Situation of Household Food Security in the Context of National Scenario: A Case Study on Three Northern Districts of Bangladesh

Md. Elias Hossain*
Tithy Dev*
Md. Khairul Islam*

Abstract: *Improved food security is considered to be instrumental for reducing hunger, improving human health and enhancing economic development in the developing countries. However, it is mostly considered at national level in these countries, although food security at the national level does not necessarily ensure food security at household level. The objective of this study is to investigate the food security status at both national and household level focusing on the rural areas of the Northern Bangladesh. In analyzing food security at national level, three components- availability and access and utilization of food, are analyzed briefly using aggregate data obtained from secondary sources. For analyzing food security at household level, survey data on rural households from three northern districts are used. Food security indices for both national and household levels, and other conventional statistical attributes were calculated and comparative analysis between national and regional level have been done. It is found that, Bangladesh has achieved food self-sufficiency at national level through domestic production, imports and food aid but scenario of household level is different. It is found that there is difference between per capita daily availability of food grain at national level and that consumed at household level. Actual food expenditure was found to beless than required food expenditure and at the household level, from district wise analysis, it is found that food access gaps differed among the sample districts- Rajshahi, Natore and Naogaon. It is observed that Bangladesh has achieved just threshold level food security in 2010, as shown by the food security index value of 1.02, although the calorie intake differed between rural and urban people. The mean value of food security indices is 0.979 in the study area, whereas the individual values are 0.942, 0.996 and 0.999 for Natore, Rajshahi and Naogaon districts. This pattern is different from the food secure and food*

* Professor, Department of Economics, University of Rajshahi, Rajshahi-6205, Assistant Professor, Department of Economics, University of Rajshahi, Rajshahi-6205 and Lecturer, Department of Economics, University of Rajshahi, Rajshahi-6205

insecure households for the sample households.

Keywords: Food Security, Bangladesh, National and Household Level, Northern Bangladesh.

1. Introduction

Despite growing abundance of food in several countries of the world, food related crises are frequently occurring in many developing countries. Improved food security is important in these countries for reduction of hunger, improvement of human health and promotion of economic development. According to a study published in 2012, about 820 million people are affected by hunger in the developing countries and the number of hungry people in the world is growing at an alarming rate, and the trend is not falling quickly enough to achieve the goal of food security particularly in African and Asian countries(von Braun,2012). Food security is a complex issue and its definition has evolved over time as it has number of dimensions that go beyond production, availability and demand for food. Although initially food security was taken as a global concern related to volume and stability of food supplies, recent views on food security are

different.In 2002, FAO again held that food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life(FAO, 2002).

There are three major components of food security such as food availability, food access and food utilization, which are hierarchical in nature. However, food availability is necessary but not sufficient for food accessibility and access is necessary but not sufficient for utilization (Omonona and Agoi, 2007; Kuwornuet al., 2013).Food availability is a function of the combination of domestic food stocks, commercial food imports, food aid and domestic food production as well as the function of underlying determinants of each of these factors. Food availability refers to the existence of food stocks for consumption at both household level and aggregate (regional and national) level. Food access is influenced by the aggregate availability of food through the impact of the latter on supplies in the market and on market prices (Omonona and Agoi, 2007).Food access is determined by physical and financial resources, as well as by social and political factors. Food utilization which is typically reflected in the nutritional status of an individual is determined by the quantity and quality of dietary intake, general childcare and feeding practices, along with health status and its determinants(Omonona and Agoi, 2007; Kuwornu*et al*., 2013).

At the national level, food security means availability of sufficient stocks of food to meet domestic demand, and at the household level, it means that all members of the household have access to the food. An individual may consume food from their

own production or they buy it from market or they may receive from the government's transfer payment programmes. In this viewpoint, Bangladesh has achieved food security at national level but at household level the country has not achieved food security in terms of access to food (Clay et al., 1988). The country experienced famine in 1974 due to the destruction of infrastructure during the liberation war against Pakistan in 1971 and successive natural disasters which caused reduction in rice and other crops production. In view of that experience, long run food security and achieving self-sufficiency in rice production was an important policy issues of Bangladesh government (Doroshet al., 2004). According to a report of the ministry of food, by the end of the 1990s food grain production in Bangladesh has exceeded the target requirements based on 454 gram per person per day. However, food security has not been achieved yet now and the progress that has been achieved was found difficult to sustain because of growing pressure of population in the context of extremely scarce natural resources. Moreover, Domestic food grain production of Bangladesh remains vulnerable due to floods, droughts and other climatic change events which may continue to cause production shortfalls and inadequate food availability. Increases in cereals production have not been accompanied by significant increases in availability of other foods (Hossain*et al*., 2005).

Poverty and food security are intertwined as poverty is considered as the major cause of food insecurity in the country.The incidence of poverty, as measured by the headcount ratio, is 31.5% in 2010. Over the 1984-2010 periods, total population increased by about 52.0 million and the number of rural poor stood 38.7 million in 2010. The number of urban poor, however, increased by 2.0 million over the same period (BBS, 2011). The persons who are living in chronic poverty are most vulnerable nutritionally. The incidence of absolute poverty (in terms of percentage of total population with less than 2,122 kcal/person/day) was 40.4% in 2005 (BBS, 2005) while the incidence of hardcore poverty (with less than 1,805 kcal/person/day) increased during the late eighties (1988-89) and is remained as 20% in 2010. However, food security is tried to be achieved by increasing the production of rice both by employing modern agricultural technology as well as by increasing the area under rice production in Bangladesh. Some time efforts and policies to expand production of other cereals were also taken. The rapid expansion in the production of cereals was partly achieved through reductions in area for production of pulses, oilseeds and sugarcane. Pulses and oilseeds are important sources of protein and micronutrients, especially for the poor. The decrease in the production of these crops has had adverse impact on nutritional balance among the people. There has been perceptible decline in the production of pulses and sugarcane, and somewhat of oilseeds. The productions pulses, oilseed and sugarcane have either remained stagnant or has declined. The production of oilseeds has picked up in recent years due to favorable prices, some progress in the development of higher yielding varieties. The dependence of Bangladesh on the world

market for the availability of pulses, edible oil and sugar and milk has been grow-ing.

