Food availability has increased @ 3.12% p.a. and per capita food availability has increased @1.45% p.a during 1980-2013. Adequacy of food grain availability has increased by 0.42% point in aggregate and by 0.64% point in per capita food grain availability.

Self sufficiency of food grain production is around 98.8%. The figure for rice production self sufficiency is closer to 100% in the recent period, and in as much as rice is the staple food for the people, Government is in a position to proclaim achievement of food grain self sufficiency in the country. As we shall see later on, Bangladesh has to import huge quantities of non-cereal food items and self sufficiency in many of these items is far from realization because of scarcity of land.

Bangladesh has made substantial progress in enhancing food security by increasing production of food grains, particularly rice. Rice has contributed most to self-sufficiency in food grain. Rice production gains have been mainly driven by an increased use of irrigation water, expanded use of other agricultural inputs along with an increased coverage of high-yielding and modern rice varieties. However, the sustainability of domestic food grain production remains an issue. Rice cannot be expected to experience the growth rate of the past without net technological breakthrough. Furthermore, demographic pressures and increased urbanization have caused cultivated area to decline at a rate of 1 percent per year, whilst cropping intensity has virtually reached its limit. Small and marginal farmers represent more than 80% of all farmers. Only a limited percentage of crops circulate through commercial channels. This also results in a situation where, despite efforts, food grain procurement remains limited and sizeable food grain imports are needed for public distribution. In the last five years, total annual imports of food grains have ranged between 2 to 3 million tons. Imports consist mainly of wheat, whose production has been continuously reducing over the past years, with rice accounting for about half million tons per year.

It is notable that the emphasis placed on rice production has resulted in an increased dependency on imports for non food grain commodities, such as pulses, oilseeds and fruits which remain unaffordable to many consumers, especially poor consumers. For instance, 70% of the pulses and 66% of the edible oil requirements are currently imported. Traditionally, the two most important non-cereal foods for the poor were fish and pulses. Due to crop substitution, the national supply of pulses decreased substantially, and the poor substituted cereals for pulses with negative nutritional implications especially for children, pregnant and lactating women. Furthermore, rice mono cropping causes the nutrient depletion of the soil.

With the achievement of self sufficiency in rice, the issue of preserving farmers' incentive has been an issue for debate. Monitoring Report questioned the desirability and affordability of subsidizing low value added exports as rice. We have reservation against this stand.

Our standpoint is that self sufficiency of staple food like rice for Bangladesh need to be consolidated and export channel opening in case of exportable surplus is justified to stabilize price in case of bumper harvest. Stress need to be on subsidised inputs to incentivize the farmers to grow rice with profit margin. For public distribution, Government can procure from the open market in appropriate time and develop storage capacity. It is notable that in future, increased population pressure and shrinking cultivable land may challenge the state of self sufficiency of rice if additional land could not be managed. Rice exports and imports need to be taken as a temporary measure to balance production and demand for sustain food security. We are agreeable to Monitoring Report to the stand that in case of permanent achievement of self-sufficiency, the trade-off between generating a larger exportable surplus of rice, and promoting diversification and a higher degree of self-reliance for other foods needs to be carefully balanced. Farmers' incentives should be adequate to promote the investment and innovations required for a growth of both rice and non-cereal production to generate increasing profit margin for the farmers and for more diversified food production system which would contribute to the diversification of diets and to income growth. More attention should be made on increased production of quality rice like aman and fine rice and diverting some land of boro cultivation to non-cereal agricultural production like pulses, vegetables and seasonal fruits. Diversification efforts need to be backed-up by clear understanding of the relative profitability of competing crops, physical and location-specific conditions for non crop enterprises, the supply chain of high value products and provision for processing, storage and marketing activities, as well as by a clear appraisal of international trade opportunities

There are seven important challenges for food security associated with agricultural production: diversification toward high value nutritious products, risk arising from climate change, conversion of arable land to non-agricultural purposes, the depletion of ground water tables, arsenic contamination, high chemical use and emerging scarcity of agricultural labour.

6.4.2 Self Sufficiency and Import Dependence of Food supply

Bangladesh experiences self sufficiency in rice, potato, eggs, vegetables, meat and fish (Table5.3) Near about 90% self sufficiency has been attained by vegetables, fruits, milk spices and pea nuts. Tea and coffee once import export product is busy with domestic consumption with a shortfall of 6% market demand and became import dependent for 8.8% for meeting domestic market demand. There is a possibility of regaining its self sufficiency status if efforts are made for boosting

production in unutilised high land of different areas. The food items that are far from self sufficiency are wheat (27%), sugar (36%), edible oil (10%), pulses (17%), and beverages (1%). In aggregate, Bangladesh is closer to food self sufficiency because of surplus production in rice and potato but experiences considerable import dependence because of high imports of beverages, oilseeds and edible oil, wheat and pulses. Out of gross available food supply, exports constitute only 0.63% and imports constitute 15%. Food self sufficiency of Bangladesh is at a level of 95% gross food supply. Gross food supply is at the level of 128% of net available food supply out of which feed and seed constitute 6.9%, wastage constitute 7% and processing constitute 14% of food supply.

There has been high positive change in self sufficiency in case of rice (9%), potato (4% point) and oil seeds (8%). There was insignificant positive change in case of sugar and spices. High negative change of food self sufficiency was found in case of pulses, vegetables, fruits, tea and coffee, animal fats and wheat during 2007-11.

There is a high import dependence of edible oil (91%), wheat (91%), sugar (76%), pulses (62%) and oilseeds (44%) as indicated in Table-5.3. The food items like milk, spices, fruits and maize are still dependent on imports to an extent despite their closeness to self sufficiency. Among the export items of food, fish, nuts, sugar, vegetables, tea, oil seeds and edible oil are prominent.

There has been increased import dependence in case of wheat (12% point), sugar (13% point), fruits (5.3%), animal fats (11%), tea (5.2%) and milk (2.3%). There has been remarkable decline of import dependence in case of pulses (4.6%), oil seeds (6.2%) and potato (4.3%). At aggregate level, there has been 2% point increase of import dependence during 2007-11.

. Increased self sufficiency in non-cereal and animal products is important from the perspective of expanding employment opportunities and for increased food and nutritional security. This may be a challenging task but possible to accomplish if commitment and drive is there towards that. Reduction of import dependence in food items like fruits, tea, pulses and milk is possible through increased investment, incentives and proactive measures in extension services and research and development (R &D) activities in these vital food products.

In as much as rice and wheat are two important food grains constituting 77% calorie in Bangladesh, we have estimated import dependence of these two products in particular and food grain in general during 1973-2011 in different phases. During the period under review, import dependence for rice was 2.21% and for wheat 64.3% on average, and changing from 2.04% to 3.26% for rice and from 84% to 78% for wheat, implying increase of 1.22% point for rice and decline

of 6% for wheat and decline of 1.4% for the whole food grain import dependence. Coefficient of variation was small reflecting low volatility of import dependence for the food grain in Bangladesh on yearly basis. Import dependence on wheat is not only high but also persistently increasing after the period of 2001-05. Import dependence for rice has declined from 4.1% in 2001-05 to 2.23% in the period 2006-10, i.e. by 2% point. Import dependence for rice has declined from 4.1% in 2001-05 to 2.23% in the period 2006-10 i.e. by 2% point. Import dependence of wheat has increased from 65% to 72% i.e. by 7% during the same period. Import dependence of food grain has been persistently increasing (from 3.72% in the period 1985-90 to 11.2% in 2011-12), because of large increase of imports of wheat every year for food processing industry.

6.4.3 Wastage of Food in Bangladesh

Out of gross available food supply, as indicated in Food Balance Sheet of FAO, 2011 for Bangladesh, about 5.5% of food supply is for seed and feed, 5.6% is wasted, and 14% of food is used for processing. There has been large amount of wastage in the stages from production to the point of making food available for consumption. High wastage was found in case of potato (10%), eggs (9.5%), fruits (9.1%), vegetables (8.2%), milk (7.6%) and cereals (5.7%) as indicated in Table-5.3. On average, wastage was 5.5% of gross food supply with a large variation from 1% in case of spices to 15% in case of potato. This inevitably also means that huge amounts of the resources used in food production are used in vain^{xiii}.

In Bangladesh wastage is found to occur in both harvesting point and post harvesting operations. In case of rice, total harvest loss has been estimated for Aus, Aman, Boro and all rice type as respectively 6.33%, 6.30%, 7.12% and 6.65%. Total post-harvest losses for Aus, Aman, Boro and all rice type were respectively 9.57%, 8.90%, 10.16% and 9.52%. The post-harvest losses included losses in threshing, winnowing, cleaning and drying, bulk handling for storage (bagging, sacking, etc), in-store (biotic and abiotic), out-store (destoring, bagging, sacking, transporting and marketing).

6.5 Comparatives of Growth of Domestic Production and Availability for Consumption of Food items

There is a significantly positive correlation between growth of domestic production and growth of food availability (0.94). We have estimated regression coefficient of growth of per capita production on growth of per capita availability of food, the coefficient is 0.911 and significant at 01%, adjusted R squared being

0.87. Regression results suggest that with every 10% growth of per capita domestic food production, growth of per capita food availability will increase by 9%.

We have compared per capita production and per capita available food supply per day for consumption. We have seen that there has been surplus of production in case of rice (80 grams), potatoes (13 grams and, fish (2 grams) as indicated in Table-5.6. In case of products like tea and coffee, nuts, eggs and meat, per capita production and availability for consumption are closer to each other. There has been shortage of per capita production from available supply for consumption in products like milk (9 grams), wheat (34 grams), sugar (9 grams), vegetable oils (14 grams) and pulses (7 grams). All these evidences indicate that there is a deficiency in non-starchy products and surplus of starchy products. This need to be balanced for healthy life of the population.

6.6 Statics and Dynamics of Composition of Food in Bangladesh and Sources of Growth of Food Supply by items

Food availability has reached the level of normative consumption requirement of 2430 kilo calorie per capita per day. Calorie intake consists of 77% cereal, 18% non-cereal and 4% animal food (Table-5.7). Protein intake per capita per day is 55 gram, 82% of which is vegetative food and 18% is animal food. Around two thirds of protein are from cereals, 15% from non-cereal and the rest 18% from animal food. Fat is majorly from non-cereal vegetative food, from cereal 15% and 19% is from animal food. Thus major energy intake is from cereals whereas normative ratio of kilo calorie, protein and fat is 7:1:2 indicating big divergence of food availability from requirement norm. Growth of kilocalorie has been 1.6% p.a with growth of 5.80%p.a for animal food.,2.1% for non-cereal food and animal food 1.27% p.a. There has been negative growth of calorie energy intake during 2007-11, Animal sourced food has positive % point in calories, non-cereals and fat and protein in terms of availability.

As indicated in the Table-5.7, proportion of per capita vegetative products in calorie availability is as astoundingly high as 95.7% in 2011 decreased very slightly from 96.4% in 2007. The Proportion of vegetative products in protein and fats is also as high as 82% and 80% respectively. Three of them declined by 0.64%,2.4% and 3.5% point respectively in vegetative products with corresponding increase of their percentage points in animal source foods which constitutes 4%, 17.5% and 19.5% respectively of the total food available.

Main source of calorie as indicated in Table-5.8, is from cereals constituting 77% of total energy supply. Main source of protein is also cereals constituting 67% of protein supply. Other sources of protein are animal foods(18%) like fish, milk, meat and non-cereals (15%) like pulses, potato, and oilseeds and oil. Fat comes mainly from vegetable oil and animal foods. Low proportion of animal foods as source of calorie, protein and fats is likely to have adverse impact on nutrition and health of Bangladesh population. High positive change in terms of increased percentage point of food available is found in case of rice, wheat, potato, spices, milk and fish. Negative change in terms of decreased percentage point is visible in case of vegetable oil, pulses and cereals. There is positive change in terms of high increase of percentage point in case of animal foods.