Despite the impressive gains in increasing domestic food grain production, prob-lems of food and nutrition security still remain. Bangladesh is yet to achieve com-prehensive food security that resolves the problems of inadequate food intake and chronic malnutrition among those who are poor and vulnerable. Addressing these problems satisfactorily would not only require rethinking of strategies and policies to promote food security in the country but also require decisive actions by all stakeholders- the government, the NGOs, the private sector and individual house-holds. In fact, ensuring food security through physical availability and economic access to food would continue to be a major challenge for Bangladesh in the coming years. To meet these challenges, an integrated strategy encompassing major aspects of comprehensive food security namely, (a) adequacy of food supply through increased domestic production and imports (b) access to food through public distribution and expanded safety net programs and (c) improved food utilization and nutrition is required.

As food insecurity has multidimensional interrelationship with development issues,ensuring food security for population in the country is a crucial step of development policy. So, the issue of food security in Bangladesh needs to be studied with great care. Therefore, the main objective of the present study is to analyze the food security status of Bangladesh at national level in terms of avail-ability, access and utilizationas well as at household level focusing of food intake in relation of calorie and protein received by people in the rural areas.

The paper is organized as follows: giving an introduction on the research issue, the paper provided a literature review in Section 2. The methodology is presented in Section 3. Section 4, discusses the results of the study and Section 5 provides the conclusion.

2. Literature Review

In this paper has reviewed several studies, which have dealt with different aspects and issues of food security. Most of the study are found to have focused mainly on measuring the status and level of household food security, and investigating the determinants of food security (Babatunde*et al*., 2007;Hossain and Rashid, 2009; Ahungwa*et al*.,2013; Iorlamen*et al*.,2014; Omonona*et al*., 2007; Hossain*et al*., 2005; Kuwornu*et al*., 2013; Khan and Gill, 2009; Sultana and Kiani, 2011; Kazal*et al*., 2010) while some others dealt with other related aspects of food security(Chowdhury, 2009; Rahman and Islam, 2012; Salam et al., 2009). Moreo-ver, food security in Bangladesh is one of the important issues to be analyzed com-prehensively by different researchers.

Babatunde*et al*. (2007) investigated the factors influencing food security status of rural farming households in Kwara State of Nigeria. Using the calorie intake

approach, they found that 36% and 64% households in the study area are food secure and food insecure, respectively. They estimated a Logistic regression model which found that total annual income, household size, educational status of household heads and quantity of food obtained from own production are the significant factors of food security status of farming households in the study area. Hossain and Rashid (2009) explained that the food security status of marginal farmers of a village under Basailupazila in Tangail district of Bangladesh. They found that marginal farmers obtained much lower per hectare yields of modern variety of Boro (4940 kg./ha.) due to financial capital constraint compared to the yield achieved by well-to-do farmers (6175kg./ha.). This has significant impact on the food security of the marginal farmers of that village.Ahungwa*et al*. (2013) examined the food security status of farming households in Benue State of Nigeria. The study assessed the socio-economic characteristics of the households using descriptive statistics and it measured the household food security status using the 'food security index' followed by the FAO benchmark of 2500 kcal per capita per day. They profiled the households into food secure and food insecure where 36.67% were food secure while 63.33% were food insecure. Iorlamen*et al*. (2014) assessed expenditure on food among urban households in Benue State of Nigeria. The study found that 67.3% of the households were food secure while 32.7% were food insecure.The study revealed that size of household, income of the household head and price of food commodities are major factors influencing household food demand decisions in the study area. Omonona*et al*. (2007)analyzed the food security situation among the urban households in Nigeria. They found that food insecurity incidence for the study area is 49%. Using regression model they found that food insecurity incidence increases with increase in age of household heads, household size and dependency ratio. The study also revealed that food insecurity incidence is higher in case of female-headed households than male-headed households and food insecurity incidence decreases with increase in level of education and household income.

Kuwornu*et al*. (2013) examined the food security status of farming households in the forest belt of the Central Region of Ghana. The study revealed that 60% farming households in the study area are food insecure. The binary logistic regression results revealed that an increase in household's income, having access to credit as well as increase in the quantity of own farm production may have the probability of improving the food security status of farming households in the study region. Khan and Gill (2009) examined the determinants of three aspects of food security in rural areas of Pakistan, i.e. food availability, accessibility and absorption. For that purpose a series of models applied on district level data of rural areas of Pakistan. The study found that the production of wheat, rice, maize, pulses, oilseeds, poultry meat and fish at the district level is found to affect food availability positively. They also found that all the district except of Sindh are more probable to be food insecure in availability and electrification and adult literacy emerged as

the factors having negative effect in the food accessibility. Sultana and Kiani (2011) examined the determinants of food security in Pakistan using a logistic regression technique. They found that three factors are statistically significant with expected signs. The analysis found that place of residence (urban) has a significant and negative effect on household's food security status. Dependency ratio has a significant impact on food security and has expected sign that is negative. Level of education of household's has also significant and positive impact on food security status of household. While social capital and employment do not effect household's food security.

Kazal*et al*., (2010) analysized the determinants of food insecurity and formulated the strategies to overcome the food insecurity problem obtaining in the haor area in Bangladesh. They used descriptive and inferential statistical tools and techniques to measure household's food security condition and socio-economic condition, to determine the predictors of food insecurity using both multiple binary and logistic regression models. The results found that the decrease in landholdings increase the risk of food insecurity very significantly irrespective of scale and the level of education of the household head also shown similar trend. Hossain*et al*. (2005) examined the progress of food and nutrition security in Bangladesh. The study also found that 40% population live below the poverty line and income inequality has been worsening which affect food production, availability of food and their impact on nutrition outcomes. Chowdhury (2009) investigated physical and economic access to food by households in rural Bangladesh The study revealed that even though 75% food production comes from the rural areas, due to landlessness and some associated factors, the small and marginal farmers in the rural areas are still deprived from their access to food. Rahman and Islam (2012) explored the nutritional status and food security of farm households under different land use patterns in Bangladesh. The study revealed that households of alternate shrimp and rice farming consumed the highest amounts of food followed by year round shrimp farming whereas the highest per capita calorie intake was observed in households of alternate rice and wheat production. Talukder (2005) studied food security and food self-sufficiency status of Bangladesh. He found that although aggregate and per capita food availability in the country have increased over the years, resulting from increased domestic production and improved food management about 40% people live below the absolute poverty line defined by food intake of 2122 kilo calorie per person per day. Salam et al. (2009) explained that self sufficiency in food production in Bangladesh is considered as an important strategy of the government. They concluded that it is necessary to adopt high yielding varieties and others modern agricultural technology which will increase the productivity of existing land. Thus, the increase in production will help ensuring food security of the country.