Structural change in the composition of available food table, as in Table-5.9, is characterized by negative change of cereals, declined by 7.6% point, positive increase of non-cereals by 4.6% and animal foods by 3.0% point. Among the cereals, rice has negative percentage point to the extent of 6.5%. Among the non-cereals, negative change was found in case of sugar and pulses (-0.7%). High positive change was found in case of potatoes and vegetables. There was very low positive change in case of fruits and vegetable oils. Among the animal foods, there was positive change in case of milk and fish. No perceptible change was visible in case of meat and eggs in the food balance sheet. Main sources of growth of food available in order of importance during 1994-2011, were non-cereals (46%), cereals(33%) and animal foods (26%). Among the individual items, six food items like rice (26%), potato (21.5%),vegetables (9.9%) and fruits (6.3%) constitute together 84% of sources of growth of available food supply during 1972-2011. Negative food supply growth was from sugar and pulses. Very insignificant contribution was from vegetable oil, meat and eggs.

As indicated in Table -5.10, high growth rate was visible in case of animal source foods, followed by non-cereals in all components of macronutrients. In cereals, while there was positive growth of carbohydrates and protein, there was negative growth in fats. In non-cereals, though there was reasonable positive growth in carbohydrates and protein, there was insignificant growth of fats because of negative growth of oil seeds and vegetable oils which are major sources of fats among non-cereal products. High growth of vegetables and fruits as sources of fats is encouraging though their share in fats is insignificant in non-cereals group. Growth of potato and pulses remains static. Growth of carbohydrates and protein in non-cereals is positive and reasonably high. In animal source foods, all food items of macronutrients have highly positive growth.

As sources of growth in carbohydrates, around 87% is accounted for by vegetative products and 13% animal source products. Cereals constitute 62% share of its growth, followed by non-cereals constituting 25%. Among the cereals, rice constitute 88% cereals growth and the rest 12 % belongs to wheat and other cereals. In the non-cereals group, main sources of growth of carbohydrates, potato has pin case of pulses, oilseeds and vegetable oils.predominantly high share of 21% followed by spices with 3.2% and vegetables with 2.6% for growth of carbohydrates. Negative share of growth of carbohydrates is visible . In the animal source food group, carbohydrates has 13% share. Predominantly high positive share of growth comes from milk (5%) and fish (4.98%) in growth of carbohydrates.

As sources of growth in protein, vegetative products constitute 56% and the rest 44% animal foods and non-cereals. Share of growth of protein is positively high in case of potato (18%), vegetables (4%) and oilseeds (2%).All this means that starchy foods like cereals and potato are the main sources of growth of available protein constituting 54% of its growth total in Bangladesh..Share of growth of protein was negative in case of pulses (-13%). In the animal food group which constitutes 44% share of protein growth, protein has high share of growth in milk (11%), fish (26%), meat (5%) and eggs (2%).

Share in growth of fats of vegetative products is negative (-25%) and of animal foods is highly positive (125%%). High share of negative growth is of cereals (-52%). Non-cereals has a positive share of growth of fats (27%). Among the non-cereals, high share of growth of fats is of fruits (10%), vegetables (10%) and spices (12%). In animal food group, high share of fat growth comes from milk (46%), fish (24%), meat (20%), animal fats (23%) and Eggs (12%).

It is expected that amount of actual consumption and amount of food availability will be closer to each other. However as data of Table-5.7 show that there is a gap between availability and consumption . There has been excess availability of cereals (57 grams for rice and 21 grams for wheat), potato (59 grams), milk (24 grams), and fruits (21 gram). Surprisingly, there has been excess consumption over availability in several food items. In case of vegetables, there has been excess of consumption of 95 grams in 2011 as compared to 103 grams in 2007.s). There has been some excess of consumption over availability has been found in case of eggs (2.9 grams), edible oil (4.0) and meat (1.1 grams).

One of the explanations for excess of availability over consumption of food items may be some wastage in course of use of food items in the process of storage, preparation, processing and distribution for final consumption. There may be

overestimation of production of food quantity at field level production. Excess of consumption over availability as in vegetables, eggs, oil and meat may be explained by likelihood of huge quantum of their homestead production which may not be accounted for in national accounting and food balancesheet. There may be procurement of vegetables from nature-forests and community resources like rivers and sea. There is a illegal cross border trade of food items which remain unrecorded. Likewise, there is a doubt regarding the validity of estimate of acreage of cultivation and production of different food items.

6.7 Food Imports in Bangladesh

Bangladesh has to import large amount of food every year to satisfy the needs of huge population with a tiny land for food production. Bangladesh has to import large amount of cereals every year. Cereals constitute major portion of imports constituting 48% of total imports (Table-5.7). Import of cereals has increased from 1382 thousand tons in 1972 to 4420 thousand tons in 2011, i.e. increased by 3.82 times and increased @2.96% p.a. during 1972-2011. Growth rate of import of cereals in the last two decades was as high as 5.35%p.a. Wheat is the most important import item constituting 34% of total imports and 88% of total food grain import and increased @2.44% p.a. during 1972-2011. Average figure of wheat import for the last five years was as high as 2687 thousand tons and rice import is on average 515 thousand tons. Among others, sugar, vegetable oil, milk, pulses and fruits are important imported food items. During 1972-2011, sugar has grown @ 11.4% vegetable oil has grown @ 8.2%, p.a, fruits @ 8.9% p.a. and milk @ 5.9% p.a. Import dependency of pulses and fruits may be reduced by boosting domestic production. Import of vegetable oil may be reduced by increasing import of oil seeds for processing to oil. There is a high instability of imports in case of rice, sugar, vegetable oil, pulses, vegetables and fruits. Such import instability is linked with both domestic production situation and international market situation.

We have enquired into the changing share of major import items of Bangladesh. As we have observed (Table-5.23), share of wheat in the import basket is predominantly high constituting on average 23% of the total imports throughout 1980-2009 changing from 37% in 1980 to 17% in 2009 decreasing by 20% point. Raw sugar has emerged as second important food import (12%) instead of sugar as final product (1%) as previously imported to the extent of 6% in 1980. Next important food import is vegetable oil like palm and soyabean oil constituting 29% in 2009 increased from 17 % in 1980 i.e. increased by 12% point. Onions and lentils have become important import items in recent years. In 1980, lentil was not important import item. Now it

constitute 5% of our exports. Share of dried milk remained as in 1980, while share of nuts, apples, maize, rapeseeds, soya seeds has increased in the import bills in 2009. Rice import has remarkably decreased from 21% in 1980 to 5% in 2008 and 2% in 2009. Potato import as was visible before is not there in import basket any more. Decline of to insignificant level and absence of potato in the import basket is because of attainment of self sufficiency of these two products. It is observable that with increased income level, share of non-starchy products has increased in the food imports structure of Bangladesh.

6.8 Capacity to Import Food: Proportion of Value of Imports to Export Earnings and Total Imports

Capacity to import depends on Export Earnings, Remittances and Terms of Food import Price relative to export unit price. As indicated in Table-14.1, ratio of food imports to total exports has been on average 20% and increased by 4.6% point during 1994-2011. This reflects increased capacity to import food out of export earnings and increased dependence on import for food in the context of increased global integration of the country. Food share of imports has been 12% on average and increased by 3.04% point. during the period 1993/4 -2010-11. Food grain import to export has been around 8% of export earnings on average and increased from 6.2% in 1993-94 to 9.2% in 2010-11, i.e. positively increased by 3.3% during the period. Coefficient of variation of Share of food grain import to total exports is relatively higher reflecting more volatility of the indicator. It is notable that high magnitude of all three indicators in 1997-98 was related to pervasive floods in the country. Their high magnitude was in 1994-95 and 1995-96 was related to political instability in the country affecting domestic food production system. High magnitude of three ratios in 2007-08 was related to floods and cyclone affecting domestic production and high spiral of food prices in the global market heightening import bill for food import. Thus political instability, climate change and global trade volatility can be pinpointed responsible for causing national level food insecurity in Bangladesh.

Problems related to International trade for food security

Problems related to international trade in relation to food security are visualized as:

- i. Problem of lack of Availability of Food for Imports because of Shortage of global market supply of food
- ii. Hazards of Climate Change affecting normal availability of food in the global market

- iii. High and volatile Food Price in the Global market
- iv. Uncertainty in determining security stock arising out of Uncertainty of demand and Supply
- v. Export Restrictions of Supplying Countries creating uncertainty of availability of food in the global market
- vi. Adverse effect of trade liberalization dampening domestic food price affecting the domestic productive capacity and future food security
- vii. Low Capacity to Import adequate nutritious food and dependence on export earnings
- viii. Conflicting interests of producers and consumers in determining food price and trade policy measures
- ix. Uncertainty in determining Strategy of food security and Self sufficiency
- x. Food Poverty and Inequality in income distribution
- xi. Global economic shocks affecting capacity to import food
- xii. Trade Distortive WTO Agreement on Agriculture affecting domestic productive capacity of the country creating ground for prospective food insecurity
- xiii. Poor and instable access to nutritious and safe food
- xiv. Reduced Food Aid affecting food security of poor segments of population
- xv. Poor testing facilities to check unhealthy imported food items
- xvi. High transaction costs of food imports because of poor shipping and port facilities and bureaucratic procedures in import
- xvii. Lack of clear cut long term trade policy regarding food security of the country

6.9 Prices of Food Items and their volatility

Food prices play an important role for the people, specially poor since food consumption constitutes a large fraction of their income. About three quarters of their income is spent on staple foods so that food price increases have major impact on poor consumers and are a threat to their food security. Not only the wage labour but also marginal farmers are net consumers of food commodities

(FA), 2008). Global food market has been characterized by higher and more volatile prices. Taking the period 2002-2004 as base, food price has increased more than two times and experienced high volatility. After the Crisis of 2007-08, food prices started rising again in June 2010 with international prices of food more than doubling by October 2011 (Table-). Not only higher prices but also more volatility of food prices in recent years has created serious concern among the academics and development policy makers. As IFRI research finding show, price volatility has been at its highest level in the last fifty years. This volatility has been found to affect the wheat and maize in particular. It has been found by IFRI (C-Martins-Filho, M. Torero and F.Yao^{xiv}," Estimation of Quantiles based on Non-linear Models of Commodity Price Dynamics and Extreme Value Theory", IFRI, 2010, Mimeo,) cited in its Food Policy Report, 2011. In wheat, there was an average of 27 days of excessive volatility a year during January 2001 and December 2006. From January 2007 to December 2011, the average number of days of excessive volatility more than doubled to 76 a year. High price and volatile food prices are two different phenomena with distinctly different implications for producers and consumers. As IFRI Food Policy Report, 2011 stated, high food prices may harm poorer consumers because they will require more money to spend for essential food and thus may cut back quantity or quality of food and other goods and services needed for decent livelihood. For producers, who are not net sellers, their livelihood would worsen. Only net seller producer may benefit from higher price if production costs remain below the price,.

Price volatility is also harmful to both producers and consumers. Greater price volatility encourages speculative behavior and discourages investment since price volatility creates uncertainty of return out of investment and leads to situation of fear of making losses of investment. It becomes difficult to decide what to produce and how much to produce and for which segments of customers. This may reduce supply which may lead to higher food prices hurting the consumers. In a situation where producers and consumers are the same, high prices and price volatility both affect the households. If prices are volatile, these households reduce expenditure on agricultural inputs, this may affect the amount of food available for their own consumption. Even net sellers produce less and have less to sell leading to reduced income lower purchasing power affecting consumption. High price surges (100% price increase) and price volatility in 2004-08 in Bangladesh has caused real income to fall and increased poverty and food insecurity in the country. Study by Rahman et al, at CPD^{xv} estimated that high inflation and rapid rises in rice price increased poverty by 8.5% (12.5 Million People). In a second study, Raihan et al^{xvi} showed that head count ratio in

Bangladesh remained at 40% during 2004 but increased by 2.1% in 2006 and by a further 4.3% in 2007-08. Another study (2008) conducted by FAO/WFP estimated that the number of food insecure people increased by 7.5 Million as a result of rising food prices. The study added that the number of under nourished people grew by 6.9 Million i.e., by almost 25%^{xvii}.

Study results indicate the following drivers of high and volatile prices:

- i. Increasing bio fuel Production affecting availability of food for human consumption (FAO, 2008, Timmer,2008 and Trostle,2008)
- ii. Higher fuel prices leading to high production costs in agriculture by raising the cost of inputs such as fertilizers and irrigation.
- iii. Weather related shocks leading to droughts and low harvests have hit countries like Australia and Russia.
- iv. Export restrictions of major exporting countries. Export bans and restrictions to stabilize domestic prices lead to more instability in international rice prices and contributed to the sharp increase in the rice price (Headey and Fan 2008^{xviii}).
- v. Financial speculation in the agricultural commodity markets contributed to food price increases (Von Braun and Torero, 2009)
- vi. High concentration in few exporting countries for food supply, i.e. thin world food market
- vii. Low level of global stocks of food staples leaving the world and countries vulnerable to high and volatile price situation. In 2007, stock to use ratio of grains and oil seeds reached the lowest level since 1970. As World Bank put, stocks can function as a buffer for market shocks and thereby dampen the effect on prices.^{xix}.
- viii. Lacking appropriate and timely information flow on production and stocks and price forecasts
- ix. Unusual Import Restrictions or abrupt import liberalization of food items by big buyers of food items
- x. Too much reliance on private sector for food supply and poor governance in monitoring and in food management of the country
- xi. Social unrest and conflict

To cope with the high and volatile price, strategy of self sufficiency in staple food items is better option. High security food stocks is also important to combat the

volatile supply situation in the world of climate change as at present. Government role need to be strengthened to give support to farmers and organize social safety network and public food distribution system effectively. Cost of agricultural inputs need to be kept as low as possible through macroeconomic policy measures. Increasing productivity in agriculture is the unique option to lower cost of production and lower prices of food items. Strategic trade liberalization and management of food aid are important drivers of checking high and volatile prices.

Our regression exercise suggests that there has been positive link between real price of rice in the country and its international price. With increase of 10% increase international price there has been increase of 4% retail price of rice in the domestic market. There has been high positive cross price elasticity between rice and wheat, cross price elasticity being 1.16 implying high level of substitution between the two.

We have enquired into the price movement behaviour of main food imports of Bangladesh during 2000-09. The evidence as in Table-5.21, shows that price of wheat has been on average \$149 per ton, rice \$225 per ton, Soyabean oil \$565, pulses \$571, sugar \$310 and milk \$2384 per ton during 2000-09. Growth of price of these import items were 0.79%, 8.75%, 2.91%, 7.2%, 8.73% and 3.9% respectively. During 2000-08, growth of prices of these commodities. during 2000-08 is much higher, being 9.1%, 12%, 11%, 5.75%, 6.5% and 12.7% respectively. The price of imports of Bangladesh grew abnormally in 2008. It grew @ 68.4%, 40.5%, 111%, 89%, -9% and 58% respectively. Except sugar prices of all the major import items grew at a very high abnormal rate creating catastrophic situation in the global economy. It affected Bangladesh economy tremendously fuelling price of commodities dependent on imports..Coefficient of variation of imported commodities of Bangladesh is a modest one.

We have analysed international food price data during 2000-11 (Table-5.21). The results suggest that there has been spectacular growth for meat, dairy, cereals, oils and fats and sugar. Their growth was 5.7%, 7.2%, 8.6%, 11.4\$ and 10.8% respectively. Food price has grown @ 8.3% p.a during the period under review. This might have increased import bill and adversely affected the domestic price.

6.10 Projections of Requirements of Food Supply and Demand of Food and Food Gap by 2015

According to the projected level of requirements and production of important food crops estimated by BARC for the target year 2015 of meeting the millennium

development goals (Table 5.15), there will be a marginal surplus of 1.20 million tons of food grains and 2.03 million tons of potato. However, deficit will continue to persist in pulses, oilseeds, fruits and vegetables. Food availability at the national level in terms of cereals has certainly increased to keep pace with the population growth in recent times. But considering the highly volatile nature of cereal production, caused due to disastrous flood and drought, one cannot predict with any amount of certainty increasing growth in cereal production in the future to feed the growing population. Major efforts will be needed to boost production of food grains to the projected level and to even out the deficit in other food crops to meet the millennium development goals. This is a task that has to be achieved against shrinking land resources, declining soil productivity and competing demand for land by other sectors. Even within agriculture, Boro rice, high value crops (fruits and vegetables), fodder cultivation, pond fisheries and even fruit tree and first growing forest tree cultivation are competing with each other for land. On top of this, inefficient water and fertilizer use, input-output price distortion and inefficient marketing system (inadequate market infrastructure, inefficient market management) will, as usual, have a negative influence on production. The national requirements of meat and milk as estimated by DLS for the year 2015 are 6.86 million tons and 14.29 million tons respectively, and of eggs 16297 million. The deficit is large 4.41 million tons for meat, 9.75 million tons for milk and 5245 million for egg. This is a huge gap, and this gap can be filled by increasing the production at an annual growth rate of 3% only.

Share of rice is expected to go down and share of non rice food production has gone up., negative change occurred in the share of rice compensated by the positive change in non- cereal products (Table-5.16).

6.11 Projections of Consumption and Dietary Energy gap with Normative and supply-Demand Gap in the sixth and Seventh Five Year Plans

The normative of consumption requirements worked out by us in consultation with paramount works on composition table, seems to be closer to balanced and more realistic one in the context of Bangladesh. Reliance on starchy food will get reduced in phases with increased income. Projection results show that the proportion of cereals will be just 40% in our calorie energy table, while share of non-cereals has been 48% and the rest is animal source food constituting 15% of the total food..It is desirable to make separate food composition table for rural and urban people in view of their difference in physical activity and metabolism. In the same way, there is a need for gender specific food composition table.

So long all the composition tables were on dietary calorie requirements with no effort for balancing food intake of protein and fats. Protein and fat composition tables need to be worked out along with dietary calorie requirements normative.. We have analysed the projected consumption demand of Bangladesh in sixth and seventh five year plan with high growth target as worked out by Mahbub Hossain and Uttam Deb. It was expected that consumption level at such high growth envisioned in 7th Five year plan would be at least closer to normative of food requirements. Though situation of nutritional balance is better in the period under 7th five year plan relative to sixth five year plan, nutritional imbalance in food intake is likely to be quite there.

The results show that there persists high nutritional imbalance in projected consumption: excess consumption of rice while there is projected deficiency of intake of fruits and pulses in both rural and urban areas by the year 2021 which is inconsistent with projected high growth scenario. It is expected that deficiency of these two items will be still more under non attainment of projected growth level during 2016-2021. This might be because of high non-availability of pulses and fruits and non-affordability of most of the people. In all food items urban people are found to consume relatively better in terms of nutritional balance in general. Rural people are likely to consume more starchy food and urban people more amount of non-starchy food during the period of seventh five year plan.

We have enquired into the supply-demand gap in the sixth five year plan (2011-16) and seventh five year plan (2016-21). Our estimate shows that there will be sizeable supply deficiency in food products like wheat, pulses, edible oil, vegetables, spices, meat and eggs. Supply-demand gap of wheat is unlikely to be reduced while in others, efforts can be made to reduce supply deficiency by raising productivity, increasing acreage of cultivation and incentivizing the farmers for boosting production of these food products.. There will be sizeable surplus of supply in rice and potato followed by fruits, fish and milk. Government efforts for boosting diversification of food production are necessary to meet the food requirements as per normative for balanced nutrition.

We have calculated and made projections of consumption requirements for the population of Bangladesh by year 2021 and tried to show gap of consumption requirements with domestic supply visa-a- vis demand- supply gap in the country. The results show that there will be a surplus of 5.2 Metric Tons (MT) of food by 2021. However, there will be persistence of nutritional imbalance in the food composition because of deficiency of non-cereals supply by 5.3 MT though cereals are in supply surplus of 6.5 MT. Starchy food will be in surplus of 14.6

MT consisting of cereals of 6.5 MT and potato of 8.0 MT in the country. Non-starchy food is projected to be in supply deficiency amounting to around 10 MT by 2021. The projected deficiency of food as per normative of requirements will be in pulses (2.7MT), edible oil (1.0MT), fruits (3.8MT), vegetables (6.2 MT), spices (0.3 MT), meat (0.4 MT) and eggs (0.3 MT). Among the starchy food, only wheat is projected to be in deficiency of supply (2.5 MT) as per normative of consumption requirements. Projection results show that there will be surplus supply in case of mainly four products, namely, rice (9MT), potato (8 MT), fish (2.4 MT) and milk (1.1 MT) by 2021. First three products have possibility of exports in the global market.

Since there is likelihood of difference between demand and requirements of consumption are different, we have compared projected requirements for balanced nutrition with projected consumption demand estimated by Mahbub Hossain and Uttam Dev as under high growth scenario of seventh five year plan. Results of our analysis show that consumption demand can cover normative requirements at aggregate level and can show surplus of 18.5 million tons (MT) of food with 9.3 MT in urban location and 9.2 MT in rural areas, as against the land is at a level of 128% of the normative. Under high growth of 10%, in such high level demand projections under high growth scenario, it is expected that all the requirements will be covered by market demand. Food specific analysis shows that it will not be possible to meet the consumption requirements in all food items and in all locations. Even under this high demand projection. Evidence shows that consumer requirements of fruits cannot be met by consumption demand in both rural and urban areas. Requirement of pulses, edible oil, wheat, and sugar is likely to remain unmet by consumption demand in rural areas by 2021. Requirement of urban people in case of all food items except fruits may be met by market demand. Thus high growth induced market demand may not guarantee satisfaction of all consumption requirements of all the people, particularly rural population. This is a big challenge in the way of access to balanced nutritious food for all. The results of analysis indicate that rural population deserves priority attention for balanced nutritional security. In all food items, rural population is lagging behind the urban population in attaining the level of normative by market demand. Non fulfillment of the growth target, which is not unusual given the previous records of growth performance, is likely to hamper further the attainment of normative of balanced nutritional food security.