From the review of available literature it is found that the existing studies are

focused on different issues of food security and the methods of analysis have also varied from study to study. Most of the studies carried out in the context of Bangladesh have analyzed the food security situation at national level using production, import and aid based data of food grains and studies of food security at household are rare. From regional perspective, food security situation of the northern part of Bangladesh, which is a relatively backward region as considered by the economists, has hardly drawn any attention by the researchers. Considering these, it is necessary to investigate the food security situation at household level in the Northern part of Bangladesh.

3. Methodology

The study is based on primary and secondary data. The required national level data have been collected from secondary sources such asvarious issues of Bangladesh Economic Review, the Household Income and Expenditure survey and other related publications. The primary data are collected from the households of three northern districts- Rajshahi, Natore and Naogaon, of Bangladesh using multistage sampling procedure to select the respondents for the survey. Collected data have been analyzed through simple mathematical and statistical techniques. With a view to fulfilling the objectives of the present study of determining the food security status and drawing a comparison among the different households belonging to different living standard and different socioeconomic characteristics, the sample has been selected in such a way that it covers all such households. For assessing food security status of Bangladesh at national level the situations on aggregate availability of food, access to food by households and utilization of food by households in terms of protein and calorie intakes are analyzed based on secondary data. A comparison of individual level scenario is also provided in this connection. To investigate food security status at household level, the researchers have used food security indices for the households and comparisons are made between food secure and food insecure households.

A two step procedure suggested by (Keenan, 2001; Coates, 2006) is followed to construct a food security index such as identification of the minimum level of food necessary to maintain a healthy life and this is known as the food security line which is 2280 kcal, and aggregation of household's information to derive the food security statistics for the households. The household daily calorie intake is obtained from the questionnaire and from there the quantity of food consumed by the household is estimated in the 7 days period. The quantities are converted to gram and the calorie content is estimated by using the nutrient composition table of commonly eaten foods in Bangladesh (GoB, 2005; BIDS, 1997).

3.1 Food Security Index

For measuring food security status of households two methods have been widely used in earlier studies (Maxwell, 1996). The first method was used by Omonona

and Agoi (2007) or expenditure method. The index that was used by Omonona is: Food security = (food expenditure of ith household ÷ two-third of the mean per capita food expenditure of all study households). The second method was used by Fakiyesi (2001) and Olayemi (1998) or calorie intake method. Daily calorie intake method is better than food expenditure method because daily calorie intake method represents the actual food consumption pattern of households. Therefore, this study used the daily calorie intake method. Food security status of each household is measure based on the food security line using the daily calorie intake recommended by FAO (2005). The average daily calorie requirement for a moderately active adult is 2850 kcal and a safe minimum daily intake should not fall below 80% of the above calorie requirement, which means that the minimum intake should be about 2280 kcal per adult equivalent per day. This food security line is used in this study after converting of all household members into adult equivalent unit (May, 1996; Swindale, 2005). The formula for converting all household members into adult equivalent is as follows.

$$AdE = (A + 0.5C)^{0.9} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where, AdE= adult equivalent unit, A = number of adults above the age of 15 years, and

C = number of children below the age of 15 years in a household,

Weekly per capita calorie is calculated by dividing estimated total household calorie intake by the family size (all adult equivalent) and to get the household's daily per capita calorie intake we divided the household's per capita calorie intake by seven (Babatundeet al., 2007). A household whose daily per capita calorie intake is at least 2280 kcal is regarded as food secure, while those with less than 2280 kcal are food insecure. The food security index as applied in Fakiyesi (2001) is given by the formula as

$$F_i = Y_i / R \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where, F_i = Food security status of ith household (food security index of the ith household)

Y_i = Daily per capita calorie intake of the ith household, and

R = Recommended per capita daily calorie intake (2280 kcal per day per adult equivalent).

When, $F_i \geq 1$, the ith household is regardedas food secure [$Y_i \geq R$]

$F_i < 1$, the ith household is regarded as food insecure [$Y_i < R$]

Speaking other way, a food secure household is that whose daily per capita calorie intake is above or on the recommended per capita daily calorie intake line. On the other hand, a food insecure household is that whose daily per capita calorie intake

falls below the recommended per capita daily calorie intake line.

Based on the calculated Fi values, another related measures is also calculated such as head counts of food secure households following the formulae given in FAO(2005).The head count ratio measures the fraction of foodsecure households to total study households. A household may consume more or less than recommended calories which is necessary to lead a healthy life.

4. Result and Discussion

4.1 Food Security in Bangladesh at National Level

National food security is used to describe whether a country has access to enough food to meet dietary energy requirements of her citizens. To some it connotes self-sufficiency, which means a country produces enough food to meet its population's demand. National food security measures the extent to which a country has the means to make available to its people the food needed or demanded, irrespective of whether the food is domestically produced or imported (Kuwornuet al., 2013).

4.1.1 Food Availability: Major Food Items

Availability of food is determined by domestic production, external trade and the efficiency of distribution through market and other channels (Devet al., 2014). At the national level food security means the availability of sufficient stocks of food in the country to meet domestic demand and at the individual level. It means that all members of the society have access to the food they need, either from their own production, from market and/or from the government's transfer mechanism. However, when the national level food security is achieved, in terms of food availability, individuals and groups in the country can face the food shortages because they do not have the means to access to food. The availability of food at national level in Bangladesh is shown in Table 1.It is found that Bangladesh has made steady progress in the expansion of domestic food production. The net production of food grain has increased from 24 million metric ton in 2004 to more than 30 million metric tons in 2013 from Table 1. We know when population increases, food demand also increases. As a result, consumption requirement for food grain is 25.81 percent higher in 2013 compared to 2004.