7. Access to Food and Affordability of Food

7.1 Link between Food access and food security

Adequate food availability may not necessarily ensure access to adequate food. One need to have ability to afford it. Entitlement approach to have access to food has been well presented by Amartya Sen^{xx}. to him, According to him, hunger is the characteristic of some people not having enough food to eat, rather than characteristic of not there being enough food to eat. In order to avoid hunger one has to command over food or purchasing power to afford it. Access or entitlement to food along with food availability is essential to ensure food security. Access to food depends upon entitlement to employment, adequate earnings from employment, access to credit, resources for disposal, price stabilization of food price and entitlement to Social Security Benefits or other transfer such as remittance. A general decline in food supply may result in price increase resulting in unfavourable effect on exchange entitlement and cause the people to get exposed to hunger. Evidences show that food insecurity is in most cases caused by decline of purchasing power and exchange entitlement rather than food shortage in the society. Food supply influences food security through indirect channels of effects on food entitlement. Thus exchange entitlement increases with decline of food price. In a private ownership market economy, access to food .as established by Amartya Sen, depends upon four elements of entitlements:

- i. Production based entitlement that depend on ownership of land and non-land assets;
- ii. Trade based entitlement that depends upon adequate import and affordable market prices;
- iii. Own Labour based entitlement that depends upon employment and wages; and
- iv. Transfer based entitlement which includes inheritance, gifts, remittance transfer from relatives and transfer from government through safety network programmes.
- vi. The ability of the people to access food is the resultant outcome of the complex operation of all these elements.

Achievements of Bangladesh in the enhancement of people's economic access to food have been significant as reflected in the data of HIES, BBS. Poverty incidence has markedly decreased in both rural and urban areas and this favourable trend holds whatever the methodology is used for measuring poverty.

Still, many poor and vulnerable households, whether food producers or not, as we shall see later on do not have food security because they are unable to afford a minimum basket of food items through their own food production, cash income, market purchases and other resources necessary to acquire safe and nutritious food.

7.2 Incidence of Household Food Insecurity

Prevalence rate of household food insecurity, as indicated in Table-6.3, is as high as 48.0% of households at the national level. In the rural area food insecurity is more relative to urban location with the ratio of 1.04. The proportion of food insecure households appeared to be still more in the slums (63.7%), compared to rural (48.6%) and urban areas (46.5%). Just over 12.0% of households experienced severe food insecurity at national level with equal proportion in the rural and urban area. This proportion appeared relatively higher in the slum stratum (17.2%). Moderate and severe household insecurity taking together is around 34% of the total households in Bangladesh. This food insecurity incidence is around 34.5% in rural areas and 32% in urban areas.

7.3 Food Poverty Incidence of people in Bangladesh

Incidence of food poor people, as indicated in Table-6.4, has decreased from 82% in 1973 to 32% in 2010, i.e. declined by 50% point. during the period. Incidence of rural food poverty has declined from 83% in 1973 to 36% i.e. by 47% point. Incidence of urban food poverty has decreased from 81% in 1973 to 23% i.e. by 58% point during 1973-2010. Incidence of extreme food poverty has decreased from 48% in 1973 to 18% in 2010 i.e. by 30% point. In case of rural areas, incidence of extreme food poverty has decreased from 44% to 22% i.e. by 22% point and in urban location from 29% to 9% i.e. by 20% point during the period.

We have calculated the share of food poor by location. The results show that among the food poor, rural people constitutes 79% in 2010 decreased from 91% in 1973 i.e. decreased by 12% point. Among the extreme food poor, rural population constitutes 69% in 2010 decreased from 94% in 1973, i.e. declined by 25% during the period. Thus the hub of both moderate food poverty and extreme food poverty is still rural location though urban share is increasing with increased urbanization.

It is notable that extreme poor constitutes more than 54% of total food poor in 2010 increased from 52% in 1973. i.e. increased by 2.3% point. Rural extreme food poor constitutes 37.5% of total food poor in 2010 decreased from 49% in

1973 i.e. decreased by 11% point. Urban extreme food poor constitutes 16.7% of total food poor in 2010 increased from 3.2% i.e. increased by 13.5% point. Thus extreme food poverty assumes greater importance for food insecurity with larger rural share.

Though incidence of food insecurity has declined remarkably over the period of 1973-2010, absolute number of food insecure population is still very large. At present, food insecure people are around 48 million out of which 26 million are extremely food insecure which constitutes 54% of total food insecure at national level. Number of food insecure people, as indicated in Appendix Table -6.5, has decreased to 51.2 million in 1985, but again it started increasing and increased to 55.3 million in 1995, 55.9 million in 2000 and 56 million in 2005. After 2005, number of food insecure started falling and decreased to 48 million in 2010. It means that though food insecure people decreased by 15 million people during 1973-2010, it remains large in number, posing a great challenge in the way of development of Bangladesh. Number of extreme food insecure decreased from 33 million in 1973 to 26 million in 2010, i.e. decreased by 7 million during the period. Thus not only number of moderate poor but also of extreme poor is alarmingly large deserving priority focus for policy action. It is notable further that alongside with large decline of food insecure in rural areas, number of urban food insecure increased by 4.4 million in moderate insecurity and 6.0 million in severe extreme food security during the period of 1973-2010. Thus urban food insecurity is emerging challenge to address in the coming years.

Though share of rural areas in food insecurity is much high, over time, urban share of food insecurity has been increasing. Its share has increased from 9% in 1973 to 21 % in 2010 in case of moderate insecurity and from 6% in 1973 to 31% in 2010 in case of extreme food insecurity. Urban share of extreme insecurity among the total food insecure has increased from 3% in 1973 to 17% in 2013, i.e. increased by 13.5% point as against decline of extreme food insecurity in rural areas by 11%. Thus, though rural food insecurity tends to decrease, urban share in food insecurity has been increasing. Increase of urban food insecurity may be the result of migration of food-poor people from the rural areas to the urban centres without prior arrangement of earnings, food and accommodation.

Both moderate and extreme insecure people have increased during 1973-81 @ 0.83% and 4.3% p.a. respectively and in both urban areas (@ 1.7% and 5.3% p.a. respectively) and rural areas (@ 0.74% p.a. and 4.3% respectively). However, from 1981 onwards, moderate and extreme food insecurity have decreased in eighties and nineties with the exception of urban areas where it has increased in

all periods upto 2005. It is notable that growth of extreme food insecurity was always positive for urban areas in all the periods of 1973-2005. After 2005, food insecurity whether moderate or extreme in both rural and urban areas, food insecure population tended to decline. During 1973-2010, moderate insecure have decreased @-0.73% p.a. and extreme poor @-0.64% p.a (Table-6.5). This low decline of food insecure is because of continuous increase of urban food insecure .not compensated by meagre decline of food insecurity in rural areas. Highest growth of food insecure was found during 1985-1991 as reflected in highest growth of extreme food insecurity in both rural and urban areas in this period. This may be due to devastating floods in 1987 and 1988 and cyclone of 1991. Incidence of extreme food insecurity has increased to 27% in 1988 and 30% in 1991 from 22% in 1985. Similarly, devastating flood of 1974 might have affected food insecurity which might have caused high growth of extreme food insecurity during 1973-81. Bangladesh faced food insecurity situation in 1997 and 1998 and 2007 and in all these years devastating floods and cyclone have caused colossal damage to the crops and loss of the farming population and agricultural labour in earnings from adequate employment. In normal years, country does well in agricultural production and can attain self sufficiency in rice, potato, vegetables. fish, dairies and poultry products. Thus, food insecurity in Bangladesh is very much related to climate change.

8. Consumption Pattern and Consumption Gap at Household Level

8.1 Trends in Food Intake

We have analysed the trend of food intake. There has been remarkable progress in calorie intake during 1973-2010. Calorie intake has increased from 1915 calories in 1973 to 2315 calories in 2010, i.e. increased @ 0.43% p.a. (Table-7.1). This quantity of calorie intake is closer to normative of food intake. Growth rate has been higher in the eighties, but declined in 90's, In the period during 2001-2010, calorie intake has grown positively @ 0.34% p.a. Calorie intake in the rural area was lagging behind urban areas. Since 1983, rural urban ratio in calorie intake was in favour of the rural areas. Thus magnitude of calorie intake has grown positively in persistent way during the whole period of 1973-2010. On the other, calorie intake in rural area has grown more relative to urban area. Rural urban ratio has increased from 97% in 1973 to 105% in 2010. The level of calorie intake in 2010 is at 121%, 115% and 124% to 1973 for national, urban and rural area respectively. And rural-urban ratio is around 108% level in 2010 relative to 1973.

It is not only quantity but also quality that matters for balanced nutrition. One of the indicators is share of cereals. Share of calories by international standard and

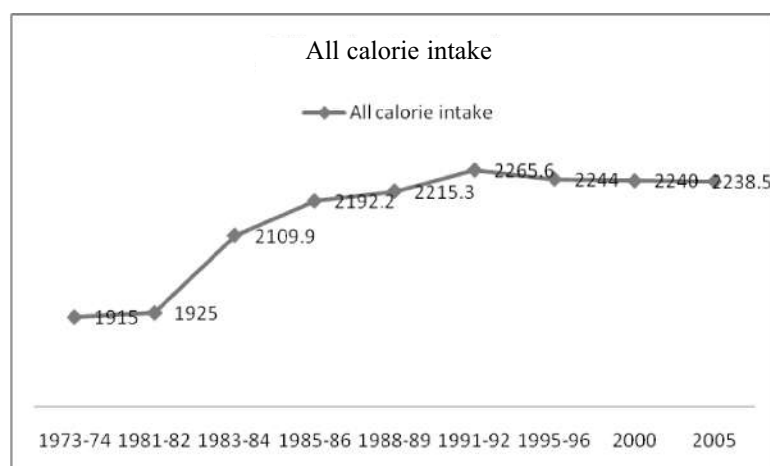
normative requirements should not exceed 60% of total calorie intake for maintaining nutritional balance. (Table-7.2). Dietary energy intake from cereals is still more than 70% though decreased from 80% in 1973 to 70% in 2010 i.e. decreased by 10% point. Bangladesh is slowly moving toward that though at a slow pace. Rural population is found to be relatively more in nutritional imbalance in dietary energy intake. Share of cereals is closer to normative of consumption requirements in urban areas.

As indicated in the Table-7.4, food security increases with decline of income poverty in both rural and urban locations. However, there is no linear link between income poverty and food poverty in as much as there is incidence of food insecurity in the households of non-poor. Incidence of food security for extreme poverty was in case of 22% increased to 50% in case of moderate poor and 79% in case of non-poor indicating link between food security with income poverty status.

There has been change in case of all food items except rice, wheat, red meat and sugar. Food composition of food intake in Bangladesh is in imbalance and tends to decrease though very slowly. Share of cereals exceeds the level of normative of 60% and other foods remain far below the requirements.

Level of poor to non-poor in dietary energy intake is 75% on average, i.e. far below equitable level. The food where level of poor remains below 50% are meat, fruits, fish, eggs, milk and sugar. The level of poor to non-poor more than 80% is in case of rice, potato and vegetables.

Fig.1 Trend in Food Kilo Calorie in-Take during 1973-2010



8.2 Adequacy of Food Intake: Gap of Food Intake with Normative of food Items

We have tried to verify adequacy of food intake by comparing the actual food intake with required normative of balanced nutrition. For the purpose, we have worked out a normative for verification of adequacy and gap of actual food intake and its composition with respect to normative of balanced nutrition. We have analysed normatives of six works of four national institutions and two international bodies. Our calculation shows that there has been deficiency of food intake relative to normative in most of the products except rice, potato and spices. In 2010, large deficiency of calorie intake was found in fruits, milk, pulses, wheat, vegetables and edible oil. There has been structural difference of intake and normative. Share of rice constitutes 42% against the normative of 35% implying 7% point larger share. This is relatively a regressive structure of food intake. Starchy food constitutes 52% as against the normative of 44% implying 7% higher share than the norm. Again, Bangladesh is overeating rice and under eating wheat indicating the need for decrease of taking former and increasing taking of the later. Bangladesh people are over eating carbo-hydrates and under eating protein food like fruits and vegetables, animal foods like meat, eggs and milk and its products. There is a deficiency of sugar intake as well, Thus Bangladesh at present has a serious problem with balanced food though it can tackle hunger situation at reasonable level. Food consumption remains heavily centred on cereals, with rice alone constituting almost two thirds of energy intake. Data analysis indicates that Bangladesh population has been suffering from deficiency in all food items except rice, potato and spices. However, there has been tendency of reduction of these deficiencies over time. Diversifying domestic food production could further improve the situation. It is positive that households in Bangladesh are changing their diets though slowly. They have started consuming a broader range of foods, with a larger share of calories coming from vegetables, fruits and animal-products. These are promising developments to strengthen people's food and nutrition security. There is a need for emphasis on fruits, vegetables, pulses, milk and other animal products consumption to fulfil the requirements of desirable dietary pattern.