Table 1: Food Grain (Rice and Wheat) Availability and Requirement in Bangladesh ('000'metric ton)

Year	Net Production	Food Requirement	Food Gap	Private Import	Public Distribution	Internal Procurement	National Availability	Per Capita Availability(g ram/day)
1	2	3	4=2-3	5	6	7	8=2+5+6-7	9
2004	24698	22682	2016	2480	987	843	27322	544
2005	23520	24949	-1429	2982	1367	899	26970	529
2006	24539	25309	-770	2265	1245	945	27104	524
2007	25250	25686	-436	2209	1480	1140	27799	529
2008	26202	26046	156	2916	1329	1217	29230	549
2009	28306	26391	1915	2217	2129	1483	31169	578
2010	29179	26717	2462	2899	1964	805	33237	608
2011	30371	27058	3313	3109	2293	463	35310	638
2012	30617	27355	3262	1138	1667	1114	32308	578
2013	30885	28537	2348	1418.7	2090	1404.8	32988.9	588

Source: BBS and unpublished data from FPMU, Ministry of Food, GoB.
Food requirement (per capita intake) has been calculated 489gm thereafter

However, it is found that in recent years total private import has decreased drastically. As is seen from Table 1, the volume of private import in different years did not follow any specific trend. The total public distribution of food grain has increased from 0.98 million metric ton in 2004 to more than 2.09 million metric tons in 2013. However, it is found that internal procurement has been increased significantly in recent years.Net national food availability increased from about 27 million tons in 2004 to more than 32.0 million tons in 2013. And per capita per day availability (gram) also rose from 544gm to 588 gmwhereas per capita food grain requirement is 489 gm (MoFDM, 2012). Thus, per capita food availability has also increased in this period despite increase in population. This growth in production has been achieved through expansion of irrigation facilities, spread of modern varieties and increase of cropping intensity.

4.1.2 Self Sufficiency Level of Major Food Items in Bangladesh

The core food items in Bangladesh are rice, wheat, pulses, edible oil, potato, fish, milk, meat, vegetables etc(Muzaffar, 2009).Self sufficiency level of food items is an important indicator in ensuring food security at national level.For Bangladesh food security is synonymous with achieving self-sufficiency in rice production and stabilization in rice prices. However, domestic food grain production remains susceptible to floods and droughts thereby perpetuating the threat of major production shortfalls, inadequate food availability, and vulnerability from fluctuation in prices. The availability of other foods has not increased, and the progress in nutritional outcome has remained slow. The level of self sufficiency of major food items (food grain, potato, pulses, oil seeds, vegetables, fish, meat, milk, fruits and sugar) of Bangladesh are presented in Table 2.

Table 2: Self Sufficiency Level of Major Food Items in Bangladesh ('000'metric ton)

Food Items	2012			2010			2008		
	Net Produc-tion	Food Require-ement	SS Level	Net Produc-tion	Food Requirement	SS Level	Net Produc-tion	Food Requirem-ent	SS Level
1	2	3	4=2/3	5	6	7=5/6	10	11	10/11
Food Grain	30617	27355	111.9	29179	26717	109.2	26202	26046	100.6
Potato	74.03	41.38	178.9	72.21	39.92	180.9	59.78	39.40	151.7
Pulses	2.16	6.13	35.24	1.99	5.91	33.67	1.85	5.83	31.73
Oil Seeds	4.04	30.65	13.18	3.4	29.57	11.50	5.78	29.18	19.81
Vegetables	21.33	25.28	84.38	20.08	24.39	82.33	18.37	24.07	76.32
Fish	29.60	73.56	40.24	26.19	70.97	36.90	23.13	70.04	33.02
Meat	21.29	18.39	115.8	11.44	17.74	64.49	9.4	17.51	53.68
Milk	31.59	88.89	35.54	21.35	85.75	24.90	23.9	84.63	28.24
Fruits	29.66	30.65	96.77	32.14	29.57	108.7	29.34	29.18	100.6
Sugar	6.24	30.65	20.36	5.6	29.57	18.94	14.78	29.18	50.65

Source: Own Calculations using data from BBS

From Table 2 it is observed that in food grain, potato and meat production Bangladesh have achieved self sufficiency level whereas in fruit and vegetables production near sufficiency level is achieved in 2012. However, In case of pulses, oilseed, fish, and milk and sugar production our self sufficiencylevel are on critical level in these years. Food grain, pulses, vegetables and fish production gradually increased while meat production has sharply increased at the sufficiency level but sugar production has decreased continuously from 2008 to 2012.

4.1.3 Food Access: Food Expenditure Scenario of Bangladesh

Food access depends upon income available to the households, on the distribution of income within the households and on the price of food. The sources of income and their reliability for a steady flow and reliable amounts are important to individuals and households for ensuring food. During the last fifteen years the monthly household expenditure has risen at national level and this has increased both in rural and urban areas. The household expenditure has scaled up mainly due to the higher food expenditure. The food expenditure scenario in Bangladesh at the national level and rural- urban level is shown in Table 3.

The food expenditure has climbed up from Tk2477 to Tk 6030 at national level, Tk 2299 to Tk 5542 in rural areas and from Tk 3174 to Tk 7361 in urban areas during the period of 2000 to 2010 in Bangladesh. However, food expenditure has increased at a faster rate than that of income. During the period of 2000 to 2010, the monthly household income has increased with a growth rate of 18.20%. At the same time, the monthly household food expenditure has risen with a growth rate of 19.72%. From Table 3 it is also found that at the national level, actual food expenditure did not exceed the required food expenditure in different years. This means there is a problem of access to food in the country although the access gap is gradually declining. This pattern is almost same at both rural and urban level but access gap of the urban level has quickly been declining than rural level.

Table 3: Food Expenditure Scenario in Bangladesh (Tk)

Year	Average Household Income	Average Household Expenditure on Food (%of average household income)	Required Per Capita Food Expenditure Per Day	Household Size	Required Food Expenditure of the Household Per Month	Gap/Surplus of Food Expenditure	Access Gap in %
				National			
1	2	3	4	5	6=(4*5)*30	7=3-6	7/6*100
2000	5842	2477(35.90)	27.50	5.18	4273.5	-1796.5	-42.04
2005	7203	3209(44.55)	33.00	4.85	4728.75	-1519.75	-32.14
2010	11479	6030(52.53)	52.37	4.50	7069.95	-1039.95	-14.71
				Rural			
2000	4816	2299.85(47.75)	27.50	5.19	4281.75	-1981.9	-46.29
2005	6095	3023.59(49.61)	33.00	4.89	4841.1	-1817.51	-37.54
2010	9648	5542.71(57.45)	52.37	4.53	7117.08	-1574.37	-22.12
				Urban			
2000	9878	3174.19(32.13)	27.50	5.13	4232.25	-1058.06	-25.00
2005	10463	3755.89(35.90)	33.00	4.72	4672.8	-916.91	19.62
2010	16475	7361.50(44.68)	52.37	4.41	6928.55	-432.95	-6.25

Source: Author's own calculation using BBS data

4.1.4 Division Wise Food Expenditure Scenario of Bangladesh

Food expenditure by the households differs across regions in Bangladesh. Division wise actual food expenditure scenario in Bangladesh is shown in Table 4. It is found that food expenditure scenario is not similar in all divisions because the income and other socioeconomic characteristics of households in all divisions are not similar.

From Table 4 it is observed that at the national level required food expenditure of households per month was Tk 7069. Food expenditure gap was Tk 1039 and access gap was 14.71% in 2010 in Bangladesh. Table 4 shows that the average household size in Sylhet division was 5.50 persons in 2010 whereas this was 4.26 and 4.15 in Khulna and Rajshahi divisions, respectively, in the same year.

Table 4: Division Wise Food Expenditure Scenario of Bangladesh (Tk)

Food Consumption Indicators	Year		
	2000	2005	2010
Barisal			
Household Size	5.44	4.97	4.56
Required Food Expenditure of the Household Per Month	4488	4920.3	7164.22
Gap/Surplus of Food Expenditure	-2011	-1711.9	-1134.22
Access Gap in %	-44.81	-34.79	-15.83
Chittagong			
Household size	5.86	5.42	4.97
Required Food Expenditure of the Household Per Month	4834.5	5365.8	7808.37
Gap/Surplus of Food Expenditure	-2357.5	-2156.8	-1778.37
Access Gap in %	-48.76	-40.20	-22.78

Dhaka			
Household Size	5.00	4.69	4.39
Required Food Expenditure of the Household Per Month	4125	4643.1	6897.13
Gap/Surplus of Food Expenditure	-1678	-1434.1	-867.13
Access Gap in %	-40.68	-30.89	-12.57
Khulna			
Household Size	5.07	4.71	4.26
Required Food Expenditure of the Household Per Month	4182.75	4662.9	6692.89
Gap/Surplus of Food Expenditure	-1705.75	-1453.9	-662.89
Access Gap in %	-40.78	-31.18	-9.90
Rajshahi			
Household Size	4.77	4.53	4.15
Required Food Expenditure of the Household Per Month	3935.25	4484.7	6520.07
Gap/Surplus of Food Expenditure	-1458.25	-1275.7	-490.07
Access Gap in %	-37.06	-28.45	-7.52
Rangpur			
Household Size	-	-	4.28
Required Food Expenditure of the Household Per Month	-	-	6724.31
Gap/Surplus of Food Expenditure	-	-	-694.31
Access Gap in %			-10.33
Sylhet			
Household size	-	5.57	5.50
Required Food Expenditure of the Household Per Month	-	5514.3	8641.05
Gap/Surplus of Food Expenditure	-	-2305.3	-2611.85
Access Gap in %		-41.81	-30.23

Source: Own calculation using data from BBS and GoB (2005)

The required food expenditure of households in Sylhet division per month was Tk 8641 in 2010 which was Tk 6520 in Rajshahi division and Tk 6693 in Khulna division. The food expenditure and access gap in Sylhet division were 2612 and 30.23% respectively. This rate was 490.07 and 7.52% in Rajshahi divisions, 662.89 and 9.90% in Khulna division. These figures were higher in Sylhet followed by Chittagong, Barisal, Dhaka, Rangpur, Khulna, and Rajshahi Divisions.

4.1.5 Food Utilization: Per Capita Food Intake Per Day in Bangladesh by Items of Food

The final pillar of food security is food utilization, refers to ingestion and digestion of adequate and quality food for maintenance of good health. In order to achieve food security, the food ingested must be safe and must be enough to meet the physiological requirements of each individual. Per capita food intake per day is essential to ensure nutritional requirement of body. Intakes of food according to food items by the households per capita per day for the year 2010 have been presented in Table 5.

Table 5: Per Capita Food Intake Per day in Bangladesh in 2010 (gram)

Food Items	Average Consumption			Required Food Intake
	National	Rural	Urban	
Rice	416.01	441.6	344.20	421
Wheat	26.09	23.3	33.6	40
Pulses	14.30	13.2	17.2	40
Potato	70.30	71.5	66.7	27
Vegetables	166.10	170	155.0	150
Edible Oil	20.50	18.3	26.6	20
Fish	49.5	45.8	59.9	48
Meat	19.07	14.07	33.3	12
Egg	7.20	5.80	10.9	50
Milk &Milk Product	33.72	31.8	39.2	58
Fruits	44.7	42.6	50.4	20
Sugar/Gur	8.40	7.4	11.3	20
Total	875.89	885.37	848.3	906

Source: Own calculations using data from BBS,2012

Table 5 reveals the detailed explanation of food consumption by households considering major food items. Rice is the main food item and average per capita per day intake of rice was 416.01 gm in 2010 in Bangladesh, which was 441.6 gm in rural areas and 344.20 gm in urban areas. The second important food item was observed to be vegetables and the consumption rate was about 166.10 gm per capita per day at the aggregate level. The next important food item was potato followed by fish, fruits, edible oil, wheat, meat, pulses, sugar, and egg.

4.1.6 Per Capita Calorie Intake of Households in Bangladesh at National Level

Food energy intake is measured by the unit of kilo calorie. Every food item has its own calorie value and these are different from each other. Total calorie intake is derived from total consumption of food for all food items and is presented in terms of per capita per day basis. Average daily per capita intake of calorie for all food items is shown in Table 6.Improving availability of and access to food are necessary but not sufficient conditions to ensure that people will be secured with food for leading an active and healthy life.

Table 6:Per Capita Calorie Intake of Households in Bangladesh

Year	National		Rural		Urban	
	Calorie Intake(kcal/cap/day)	Food Security Index	Calorie Intake(kcal/cap/day)	Food Security Index	Calorie Intake(kcal/cap/day)	Food Security Index
2000	2240.3	0.982	2263.2	0.992	2150	0.942
2005	2238.5	0.981	2253.2	0.988	2193.8	0.962
2010	2318.3	1.02	2344.6	1.03	2244.5	0.984

Source: Own calculations using data from BBS

The overall average daily per capita calorie intake by households was observed to be 2240.3 kcal in 2000 which increased to 2318.3 kcal in 2010. It is also found that

the statistics of the food security status at the different levels is shown in Table 6. The value of food security index is 1.02 (above the threshold of 1) at the national level that is found to be food secure in 2010. The value of food security index of the rural level is also found to be 1.03 (above the threshold of 1) and the value of food security index of the urban level is found to be 0.98 (below the threshold of 1) in 2000.Using the food security index measures at national level we are just food secured on the average since 2010 compared to earlier years. The studies showed that calorie intake was relatively higher for the rural people compared to urban people.