As study of BIRDEM^{xxi} shows, about 40% of the population take more than 75% of total calorie from carbohydrate which may have link with obesity and related diseases. Forty percent of the population take less than 10% of total calorie from protein sources and 53% of the population take less than 15% of total calorie from fat which reflects the scenario of stunting wasting and underweight in the country. Dietary diversity score (DDS) which is a proxy for nutrient adequacy of the diet of individuals is less than 6 indicating these households at risk for micronutrient deficiency.

9. Economic Accessibility

9.1 Income Poverty

Economic accessibility is reflected in the poverty incidence. Data suggest that head count ratio of poverty has decreased @ 2.6% during 1973-2010, in rural areas @ 2.36% and in urban areas @ 3.64%. Poverty gap ratio and squared poverty gap ratio also decreased significantly. This is reportedly incidental to increasing economic growth of the country. The growth elasticity to poverty reduction has been found to the tent of 0.54 implying that 10% increase of growth will lead to increase of poverty reduction by 5.4% point. For rural areas, poverty reducing growth elasticity amounted to 0.57 and in urban areas it amounted to 0.46. Though growth of poverty reduction was visible in all the successive periods, it increased very highly during 1991-2010 with the highest incidence during 2000-10.

9.2 Access to Employment by Different Economic Classes

Access to employment is one of the important drivers for increasing capacity to buy food and eventually access to food. As tabular data show, underemployment rate is around 20% of able bodied population in 2010 decreased from 25% in 2005 and 38% in 2002-03. Over time, underemployment has not decreased rather increased from 16.6 % in 2000 to 20.3% in 2010 dampening the growth effects and interventionist efforts for poverty reduction. Underemployment rate has increased in case of male rather than female. Female underemployment has experienced reduction by 18% point because of expansion of employment opportunities of female specially in non-crop sectors including ready-made garments. Urban underemployment remained at the same level as in 2000. Rural underemployment has increased to 27.8% in 2010 from 17.8% in 2000 i.e. increased by 40.9% point.

We have tried to link underemployment with poverty status of households. It has been found that underemployment was as high as 34% in case of extreme poor, 24% in case of moderate poor and 18% in case of non poor while average underemployment was 26% in 2002-03. Male underemployment was 32% in case of extreme poor, 23% in case of moderate poor and 17% in case of non-poor. Female underemployment was 51% in case of extreme poor, 35% in case of moderate poor and 19 % in case of non-poor.

We have seen the link of seasons with underemployment. Underemployment rate is 34% in slack season as compared to 25% for whole year implying 139% of slack season underemployment relative to whole year underemployment. Female

underemployment in the slack season underemployment is as high as 211%. As against this female seasonal underemployment was to the extent of 105%.

9.3 Physical Accessibility and Actual Consumption by Employment status

We have analysed the link food security with underemployment. AS evidence shows, food security increases with improvement of employment. However, food insecurity is found in good employment in 38% cases. Thus food insecurity is not only of underemployment which has crucial role for this.

Mode of employment influences food security. Data suggest that agricultural and non-agricultural wage labour have poorer access to food. These groups have always been vulnerable in catastrophic situation. In Bengal famine of 1943 and Bangladesh famine 1973 they were the main victims of famine situation. Wage labour has no asset to dispose of to cope with famine situation., They have only labour, which might not be demanded in a climatic crisis as in 1974.

Price varies by seasons. As observed in monthly data of rice price of different periods and years, it is clear that price reaches peak in some months and go down to low rate in some other months. This may happen in pre-harvest season and in post harvesting season. From the rice price fluctuation, we can identify months of high price of rice in February, March and September. It has been found that food shortage occurred in the months of higher underemployment and lower wage rate, though rice price was relatively lower in those months. Again location influences food security. Incidence of food insecurity is more in rural areas relative to urban location.

9.4 Food Intake and Composition by Food Expenditure and Household Income

9.4.1 Food Intake and Composition by Per capita Household Income

As indicated in Table-7.11, ratio of low income group to upper income group has been as low as 0.73 at national level and 0.75 and 0.71 at urban and rural areas respectively. For cereals intake the ratio is closer for the lower income group for both urban and rural areas. In all non-cereals and animal sourced food, lower income group is much behind the upper income group in food intake, The ratio below 0.50 is found in case of meat and eggs, fish, fruits, vegetable oil and milk. Inequality of food intake specially in protein rich food is evident commensurate with income inequality. Situation is worse in rural areas in all food items except in eggs and milk.

As indicated in 7.12, food intake in all items in both rural and urban areas have positively grown in lower 20% income group during 1983-2010. In contrast, there was negative growth in upper 20% income group in cereals, pulse and vegetables. However, ratio of food intake in lower income to upper income group is less than 100% in all food items except in cereals in both rural and urban locations.

9.4.2 Food intake by consumption expenditure and economic strata and Location

As indicated in Table-7.13, expenditure of cereals constitutes 44% of consumption of households of lowest income group compared to 21% in the top most income group. Similarly, vegetables and potato constitute 8.2% and potato 2.6% for lowest income group relative to 6.3% and 1.4% respectively in topmost income group. In fish, meats and eggs, fruits and milk the shares of expenditure for lowest income group were 12%, 5.8%, 2% and 1.5% respectively relative to the topmost income group with 17%, 16%, 7.7% and 4.8% respectively. Thus, poor income group has higher share of consumption expenditure in cereals, vegetables, potato and relatively lower share of expenditure in meats and eggs, fruits, fish and milk relative to topmost income group. Such pattern of consumption pattern is reflection of differences of affordability to buy protein rich food and metabolism of different income group.

As indicated in Table-7.14, there is a rural-urban difference in structure of food expenditure with relatively higher share for cereals, spices, fruits, meats, eggs and edible oil but lower share in in vegetables, fish, milk ,pulse and beverages relative to the share of urban population in food expenditure. During the period of 2000-2010, there was positive change in shares of cereals, but negative share for non-cereals and animal source foods. In rural areas, there was positive change in cereals but negative change in share of all other food items. In urban areas, there positive % change in cereals, vegetables and spices and negative change in all other products. Negative change in percentage point of protein rich food items may be the result of increased compromise with higher share of non-food expenditure in total consumption in both rural and urban locations.

There has been found clear cut link between income strata and share of food exp in consumption expenditure. Share of food expenditure decreased from 68% in the lowest income group to 47% in the highest income group The ratio of bottom 5% to topmost 5% is around 1.9., in the rural areas, 4.2 and in urban settlement 1.6. Rural urban ratio shows that share of food expenditure is relatively higher in all income groups for the rural population. Rural urban ratio in share of food expenditure has decreased with increase of income level. Thus income level and

locations have influence on share of food expenditure. This is consistent with Engel' law of inverse relation.

between income level and share of food expenditure. This implies that one can use share of food expenditure as an indicator for monitoring poverty and food security.

9.5 Food Vulnerability

Food vulnerability is manifested in two ways: inadequate access to food throughout the year and acute food shortage on a seasonal basis. Food security indicators developed by Murshed, et al. (2008) study show that 7 percent of households faced acute distress in accessing food on regular basis, while up to 30 percent of households encountered such conditions sometimes, marking the latter group as potentially highly food vulnerable. Besides, 12-15 percent of households had chronic under-consumption and “worry about food access frequently,” while up to 30 percent of households confronted such food vulnerability sometimes. A recent IRRI synthesis of Food Security for Sustainable Household Livelihoods (FoSHoL) Programme shows that more than two-thirds of landless and marginal agriculture-dependent, resource-poor households faced food crisis in the months of *Kartik, Aswin, Choitra and Boishakh* when they had to reduce the number of meals and quantity and quality of foods. Some households ate reduced portions/ fewer meals throughout the year.

Poor households adopt a range of strategies to cope with hazards in Bangladesh. As a first response, households typically reduce the number and the quality of meals consumed, and/or switch to cheaper but less preferred foods. Often, elderly and female members of the household are the first to reduce their food intake, allowing men and children to eat as normal. As the crisis persists, households increasingly adopt more drastic methods of coping. Female members of the household, who for cultural reasons normally do not engage in work, take up manual labor. In addition, children are taken out of school to engage in income-generating activities, and male members migrate to urban areas in search of employment. A widely practiced strategy for reducing food insecurity is taking loans from relatives and moneylenders, or salary advances from employers. This is often followed by consumption and sale of animal and household assets.(Table-7.16) It is notable that chronic food insecurity translates into a high degree of vulnerability to famine and hunger; ensuring food security presupposes elimination of that vulnerability^{xxii}.

10. Food Utilization

10.1 Importance and components of Food Utilisation

Food utilization is an important component of food security. Ability to have access to food may not ensure food security unless one has ability to make effective use of that ability to ensure balanced, safe and nutritious food. Adequate food utilization requires a diet providing sufficient energy and essential micronutrients, safe drinking water, adequate sanitation, access to health services, proper feeding practices and sickness treatment facilities. Food utilization is determined by food safety and quality, how much a person eats and how well and how much quantity a person metabolises to energy, all of which affect health, nutritional status and growth. Adequate utilization requires a diet with sufficient energy and essential nutrients, potable water, adequate sanitation, access to health services, proper feeding practices and illness management. Constraints to food utilization include nutritional losses associated with food preparation, inadequate knowledge and practices of health techniques and cultural practices that limit consumption of a nutritionally adequate diet by certain groups or families.

The coexistence of under- and overnutrition has taken a heavy toll on the society undergoing rapid transformations, resulting in the double burden of malnutrition. There has been increasing concern over utilisation of food which is governed by such factors as peoples' food preference, general non-food health condition and the overall environment under which food is prepared and consumed. Added to this micronutrient deficiency has become a third burden for Bangladesh food security.

10.2 Nutritional Balance in Food Intake

The Challenge for food Security is to continue fighting hunger and under nutrition, while preventing or reversing the emerging obesity. The concept of food security covers not only the amount of food required to guarantee absence of hunger, but also the right choice of nutritional intake to avoid malnutrition and health issues. Balanced diet is essential to lead an active and healthy life. Food consumption in Bangladesh need to be diversified, promoting non-rice food production with additional momentum. Compromised utilization caused by poor hygiene can generate nutrition failures manifest in high levels of wasting and stunting, while inappropriate diets can give rise to obesity and diet-related non-communicable diseases. The coexistence of under- and overnutrition has taken a heavy toll on countries undergoing rapid transformations, resulting in the double burden of malnutrition.

The country's undernutrition is the outcome of insufficient intake of energy, protein, fats and micronutrients; poor absorption or rapid loss of nutrients due to illness or increased energy expenditure. The causes of undernutrition are reportedly multi-level and multi-sectoral. The underlying causes at household level malnutrition are insufficient access to food, inadequate maternal and child care practices and poor water, sanitation, and inadequate health services. Chronic and often widespread hunger and nutritional deficiencies result in stunting or stunted growth i.e. decreased body size (specially height to age). This process of nutrition starts *in utero*; if the mother is malnourished and continues through approximately the third year of life (www.en.wikipedia). It leads to higher infant and child mortality, but at rates far lower than during famines. Once stunting has occurred, improved nutritional intake after the age of about two years is unable to reverse the damage. Limiting body size as a way of adapting to low levels of energy (calories) adversely affects health in three ways^{xxiii}:

- i. Premature failure of vital organs during adulthood. For example, a 50-year-old individual might die of heart failure because his/her heart suffered structural defects during early development;
- ii. Stunted individuals suffer a higher rate of disease and illness than those who have not undergone stunting;
- iii. Severe malnutrition in early childhood often leads to defects in cognitive development.

It is felt that more efforts are necessary that, normative is made in consideration of individual country characteristics and changing food habits. Normative by location, age and gender need to be separately established. Normative for children, adolescent boys and girls, pregnant and non-pregnant women, male female and adult and old people requires separate focus . There should be data on normative of calorie, protein and fats in the composition table and actual food intake. There should be consensus on conversion rate from gram to calorie in different items. Food items should be in both gram and calorie to facilitate easy understanding of balanced nutrition of food.

As indicated in the table-8.6, in rural area, level of food intake in deficiency with the exception of rice and fish has not reached the level of normative despite satisfactory attainment of normative in aggregate. Thus food composition in rural areas is in serious imbalance. In urban location, attainment of level of normative is a bit better. However urban population is deficient in rice, wheat, pulses and milk. Thus, nutritional imbalance poses a great challenge for food security of Bangladesh. If we take energy balance in terms of calorie along with gram, we can

see the picture of nutritional balance as in Table-8.7. We can see that there is serious imbalance in the energy intake in as much as cereals constitute 77% against the ideal normative of 55% implying excess intake of energy by 21,8%. while non-cereals constitute only 18% as against 37% implying large lagging behind of actual energy intake from the normative by -19%point. Similarly animal source food lags behind the normative by -2.6 % . point. There is positive difference of actual energy intake with normative in cereals (77%), potato (0.8%) spices (0.67%). Negative difference with normative found in most of the non-cereals and animal source foods indicate nutritional imbalance of serious concern.. If we analyse food intake in terms of calorie and protein, we can see that rural population lag behind urban one in protein intake though in carbohydrates they have better intake. There is a considerable deficiency of food intake in pulse, fruits, vegetables and animal foods as compared to the normative worked out by different researchers.. Only rice, potato and spices are consumed in excess of the normative quantity. Thus, 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 excessive calories intake derived from cereals. Women and children are especially vulnerable due to their greater nutritional requirements. This dietary imbalance immanates majorly from insufficient domestic production of non-cereal foods (pulses, oilseeds, fruits, meat, milk and eggs), low incomes, subconscious food preferences and lack of nutrition education and knowledge.

10.2.1 Dietary Diversity

Cereals, largely rice, are the main food in Bangladesh. The people take some vegetables, a little amount of pulses and small quantities of fish if and when available. Milk, milk products and meat are consumed only occasionally and in very small amounts. Fruit consumption is usually seasonal and includes mainly papaya and banana which are cultivated round the year. The dietary intake of cooking oil and fat is meagre. Taking same type of food every day is monotonous. There is limited scope for increase of variety of items because of lack of affordability and availability in the market. There is traditional dietary habit with a preference for polished rice and leafy vegetables and items of poor nutritional quality which often do not meet good nutritional requirements.

As the data (Table-8.9) reveal, around 61% women are found to experience inadequacy of diverse diets. Inadequacy of diverse diet is relatively much higher in case of rural women as compared to urban counterpart in 61 % cases dietary diversity does not exceed 4 food items, which indicates monotonousness of diets

taken by women. Food items exceeding 6 are only in case of 17 % women. Average dietary diversity score is around 4.1 which is very narrow from the view point of nutritious and balanced food. Mean dietary diversity score is higher in case of urban women than that of rural ones. Average score of dietary diversity is not sufficient to get real picture of food intake diversity. We need to measure adequacy of meeting most of macro and micro nutrients requirements of average women. Tabular data As indicated in the table, in the rural area, the situation is still worse with inadequacy of dietary diversity in larger number of households (64%). Food diversity changes with economic status and there is a negative correlation between inadequacy of diverse diet with wealth status of the households. Inadequacy of dietary diversity decreases with increase of economic status as evidenced by the fact that diversity inadequacy decreases from 82% in case of low wealth class to 34% in case of top most wealthy class. Food diversity of women increases with increase of not only of wealth but also with increase of their food security status and reduction of extent of food deficit in the household. Inadequacy of diverse diet is much higher in food insecure and in case of food deficit households with poor food consumption.

The diets of pregnant women in low-income groups are deficient not only in micronutrients but also in dietary energy. Inadequate food intake and imbalanced nutrition along with low dietary diversity affects nutrition for healthy life. 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.^{xxiv}.

The diets of pregnant women in low-income groups are deficient not only in micronutrients but also in dietary energy. Inadequate food intake and imbalanced nutrition along with low dietary diversity affects nutrition for healthy life. 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.^{xxv}.

Analysis indicates that the underlying causes of malnutrition of children include (i) household food insecurity resulting from inability to grow or purchase a nutritionally adequate amount and variety of food; (ii) lack of dietary diversity; (iii) inadequate maternal and child care due to inappropriate hygiene, health and nutrition; (iv) low rates of exclusive breast feeding; (v) inadequate access to quality health services; (vi) poor environmental hygiene and sanitation along with low levels of income and maternal formal education. Nutritional status is determined thus not only by quantity and quality of food intake but also by diseases and quality of treatment and healthy environment for living.

Data analysis suggests that Determinants of Acute Undernutrition of Children are: i. Low birth weight of Children, ii. Anemia of Mother, iii. Low Weight and BMI of Mother, iv. Low Anal care of Mother, v. Low Age of Mother, vi. Poverty of the Household, vii. Stunting of Mother, viii. Low Education of Mother, and ix. Income earning of Mother

10.3 Nutritious Status of Women

Maternal undernutrition (body mass index less than 18.5 kg/m²) in non-pregnant women in the country, while declining from 54 percent in 1996–1997 to 38 percent in 2003 and 35% in 2011, is still very high. Along with underweight, the women are suffering from overweight (20%).

Undernutrition, both before and during pregnancy, causes intrauterine growth retardation and is one of the major reasons for the high LBW (36 percent) prevalence in the country.

Low birth weight is more common among adolescent mothers. Marriage at very young age has serious consequences for pregnancy, future survival, health, growth and development. When combined with positive energy balance (adequate energy intake) in later life, LBW increases the risk of obesity, diabetes, high blood pressure and coronary heart disease

10.4 Status of Micronutrients in Bangladesh (Adequacy/Deficiency)

The National Micronutrients Survey 2011-12^{xxvi} collected updated data on the key micronutrients status- such as subclinical vitamin A, anemia, iron, zinc, foliate, B₁₂, iodine and iodization of salts in Bangladesh population.

The prevalence of subclinical vitamin A deficiency, as measured by serum level of retinol was 20.5% in the preschool age children; the prevalence in the slums was significantly higher at 38.1%. The prevalence was 20.9% and 5.4% respectively in the school age children and the NPWL women. The prevalence in the school age children in the slums was 27.1%. Coverage of Vitamin A supplementation at national level is estimated to be around 77.0%. It is 77.9%, 73.1% and 72.4% respectively in the rural, urban and the slums area. The coverage is 76.4% in the “poorest” section and 87.5% in the “richest” section of population (Table-1).

The prevalence of anemia in the preschool age children was 33.1%. It was 37.0% and 22.8% respectively in the rural and the urban strata. The prevalence appeared to be lower than the earlier nationally representative estimates of the country of

47%. The prevalence of anemia in the school age children was 19.1% and 17.1 % respectively in the 6-11 year and 12-14 year groups. The prevalence of anemia in the NPNL women was 26.0%. According to the earlier nationally representative survey it was 33.0%.

National prevalence of Iron deficiency, as measured by estimation of the serum level of ferritin, was 10.7% in the preschool age children. In the NPNL women it was 7.1%. It was 3.9% and 9.5 % in the school age children aged 6-11 year and 12-14 year respectively. The prevalence of iron deficiency in Bangladesh population appeared to be substantially lower than the widely held assumption. The amount of consumption of iron from food is short of the daily recommended requirement (RDA) in all the population groups studied. The total consumption of iron from food was 41.0-82.0% of the recommended daily requirement across age and sex of the studied population groups. The mean ferritin level in the blood in the studied population groups were significantly higher in the areas where ground water iron concentration was higher than in the areas where groundwater iron was lower. In spite of lower consumption of iron from food, iron deficiency in the population was lesser than expected, and it was presumably linked with high level of iron in the groundwater, which is the largest source for drinking water in Bangladesh population (80.0%).

The national prevalence of zinc deficiency was 44.6% in the preschool age children. It appeared to be higher in the slums children (51.7%) than in the urban (29.5%). In the NPNL women the national prevalence was 57.3%, while the prevalence in the slums was 66.4%. The amount of consumption of zinc was well below the recommended daily amount. In the NPNL women total consumption was 54.7% and 47.0% of the recommended daily amount in the urban and slums area respectively. Of the total consumption majority comes from plant origin, which is poorly bio-available.

The B₁₂ and folate status was estimated in the NPNL women. It was the first time the national micronutrients survey has provided a nationally representative data on these deficiencies. The national prevalence of folate deficiency was 9.1%. The prevalence of B₁₂ deficiency was 23.0% at the national level.

The prevalence of iodine deficiency as measured by the proportion of the school age children whose mean urinary iodine concentration was below the cut-off mark was 40.0%. It appeared to have a rising trend from the 2004/5 data when it was 33.8%. In the NPNL women, the prevalence of iodine deficiency was 42.1%, which also has shown a rising trend from the earlier data when it was 38.0%. However according to median urinary iodine concentration, which was above the

cut-off for defining the deficiency, indicated that Bangladesh as a whole on the total population basis was iodine sufficient, despite the fact that the trend in iodine deficiency prevalence was on rise. The median urinary iodine concentration in the school age children and the NPNL women were 145.7 µg/l and 122.6 µg/l respectively. According to asset index, the bottom two quintiles –“poorest” and “poorer” of the NPNL women had median urinary iodine concentration below the 100 µg/l, indicating the impoverished section of the women were iodine deficient.

About 80% of the households used iodized salt, while 57.6% of the households used adequately iodized salt. In the rural stratum, usage of adequately iodized salt was just 51.8%. The national rate of usage of “brand” salt was 75.8%, however a substantial share (30%) of the households in the rural area still used “open” salt. The usage of “open” salt was 37.0% and 17.0% in the “poorest” and the “richest” households respectively. The proportion of retailer salt sample with adequately iodized salt was 66.4%.

Regarding nutritional status in the preschool age children, estimate shows that the prevalence of stunting (height-for-age z-score<2) in the preschool age children was 32.1%. It was worse in the slums (51.1%) than in the urban (31.3%) and rural (31.4%) strata. The prevalence of underweight (weight-for-age z score<2) at the national level was 30.0%. It was more prevalent in the slums (47.4%) than in the other two strata-29.6% in the rural and 28.1 % in the urban area. The prevalence of wasting (weight-for-height z score<2) was 19.3 %, with proportionately more children in the slums (20.3%) and rural (21.1%) area were living with the condition than in the urban strata (12.9%).