Table 7: Per Capita Calorie *vis a vis* Protein Intakes of Households in Different Survey Years

Survey year	Calorie intake(kcal/cap/day)			Protein intake(gram/cap/day)		
	National	Rural	Urban	National	Rural	Urban
2010	2318.3	2344.6	2244.5	66.26	65.24	69.11
2005	2238.5	2253.2	2193.8	62.52	61.74	64.88
2000	2240.3	2263.2	2150.0	62.50	61.88	64.96

Source: BBS, 2012

Along with calorie people also receive protein from consuming different items of food. Per capita calorie vis-a-vis protein intake by Bangladeshi people is given in Table 7. It is important to note that per capita calorie consumption increased from 2240.3 kcal in 2000 to 2318.3 kcal in 2010 at national level as well as rural and urban areas. However, per capita protein consumption has slightly increased over the years.

4.2 Food Security in Bangladesh at Household level

Household food security depends substantially on household income and asset status (Jacobs, 2009). A household food security should be defined as one which has enough food available to ensure a minimum necessary intake by all members. The minimum is related to, among other things, body size, weight, sex, and nature of work and for women, pregnancy or lactation status (Alamgir, 1991). Ensuring food security for all is one of the major challenges in Bangladesh today. Despite the impressive achievements in food grains production during the last few decades, food security at households and individual levels remains a major concern for the Government. Different aspects and condition of food security at household level are described in this section.

4.2.1 Food Availability: Per Capita Food Intake Per day in the Sample Households

To analyze food security status at household level individual data on food consumption have been collected from the study area and efforts have been given on identifying whether an individual household is food secured. A food secured household is that whose daily per capita calorie intake is on or is above the recommended 2280 kcal per capita daily calorie intake (FAO, 2005). On the other hand, a food insecured household is that whose daily per capita calorie intake falls below the recommended 2280 kcal per capita daily calorie intake (FAO, 2005).

Consumption of food according to food items by the study households per capita per day are presented in Table 8.

Table 8: Per Capita Food Intake Per Day in the Study Area (gram)

Food Items	Rajshahi			Natore			Naogaon			Total		
	All House-holds	Food Secured House-holds	Food Insecured House-holds	All House-holds	Food Secured House-holds	Food Insecured House-holds	All House-holds	Food Secured House-holds	Food Insecured House-holds	All House-holds	Food Secured House-holds	Food Insecured House-holds
Rice	451.9	470.7	438.46	430.9	436.5	428.77	449.15	464.95	435.33	441.23	451.85	434.47
Wheat	43.77	49.14	39.94	43.38	47.7	41.67	44.56	49.51	40.23	44.87	51.72	40.51
Pulses	34.53	44.13	27.68	32.53	41.51	28.98	35.48	44.39	27.68	36.28	48.56	28.46
Potato	30.47	32.29	29.17	33.91	40.63	31.25	33.27	34.38	32.29	38.72	52.08	30.21
Vegetables	180.6	200	166.67	171.76	195.83	162.25	186.11	208.33	166.67	174.54	200	158.33
Fish	41.67	53.77	33.02	34.18	49.06	28.3	42.01	56.6	29.25	36.43	46.23	30.19
Meat	6.05	8.55	4.27	4.39	6.84	3.42	5.93	6.84	5.13	6.46	8.54	5.13
Egg	32.72	47.3	22.3	20.53	29.73	16.89	31.08	47.3	16.89	27.96	43.24	18.24
Milk and Milk Product	30.35	47.76	17.91	25.50	52.24	14.93	30.05	50.75	11.94	28.64	52.53	13.43
Fruits	14.72	16.67	13.33	11.89	16.67	10	9.78	13.33	6.67	9.26	13.33	6.67
Sugar	16.61	20.73	13.66	16.30	18.05	15.61	17.40	20	15.12	15.77	17.56	14.63
Oil	14.96	21.11	10.56	14.22	19.56	12.11	15.82	20.44	11.78	15.04	20.33	11.67
Total	898.29	1012.1	816.97	839.54	954.28	794.18	900.64	1016.82	798.98	875.2	1005.97	791.94

Source: Author's own calculation

From Table 8 it is revealed that the rice is the main item of foods of both food secured and insecured households in the study area. It is found that average per capita per day intake of rice was 441.23 gm in the study area, which was 451.86 gm in food secured households and 434.47gm in food insecured households. Thus, food secured households consume more rice than food insecured households. The second important food item of households in the study area was observed to be vegetables and the consumption rate was about 174.54 gm per capita per day in total study households. The next important food item was wheat followed by potato, fish, pulse, milk and milk product, egg, sugar, oil, fruits, and. meat. The per capita food intake per day is not same in all three study districts. From Table 8 it is found that the per capita food intake per day is highest in Naogaon district followed by Rajshahi and Natore district.

Again, per capita food intake is not same for food secure and food insecured households. Table 8 reveals that per capita food intake per day of food secured households is high in Naogaon district followed by Rajshahi and Natore districts. On the other hand, per capita food intake of food insecured households is higher in Rajshahi district followed by Naogaon and Natore districts. Again, from the disag-gregated analysis it is found that households of all districts receive most of the calories from the consumption of rice and vegetables.

4.2.2 Food Access: Food Expenditure Pattern in the Sample Districts

The present study has analyzed the actual food expenditure pattern of selected

districts which is shown in Table 9. Table 9 shows that the average household size in Rajshahi district was 4.10 persons in 2010 whereas this was 3.95 and 4.05 in Naogaon and Natore districts respectively in the same year. The required food expenditure of households in Rajshahi district per month was Tk 6441 in 2010 which was Tk6205 in Naogaon district and Tk 6362 in Natore district. The food expenditure and access gap in Rajshahi district were 411 and 6.39%f respectively. This rate was 189 and 2.99% in Naogaon district, and 332 and 5% in Natore district.