In regard to consumption of micronutrients from food, it appeared that although the consumption level of animal source foods have been increasing in the country (Household Income & Expenditure Survey of Bangladesh, 2010), the data of the national micronutrients survey suggested, the population of Bangladesh are still well short of the Recommended Daily Allowance (RDA) of food intake for the key micronutrients. In case of vitamin A, the median daily consumption of vitamin A, were short of the RDA amount for respective age and population groups. The consumption of animal source iron, the form of dietary iron that is readily absorbed in the body was a scant proportion of the total iron consumption. The share of animal source iron to total iron consumption was 23.0%, 24.0% and 18.0% respectively in the school age children, preschool age children and the NPNL women. In regard to consumption of zinc from food, the median daily consumption was 3.2 mg and 2.6 mg in the urban and slums area, against the RDA of 3-5 mg for zinc in the preschool age children, again falling short of the requirement.

Picture of micronutrients and nutritional status in the slums is startling as the slums population have been suffering from the key micronutrients deficiencies and the under nutrition status was higher than the other two strata-urban and rural, in spite of the fact that Socio economic status indicators were not inferior to the rural area.

The survey results show that 52.0% of households at the national level were food secure. The proportion of food secure households appeared to be less in the slums (36.3%), compared with rural (52.4%) and urban (53.5%) strata. Just over 10.0% of households experienced severe food insecurity at national level as well as in the rural and urban area. This proportion appeared slightly higher in the slum stratum (17.2%).

The Table 9.1 shows prevalence of subclinical vitamin A deficiency and zinc deficiency appeared proportionately higher in the slums than in urban and rural strata. Vitamin A supplementation coverage in the preschool age children was 72% in the slums and was not different from the urban (73%) and rural estimates (78%) (Table 9.1). However dietary consumption of vitamin A appeared lower in the slums. According to data shown elsewhere in this report daily median consumption of total vitamin A and animal-origin vitamin A appeared to be lesser in the slums than in the other two strata in all the studied populations. Same observation is holding true with regard to consumption of zinc from food - the seven day consumption of total and animal source zinc appeared to be less in the slums in the preschool age children and the NPWL women (Table -9.1).

Therefore higher burden of malnutrition in the slums is ascribable to the fact that most of the slum dwellers have to pay for rent of their places, which constitutes a significant portion of their spending. Their peers from the rural stratum mostly own their homesteads (homestead ownership: 93.0%-rural, 78.0%-urban and 33.0%-slums) and do not need to pay for houses. The matter of further stress to the slum dwellers is that they live in the expensive metropolitan cities (Dhaka, Khulna, Chittagong and Rajshahi), where cost of living is higher than in the rural strata. Complementing to this, slums households might have experienced more food insecurity. Just 36.0% of the households in the slums were “food secure” against 53.0% in the urban and 52.0% in the rural. Proportions of households having “severe food insecurity” were 17.0% in the slums, whereas in the rural and urban strata this was 12.0 % (Table 13). Therefore in spite of having slightly better spending ability than the rural households, the actual consumable financial ability is limited in the slum dwellers, resulting in inferior micronutrients and nutritional status in the slums population.

10.5 Food Safety and Quality in Bangladesh

An emerging health problem is related to food safety and quality. Food safety involves handling, preparation and food storage in ways that prevent food borne diseases and avoid potentially severe health hazards. It covers all the stages of supply chain-producers, traders and consumers. Food safety considerations include the origins of food including the practices relating to food labeling, food hygiene, food additive and pesticide residues, as well as policies on biotechnology and food and guidelines for the management of governmental import and export inspection and certification systems for foods. In considering market to consumer practices, the usual thought is that food ought to be safe in the market and the concern is for safe delivery and preparation of the food for the consumer.

The food contamination and food adulteration situation of Bangladesh, as observed by WHO, is a serious public health concern. Unsafe/contaminated food causes many acute and life-long diseases, ranging from diarrheal diseases to various forms of cancer. In Bangladesh dependable assessment of the public health impact due to food contamination is not available due to absence of a regular monitoring system. Limited data from the ICDDR,B indicates 501 hospital visits per day for treatment of diarrhea that were attributable to food and water borne causes. General scenario on food contamination demonstrates a widespread non compliance with hygienic practice in food handling both among food producers and food traders such as street food traders.

There is also widespread evidence of food adulteration with harmful chemicals. The chronic effect of such events such as cancer, kidney disorders and birth defects is unlikely to be observed in short term, because the manifestation of the disease only occurs after long-term, low-level exposure. Food contamination and consumers exposure to food hazards have major implication on the food security and consumers health in Bangladesh. Low level of awareness and weakness in existing Food laws and regulation are also contributing to aggravating the country's food safety situation. make it operational in the longer term.

10.6 Stability of Food security

Stability of food security covers stability in food availability, food access, food utilization including nutrition and food safety and quality. Trade is an important instrument to stabilise food supply i.e. check downward movement of consumption and ensure food security. Trade contributes to stability of food supplies through reducing consumption fluctuations and relieving the countries of part of the burden from costly stock holding interventions. Full reliance on trade

may not stabilize prices rather may expose the country to vagaries of instability of price in the global market. Thus government intervention may be necessary to balance the food supply situation all the times depending on the circumstances. The imposition of additional tariffs under certain conditions may be applied for incentivisation to producers for long term food availability from domestic production. Another instrument for stable food supply is to maintain food security stocks at reasonable level depending upon internal and external situation. All year round employment or food safety net or social protection may stabilize the stable food accessibility to all.

11. Challenges and Strategies of Food Security in Bangladesh

11.1 Challenges in the way of Food Security

The challenge of improving food security involves an interdependent set of factors involving government policy and institutions, domestic production system, environment and international trade. The complex of several factors magnifies the challenge of achieving food security: persistent poverty and undernourishment, persistent population pressure, low level of investment in agricultural research and development and changing consumption trends inclined to non-cereal products without adequate technological preparation. There is a high undernourishment of people in Bangladesh and this is a cause of underweight, stunting and wasting of children. Often, the poorest members of society are unable to access food at an affordable price. The country produces and procures from external sources enough calories to meet their nutritional needs, but they frequently lack physical or economic access to food. Barriers include income poverty, inadequate storage and transportation infrastructure, trade barriers, political instability and lack of food safety and quality.

The challenges can be succinctly outlined as:

- i. High Incidence of Malnutrition and Hidden hunger, Increasing population pressure
- ii. Scarcity of land and Continuous Shrinking of Land and water resources
- iii. Land use change
- iv. Land Degradation and Diminishing productivity of land
- v. Poor Agricultural Diversification
- vi. Paradoxical Price setting,

- vii. Price Volatility of Food items in the domestic and global market,
- viii. Disruptions in the food supply chain ,
- ix. Trade Barriers and Uncertainties in international Trade,
- x. Labour Shortage and high wage rate of agricultural labour, .
- xi. Climate Change,
- xii. Agricultural diseases
- xiii. Fossil fuel Dependence
- xiv. Hybridization, genetic engineering and loss of diversity
- xv. Political Malgovernance, Food Sovereignty
- xvi. Limited Capacity to Import due to narrow based exports and instability in foreign exchange earnings from remittances
- xvii. Large number of food insecure population including severely insecure
- xviii. Seasonal variation of food supply
- xix. Locational variation of Food Supply
- xx. Weak governance in food management and weak coordination among agencies in the way of efficient food management
- xxi. Unsafe Food and Low Food Quality-lack of equipment and skilled manpower ,lack of good governance for effective control of quality and safety
- xxii. Unsafe Drinking water and arsenic contamination
- xxiii. High Economic poverty
- xxiv. High underemployment resulting in low accessibility to food
- xxv. Inequality of Income in the society.

11.2 Strategies of Food Security- Self Sufficiency versus Self Reliance

There are two distinct strategies of food security that are followed in different countries depending upon circumstances. They are: food self sufficiency and self reliance There are divergent views regarding the option of self sufficiency and self reliance as strategy of food supply. Paul A. Dorosh^{xxvii} argued that food self sufficiency is not prerequisite for food security. . Increasing role of self reliance would increase the role of trade for food security with consequences of increased global integration. Trade policy of liberalization and investment in stocks may be necessary to pursue this strategy. On the other hand, Uttam Dev and Mahbub

Hossain^{xxviii} asserted that Bangladesh should target food self sufficiency in at least one staple food-rice production. Their arguments for self sufficiency are based on trade uncertainties and protection of producers' interests. Arguments for self reliance are for getting benefits of trade liberalization and from the side of consumer interests in reduced prices because of liberalized imports keeping the prices low or preventing price rise. Paul Dorosh is conscious that pursuance of self reliance strategy may affect the interests of producers. He has suggested for a flexible trade policy to protect the interests of producers and long term food security. At the time of good harvests or steep declines in world prices or high subsidies provided by exporting countries may create disincentives for the producers affecting long term security of the country. There may be justifications for a particular country to pursue food self sufficiency and import restriction of food items to encourage farmers. It is claimed that better choice is flexible policy of self reliance. Import liberalization and trade act as instruments of food security when, self reliance is opted for food security. Following such approach the country need to increase capacity to import through increased export earnings and remittances money to finance food imports. Secondly, there should be confidence on reliability of world market to make supplies in times of crisis. Unreliability crops up with increased incidence of export restrictions imposed by major exporting countries. It is important to note that trade of food items is very thin but demand for purchase is widespread. Although imports at depressed prices may increase food availability may not help food security if it creates disincentive among the domestic producers.

Food security strategy in the short run is determined by domestic production and world food supply and world trade situation. World trade environment is influenced by food supply situation in the global market, the magnitude of import liberalization and restriction, export liberalization and restriction and conversion of food items to other use like bio-fuels and level and volatility of food prices. Bangladesh need to monitor not only seasonal weather and domestic production but also global food supply and trade situation to make a short term strategy in making preparation for any unseen problematic food situation in case of production shortfall and climate crisis. Component wise strategies have been well developed in the Government policy action document. The problem is of proper implement them

11.3 Potential areas of development of Opportunities for Food Security

- i. There is still scope for further increase in rice production through intensification of land use in the vast coastal areas and depressed basins as haor and char land where single crop system dominates. Shorter

maturity crop varieties may be further developed by country's R&D system..The risk in rain fed rice production may be reduced by the diffusion of submergence tolerance, drought tolerance and saline tolerance varieties in adverse agro-ecological environments. There is still scope for further increase of aman cultivation through innovative practices, The government can increase investment to increase capability of research institutions to innovate and develop food crops of high yielding and more healthy varieties. Research and development in both crop and non-crop food production and non-food commercial crops for strengthening physical food accessibility as well as economic accessibility for food security.

- ii. Expansion of employment in non-cereal production like vegetables, pulses, oil seeds and fruits and animal source foods like dairy, poultry and fisheries and in manufacturing activities is possible which may improve food security of the people.
- ii. Expansion of food processing and food preservation activities with effective control of safety and quality with network of laboratory support and extension services by the government across the regions reaching upto farmer level of the country.
- iii. Increased investment in increasing quality of food by giving stress on HACCP and Sanitary and photo sanitary measures for boosting exports and ensuring health of domestic consumers.
- iv. Liberalisation of imports of fruits and grains for food processing enterprises for products oriented to domestic consumption or for exports
- v. Property rights to the farmers in using common property through community based organizations as in fish production in using baor, open water bodies like rivers, plain low fields, canals with extension services from the government agencies. The NGOs may be engaged to see the interests of fish farmers.
- vi. Increased capacity to import food through increased export earnings and remittances from migrant workers..
- viii. Increased investment in technology and skill development for ensuring safe drinking water throughout the country
- ix. Regional variation in food security may be reduced by diffusing technology and knowledge among the farmers and consumers of backward regions.