Table 9: Actual Food Expenditure Pattern in the Sample Districts (Tk)

Food Consumption Indicators	Year	
	2000	2010
Rajshahi		
Household Size	4.91	4.10
Required Food Expenditure of the Household Per Month	4050.75	6441.51
Gap/Surplus of Food Expenditure	-1573.75	-411.51
Access Gap in %	-38.85	-6.39
Naogaon		
Household Size	4.71	3.95
Required Food Expenditure of the Household Per Month	3885.75	6205.85
Gap/Surplus of Food Expenditure	-1408.75	-185.85
Access Gap in %	-36.25	-2.99
Natore		
Household Size	4.64	4.05
Required Food Expenditure of the Household Per Month	3828	6362.96
Gap/Surplus of Food Expenditure	-1351	-332.96
Access Gap in %	-35.29	-5.23

Source: Own calculations using data from BBS, 2001& 2011

However, from the district wise analysis it is found that there are substantial food expenditure and access gaps in all the three study districts and the food expenditure gap is highest in Rajshahi district followed by Natore and Naogaon districts. On the other hand, the food access gap is higher in Rajshahi district followed by Natore and Naogaon district.

4.2.3 Food Utilization: Results of Food Security Index

On the basis of recommended daily calorie intake of 2280 kcal suggested by FAO (2005), total households are classified into food secured and insecured which is represented in Table 10. From the table it is observed that 70 of total households in the study area are food secured whereas 110 are food insecured. This figures vary for three study districts also. On the basis of field survey data collected from three districts of northern Bangladesh a food consumption index is calculated which enabled us to understand whether an individual is secured in the availability of food. Table 10 presents the mean of food consumption of an individual of sample households in the study area measured in kcal. From Table 10 it is found that the mean value of food security index is 0.979 in the study area whereas the value of

food security index is 0.942, 0.996 and 0.999 of the Natore, Rajshahi and Naogaon districts for the sample households.

Table 10: Results of Food Security Indices			
	All Households	Food Secured Households	Food Insecured Households
Natore			
Number of Households	60	17(0.28)	43(.72)
Mean Calorie Intake(kcal)	2150	2337	2075
FSI Value	0.942	1.03	0.91
Naogaon			
Number of Households	60	28(0.47)	32(0.53)
Mean Calorie Intake(kcal)	2279	2500	2085
FSI Value	0.999	1.010	0.914
Rajshahi			
Number of Households	60	25(0.42)	35(0.58)
Mean Calorie Intake(kcal)	2270	2500	2092
FSI Value	0.996	1.11	0.92
Total			
Number of Households	180	70(0.39)	110(0.61)
Mean Calorie Intake(kcal)	2233	2467	2083
FSI Value	0.979	1.08	0.913

Source: Author's own calculation

Note: The figure in the parenthesis indicates the percentage

From Table 10 it is found that the average per capita calorie intake in the area is 2233 kcal which is less than 2280 kcal whereas the mean calorie intake of food secured and insecured household in the study area is 2467 and 2083 kcal. The mean calorie intake of food insecured household is lowest for Natore (2075) compared to 2085 kcal for Naogaon and 2092 kcal for Rajshahi.

Comparison Analysis of National and Household Level

It is observed that per capita per day availability (gram) also rose from 544gm to 588gm whereas per capita food grain requirement is 489gm (GoB, 2012) from Table 1. And it is found in 2012 that food grain, potato and meat production Bangladesh have achieved self sufficiency level whereas in fruit and vegetables production near sufficiency level is achieved from Table 2. However, in case of pulses, oilseed, fish, and milk and sugar production our self sufficiencylevel are on critical level in these years. At the household level, average per capita per day intake of food grain was 486.07gm in the study area, which was 503.52gm in food secured households and 475.08gm in food insecured households and the second food item is which vegetables that consumption rate is about 174.54gm per capita per day in the study area.Although our food grain, potato and meat production is exceeded the demand of its at the aggregate level, but sample districts received most of the calories from the consumption of rice and vegetables at the household level.

As regards food access, food expenditure has increased at a faster rate than that of income. During the period of 2000 to 2010, the monthly household income has increased with a growth rate of 18.20% and the monthly household food expenditure has risen with a growth rate of 19.72%. However, actual food expenditure did not exceed the required food expenditure in different years in the national level (rural and urban), this pattern is almost same at both divisions and selected districts in the household level. Again,at the household level, from the district wise analysis it is found that the food access gap is higher in Rajshahi district followed by Natore and Naogaon districts.

Regarding food utilization, the value of food security index is 1.02 (above the threshold of 1) at the national level that is found to be food secure in 2010compared to earlier years and the calorie intake was relatively higher for the rural people compared to urban people (Table 7). Although,it is found that the mean value of food security index is 0.979 in the study area whereas the value of food security index is 0.942, 0.996 and 0.999 of the Natore, Rajshahi and Naogaon districts, but this pattern is different from the food secured and food insecured households for the sample households from Table 10.

5. Conclusion

Despite remarkable achievements in increasing food availability side, problems of access to food still continue in Bangladesh. The country has yet to achieve comprehensive food security that could resolve the problems of inadequate food intake at the household level. Bangladesh as a whole has a very low level of nutrition in the context of households and individuals level who cannot afford balanced and nutritious diet. Using the food security index, the value of FSI is food 1.02 at the national level and the mean of FSI is 0.979 which is nearly food secured in the household level whereas the mean of FSI of food secured and insecured household in the study area is 1.08 and 0.913(Table10). However, approximately 33 million of the total 160 million population in Bangladesh cannot consume more than 1800 kcal food per day. Bangladesh needs to accelerate growth and productivity of food grain production and improve the level of socioeconomic factors such as education in order to improve the quality of food utilization. Therefore, government and non-government agencies should come forward with financial supports to ensure food security for the household level and they should also provide relevant knowledge about balanced diet and nutritional food for these people.

REFERENCES

Ahungwa, G. T., Umeh,J. C. and Mukter, B. G., (2013) Empirical Analysis of Food Security Status of Farming Households in Benue State,Nigeria. *Journal of Agriculture and Veterinary Science(IOSR-JAVS)*, Vol. 6, No. 1, Pp. 57-62

Babatunde, R. O., Omotesho, O.A. and Sholotan, O. S. (2007).Factors Influencing Food Security Status of Rural Farming Households in North Central Nigeria.*MedwellJournals*,Vol. 2, No. 3, Pp. 351-357

Bangladesh Institute of Development Studies (1997). Human Development Report of Bangladesh, 1997. Dhaka: BIDS.

BBS (2005). Statistical Year Book of Bangladesh, Bangladesh Bureau of Statistics, Ministry of Planning, Government of People's Republic of Bangladesh, Dhaka

Chowdhury, M. I. (2009). Impact of Increasing Landlessness on Access to Food: Experience of Small and Marginal Farmers in Rural Bangladesh, UnnayanOnneshan-The Innovators, Dhaka, Bangladesh, Web: www.unnayan.org.

Clay, E., Jones, S., Rahman, A. and Shahabuddin, Q. (1988).Introduction in Food Strategies in Bangladesh. Proceeding of Seminar Held in Dhaka 8-10 October, and Jointly Sponsored by the government of Bangladesh and the Commission of European Communities, University Press Ltd.

Coates, J., Swindale, A. and Bilinsky, P. (2006). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide, URL: http:www.fantaproject.org/downloads/pdf   HFIAS%20Guide.pdf, Accessed 15th April,2011.

Dev, T, Hossain, M.E. and Islam, M. K. (2014).Analysis of Food Security at National Level in Bangladesh.Rabindra Journal. Vol. 22, Pp. 160-171.

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

Fakiyesi, O.M. (2001). Encouraging Growth to Reduce Poverty in Nigeria, CBN Economic and Financial Review. Vol. 39, No.2, Pp.132-137.

FAO. (2005), The State of Food Insecurity in the World. Food and Agriculture Organization of the United Nations, Rome, Italy.

GoB. (2005). Government of Bangladesh, Unlocking the potential: National strategy for Accelerated poverty reduction. A Technical Report. General Economic Division, Dhaka

GoB. (2012). Government of the People's Republic of Bangladesh, Report of Mnistry of Food and Disaster Management

Hossain, M. and Rashid, M. H. (2009). Yield Disparity and Food Security of Marginal Farmers in Basail Upazila of Tangail District. *Bangladesh journal of political economy*, Vol. 25, No. 1 & 2, Pp. 243-258

Hossain, M., Naher, F. and QuaziShahabuddin,Q. (2005), Food Security and Nutrition in Bangladesh: Progress and Determinants. *Electronic Journal of Agricultural and Development Economics*, Agricultural and Development Economics Division (ESA) FAO, available online at www.fao.org/es/esa/eJADE   Vol. 2, No. 2, 2005, pp. 103-132

Iorlamen, T. R., Abu, G. A. and Lawal,W. A. (2014). Assessment of Expenditure on Food Among Urban Households and it's Implication for Food Security: Evidence from Benue State, Nigeria. *African journal of Food, Agriculture, Nutrition and Develpoment*, Vol. 14, No. 2

Kazal, M. M. H., Villinueva, C. C., Hossain, M. Z., & Das, T. K. (2010).Food Security Strategies of the People Living in Haor Areas: Status and Prospects. NFPCSP Final Report PR #3/08, National Food Policy Capacity Strengthening Programme, Dhaka.

Keenan, D P., Olson, C., Hersey, J. C. and S M Parmer, S. M. (2001). Measures of Food Insecurity/Security. Journal of Nutrition Education, Vol.3, No.1, Pp.: 49-58.

Khan, R. E. A. and Gill, A. R. (2009).Determinants of Food Security in Rural Areas of Pakistan. The paper was presented in National Conference on Socio-Economic Stability in Pakistan. February 16-17, 2009 at Sarhad University of Science and Technology Peshawer. Pakistan

Sultana, A and Kiani, A.. (2011). Determinants of food security at household level in Pakistan. African Journal of Business Management, Vol. 5(34), pp. 12972-12979.

Kuwornu,J. K. M., Suleyman, D.M. and Amegashie,D.P. K.(2013). Analysis of Food Security Status of Farming Households in the Forest Belt of the Central Region of Ghana.Russian Journal of Agricultural and Socio-Economic Sciences, Vol. 1, No. 13, Pp.26-39

May J (1996).Assets, Income and Livelihoods in Rural KwaZulu-Natal. In: Lipton, M., Ellis, F. and Lipton, M. (eds) "Land, Labour and Livelihoods in rural South Africa. Vol. 2, KwaZulu- Natal and Northern Province, Indicators Press, Durban, 1996. Pp. 1-30.

MoFDM (2012). Report on Food Security and Disaster Managemnet. Ministry of Food and disaster Management, Government of Bangladesh.

Muzaffar, M. and Haszn, A. F. (2009). Agriculture and Food Security in Bangla-
    desh: How Climate Change Affects the Extreme Poor. Bangladesh Journal
    of Political Economy, Vol. 25, No. 1&2, Pp. 35-54

Olayemi J. K. (1998). The Nigerian Food Equation towards a dynamic equilib-
    rium. University of Ibadan Inaugural Lecture, No. 167.

Omonona B. T. and Agoi, G.A. (2007). Analysis of Food Security Situation
    Among Nigerian Urban Households: Evidence from Lagos State, Nigeria.
    Journal of Central European Agriculture, Vol. 8, No. 3, Pp. 397-406

Rahman, K. M. M. and Islam, M. S. (2012). Nutritional Status and Food Security
    of Farm Households under Different Land Use Patterns in Bangladesh,
    Bangladesh Journal of Nutrition. Vol. 24-25. Pp. 49-64.

Salam, M. A., Alam, M. S. and Islam, M. S. (2009). Changing Land Use Pattern
    and Hybrid Rice production: A Way to Improve Food Security in
    Bangladesh.Bangladesh Journal of Political Economy, Vol. 25, No. 1 & 2,
    Pp. 190-204

Swindale A and P Ohri-vichaspati (2005).Measuring household food consump-
    tion: A   technical   guide.   URL:
    http://www.fantaproject.org/downloads/pdfs/foodcons.pdf.

Talukder, R. K. (2005). Food Security, Self-sufficiency and Nutrition Gap in
    Bangladesh.The Bangladesh Development Studies.Vol. 31 No. 3&4, Pp.
    34-62

Von Braun J The World Food Situation: New Driving Forces and Required
    Actions. Intl. Food Policy Res. Inst. Washington D. C. 18pp.
    DOL:2499/0896295303. Accessed 20 August 2012.