A comprehensive programme to address hunger would include inclusive and effective interventions in the following areas^{xxix}:

- Promoting food security by sustaining strong growth of domestic food production and implementing a liberalized regime for food imports
- Designing and implementing interventions to promote food security
- Supporting safety nets for protection against natural disasters
- Promoting change in food habits for increasing nutritional intake of vulnerable
- Promoting improved infant feeding practices, including breast-feeding practices
- Supporting maternal schooling and hygienic practices
- Improving access to safe drinking water, especially by addressing the threat of arsenic contamination of underground water
- Improving access to sanitation
- Improving access to basic health facilities
- Promoting partnership among the Government, private sector and NGOs

11.4 Recommendations for sustaining and improving Food Security in Bangladesh

1. All the four pillars of food security (food availability, food access, food utilization and food stability) need to be looked into in integrated way;
2. Efforts need to be made to reduce share of a single crop (rice) and a single season (boro, which accounts for over 60% of rice production) in phases. Share of cereals need to be kept below 60% as per WHO normative. Investments in fisheries, livestock and horticulture need to be scaled up in order to raise productivity and encourage farmers to diversify. Efforts need to be made to remove bottlenecks in development, production and dissemination of seeds resistant to salinity and other ecological stresses and declining groundwater adding to the vulnerabilities.
- 2a. There is a need to stress production of non-starchy food for removing nutritional imbalance and increasing diversity of the food available in the country.

3. Efforts need to be made to reduce deprivation and narrow down inequalities. Measures need to be worked out to address families struggling with unprotected seasonal, idiosyncratic and community-wide risks. The Government's success in rice procurement, storage and distribution needs bolstering with expanded storage capacity and better integration of rice procurement, distribution and trade policies in view of the progress toward self-sufficiency in rice production. Access need to be enhanced by further income and real wage growth, and climate change, declining access to natural resources, vulnerability to price shocks require proactive attention. Regular monitoring need to be stressed to sustain implementation and support coordinated multi-sectoral actions against food insecurity.
4. Simultaneous development of economic and physical access to food need to be addressed for sound food security regime.
5. Government's role need to be enhanced to address the areas of market failure to provide balanced food to all. Government intervention must provide opportunities of employment to able bodied population throughout the year to increase economic accessibility of food . Besides, it has to develop appropriate safety net works for increased accessibility to the disadvantaged and economically excluded.
6. Targeted social safety nets and support for the poorest, focusing on pregnant women, lactating mothers ,infants and adolescents.
7. Strengthen extension services of government in educating the producers, traders and consumers about maintaining food quality, nutrition and food safety in all stages of food supply chain.
8. Policy analysis related to food and nutrition security should go beyond consideration of energy intake and highlight the importance of dietary quality ,safety and nutritional balance.
9. It is crucial to ensure that 'hidden hunger' is adequately addressed for building up healthy population with higher cognitive development. Micronutrient deficiencies cannot be allowed to remain in the shadows when there are ways to eliminate this kind of hunger.
10. Emphasize micronutrient-enriched foods and diet diversity in food assistance interventions, food security and nutritional programmes
11. Policies must be appropriate, adequate, coordinated and connected to each other. Governments should engage health, agriculture, and

education ministries, as well as ministries of planning, finance, and water and sanitation to reach a shared understanding of how national policies will work to reduce undernutrition, including micronutrient deficiencies and improve nutritional balance.

12. Increase access to nutritious foods by endorsing targeted social safety nets and support for the poorest, focusing on pregnant or lactating women, infants under two, and adolescents. Governments must incentivize private sector entities, such as seed and food companies, to develop more nutritious seeds and foods.
13. Enhancement of girls' access to education. Removing gender barriers to learning and literacy can help girls later become more empowered as women. While men control most household income and decision-making, women play a key role in ensuring household food security and fostering the health and nutrition of household members. There is a critical link between a woman's level of schooling and her family's nutritional status.
14. The country needs to define the best set of interventions necessary, considering options such as dietary diversification, fortification, supplementation, biofortification, nutrition education/behavior change, improving access to safe water and quality sanitation, and promoting good hygiene practices.
15. International and national experts should be used with local experts to develop optimal country interventions that maximize coverage and impact, while minimizing costs.
16. This is necessary to create an enabling environment to improve access to and local availability of micronutrient-rich foods. Develop long-term strategies that ensure nutritious foods are available locally. International organizations, the donor community, national and regional governments, as well as the international and national research and extension communities, should invest more in sustainable and diversified productivity increases for a range of foods, such as animal-source foods, fruits, and vegetables, as well as for biofortified staples.
17. Increase support for improved access to local markets and the development of local food processing facilities.
18. There is a need for standardization and regularization of data collection on micronutrient deficiencies. Good policies must be backed by reliable

data: To quantify and track the prevalence of micronutrient deficiencies through time and space, there should be developed standardized cost-effective biomarkers and methods for measuring micronutrient deficiencies.

19. There should be developed a system of cost-effective, and scalable food-based solutions for fighting hidden hunger. Efforts may be made to make food-based interventions, such as homestead food production and biofortification, on target populations. Evidence and best practices have to be continuously disseminated via researchers, nongovernmental organizations, and the media.
20. There is a need for Investment in increasing the number and building the capacity of nutrition and health experts at national and sub national levels, supporting greater coordination and joint interventions across the range of ministries and at lower levels, including between health workers and agriculture extension services.
21. Governments must create an enabling environment that promotes adequate nutrition to promote healthy diets and recommended caring practices and should make effective enforcement and implementation of rules.. The governments must educate consumers about the nutritional value of foods in order to stimulate demand. As consumer demand grows, private sector suppliers will respond. Transparent accountability systems should be installed to control conflicts of interest more systematically and ensure that investments contribute to public health interests. Governments must require companies to communicate nutrition- related information, practices, and performance in a transparent way. There should be enhancement of accountability. Expand monitoring, research, and evidence base to increase accountability.
22. Government intervention should support dietary diversity and strengthen local food systems by building capacity with priority to locals and sustainable solutions to hidden hunger. Measures are needed for nutrition awareness, improved infant and young child feeding, childhood healthy life and adequate hygiene and sanitation. Dietary diversification needs to be increased to reduce micronutrient deficiencies in the country, particularly iron deficiency anemia and vitamin A deficiency.

23. Micronutrient supplementation should be strengthened and food fortification should be promoted, particularly in staple foods.
24. Community based nutrition services should be strengthened considering the intergenerational and lifecycle approach. The institutional setup for multi sectoral coordination needs to be improved.
25. Emphasise 1000 days care to children and mother from the day of conception;
26. Food safety and quality control system need to be developed and existing legislation be updated and enforced. Water and sanitation, especially in urban areas and during disasters, needs to be better assured. Treatment of arsenic pollution need be given special importance for safe drinking water and safe food;
27. Increase effectiveness of the Social Safety Net system and expansion of coverage in areas of high malnutrition and food insecurity;
28. Targeted supplementary feeding with micronutrients for vulnerable groups, Children Under 5's, Under 2's, Pregnant and Lactating Women;
29. Cash transfer interventions and or targeted food assistance accounting for seasonality, and market availability;
30. Support investment in food marketing and storage infrastructure, e.g. warehouses for larger stocks and cold storage in surplus non-cereal food producing areas;
31. Promote accommodative and flexible trade policies, avoid policies that result in unnecessary trade barriers;
32. Invest more on information systems for monitoring and surveillance and early warning for early and timely actions;
33. Address the large numbers of acutely malnourished children with management of acute malnutrition at both facility and community levels;
34. Improve optimal infant and young child feeding practices emphasizing maternal and community participation; and
35. Strengthen health and hygiene promotion to prevent and treat diarrheal disease, respiratory infections and fever.

12. Conclusion

Food security needs to be redefined as a situation where all people have all the time adequate access to safe nutritionally balanced and safe food to satisfy needs with individual [preferences for healthy and active life. Food availability though was a prime concern historically; hunger and famine are found to exist along with food adequate food availability. For food security, there is need for access to food and effective utilization through nutritionally balanced intake of proper safety and quality and with freedom from diseases ensured by health facilities and sound cultural practices. Food security is better to be renamed as nutritional food security. Food security involves not only security in terms of ensuring macronutrients but also in terms micronutrients to the people with particular focus on women and children for healthy and active life. The fact of hidden hunger related to micronutrient deficiency need to be placed in the forefront for the sake of cognitive development of the society.

Data base need to be strengthened to cover details of calorie intake, protein, fats, vitamins and minerals including water. Monitoring progress on food security and nutrition and timely intervention should be of constant concern of the government.

There is a need of comprehensive composition table for indicating balanced nutrition to guide the policy makers and the people for conscious decision making on food intake for healthy life We have proposed a set of indicators in four pillars of food security, namely, in food availability, food access, food utilization and food stability for monitoring the progress of food security in a comprehensive frame. The proposal of the set of indicators of food security is in modification of the ones designed by FAO. We have worked out a composition table for Bangladesh as standard and normative for balanced nutrition of food intake.

Food availability is deficient in non-cereals and animal soured food and in surplus in rice and potato-two important starchy food items. There is a self sufficiency of food in starchy food except wheat. There is a large import dependency in non-starchy food items. Food like fruits, vegetables and eggs and meat are nearer to self sufficiency. Food items like wheat, pulses and vegetable oil are far from self sufficiency.

There is a large nutritional imbalance in food take reflected in deficiency of food intake relative to normative of consumption requirements. Thus food security is not only of quantity of food intake but also of its composition. Carbohydrates are taken larger than required and Protein and fats are taken less than the required

quantum. Additionally, deficiency of micronutrients in food intake is large making the hidden hunger a big concern for health and nutrition of the population of Bangladesh.

Bangladesh has been suffering from triple burden of food insecurity. Its population has been suffering from malnourishment because of poor food intake. It is facing problem of underweight and at the same time facing overweight. Helping emergence of large incidence of non-communicable diseases like cardiovascular diseases and diabetics. Added to this, there is micronutrient deficiency which acts as hidden hunger obstructing cognitive development of the people.

Government efforts are outlined in food policy document and action plan. The need is proper implementation. Ensuring food safety and quality has become a serious concern affecting the intake of nutritious food. Safe drinking water is immediate concern for the government intervention.

Principal challenge for food security is huge population to be fed out of a tiny size of land area constantly shrinking for increasing use of non-agricultural activities and facing vulnerability to frequent climate change disaster. Potentials for raising productivity need to be explored in preference to acreage expansion, This needs increased investment in research and development and increasing extension services at farmers' level.

There is scope for expanding area where aman, pulses, fruits and vegetables can be more grown. It is notable that aman is non-competitive crop and its acreage expansion will not hamper other crops. Again, quality and price of aman is higher relative to other rice crops.

There is likelihood that there will be sizeable exportable surplus of rice and potato in near future because of lesser per capita consumption of rice with increased income. Both import and export can occur in rice because of seasonal fluctuation of its production and variation of global trade opportunities

Government require to make increased investment in storage facilities for rice and cold storage facilities for potato, fish, meat and eggs, For maintaining quality, quicker and cheaper transport facilities need to be built up. Standard institutions and inspection network need to be strengthened to ensure food safety. Trading corporation of Bangladesh need to be strengthened for year wide distribution of food essentials at a cheaper price. Social protection and public distribution system need to redesign to provide comprehensive food security to the people as a matter of constitutional obligation of the government.

Interests of the producers in farming and processing food items need to be protected and promoted through providing monetary and fiscal incentives, technical assistance and extension services, Since demand for food specially for non-starchy food will increase in future related to increased income, investment in development of skill., technology and infrastructure for production, storage and distribution of these food items need to be developed with a special focus.

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