Reprint **ISSN 1997-2571 (Web Version)**

Journal of Innovation & Development Strategy (JIDS)

(J. Innov. Dev. Strategy)

Volume: 5 **Issue: 2** **August 2011**

J. Innov. Dev. Strategy 5(2):18-25(August 2011)

AVAILABILITY AND REQUIREMENT OF FOOD GRAIN IN BANGLADESH

M.S. RAHMAN, D.C. ACHARJEE, M. AKTER AND S. RAHMAN

GGF
Nature is Power

An International Scientific Research Publisher
Green Global Foundation©
Publication and Bibliography Division
100 Leeward Glenway
Apartment # 1601
M3c2z1, Toronto, Canada
E-mails: publication@ggfagro.com, editor@ggfagro.com
http://ggfagro.com/ejournals/current issues

JIDS** issn 1997-2571, HQ:19-10 central place, saskatoon, saskatchewan, s7n 2s2, Canada

ISSN-1997-2571 (Online)
J. Innov. Dev. Strategy 5(2):18-25 (August 2011)

AVAILABILITY AND REQUIREMENT OF FOOD GRAIN IN BANGLADESH

M.S. RAHMAN[1], D.C. ACHARJEE[2], M. AKTER[3] AND S. RAHMAN[4]

[1] Scientific Officer, Agricultural Economics Division, BARI, Gazipur; [2] Lecturer, Dept. of Agril. Marketing and Business Management, Sylhet Agricultural University, Sylhet; [3] Scientific Officer, Agricultural Economics Division, BARI, Gazipur; [4] Scientific Officer, Plant Genetic Resources Center, BARI, Gazipur.

Corresponding author & address: Md. Sadique Rahman, Email: saadrhmn@yahoo.com
Accepted for publication on 6 July 2011

ABSTRACT

Rahman MS, Acharjee DC, Akter M, Rahman S (2011) Availability and requirement of food grain in Bangladesh. *J. Innov. Dev. Strategy* 5(2), 18-25.

The main focus of the study is to examine the food availability and requirement status of Bangladesh. Time series data on food grain production were used to this purpose. Aggregate domestic production and per capita intake of the food grain increased in the country over the past decades. Growth rates in production and area of food grain in totality showed positive trend for the whole study period of 1975-1976 to 2007-2008. The growth rates of production of pulses and oilseeds were registered positive and significant trend for the whole period. The production of food grain could be changed due to total cropped area; irrigation and area under MVs. Flood and government's overall policy were other important factors that influenced the food grain production in Bangladesh. The findings further revealed that replacing area under local varieties by modern varieties, production of pulses and oilseeds could be increased to some extent.

Key words: *food grain production, food grain requirement, self sufficiency, growth rate*

INTRODUCTION

Bangladesh ranks seventh in the world with a population of about 144.2 million encompassing an area of 147570 sq. km (BER 2009). Currently about half of the population live below the food based poverty line consuming less than 2122 kcal /capita /day (Akhter 2005). Apart from the prevailing deficit in the total calorie intake, the normal diet of Bangladeshi people is seriously imbalance. Food insecurity is one of the fundamental characteristics of lives of the poor in Bangladesh.

Food security is defined as access to enough and safe food by all people at all times for maintaining an active and healthy life (Talukder 2008). The government of Bangladesh has identified food security as an important factor contributing to its socio-economic stabilization and development. So, the aim of all five year plans (FYPs) was to achieve food grain self-sufficiency. A comprehensive food security analysis needs to cover a wide range of dimensions. Food availability is one of the dimension, other two dimensions are access and utilization of food. This paper focuses on the availability of food as an essential element of the concept of food security. In addition to rice and wheat that constitute the staple food of Bangladesh, the paper deals with the production and availability issues of other food commodities such as pulses and oilseeds. Availability is a function of domestic production, imports, food aid and security stocks. Of these, domestic production is critical in ensuring food availability at both national and household levels. This study focuses on the availability of food in terms of domestic production.

Bangladesh has made a steady progress in the expansion of food production specially rice production. As a major staple, rice occupies 71% of the gross cropped area and accounts for over 94% of food grain production. Its contribution to the total capita calorie and protein intake is 74% (Hossain 2004). But because of the increasing population pressure there has been an extensive use of land to meet the growing demand for food. Food availability in our country mainly varies according to seasons, with domestic supply being high during the period of harvesting and scares during lean period. Besides, seasonal variation in agricultural employment and limited employment opportunities in non-farm sector, million of people suffer from chronic and transitory food insecurity. In view of limited availability of land, water and other resources, increased food production in future will have to be based on improved technologies and better management practices. Several studies (Akhter 2005; Hossain and Shahabuddin, 1999; Talukdar 2002) have been conducted about the issues under discussion. However, very little has been said about the effect of flood and Government policies on the food grain production. All these aspects need to be examined for assessing the sustainability in food grain production in Bangladesh. Keeping all these factors in consideration the study was undertaken with the following objectives.

Objectives

i) To determine the existing food gap on daily requirement basis over the period;
ii) To examine the growth rates and factors affecting production of food grain in Bangladesh;
iii) To assess the impact of HYV technology adoption in attaining food self sufficiency; and
iv) To suggest some policy guidelines for increasing the domestic food grain production of Bangladesh.

MATERIALS AND METHODS

Data sources

The study was mainly based on secondary data related to food grain production, availability and requirements for the country as a whole. Time series data were used for the study. The data series were divided into two periods such as period I from 1975-1976 to 1990-1991 and period II from 1991-1992 to 2007-2008. The food grain crops under the study were rice, wheat, pulses and oilseeds.

Analytical techniques

a) Food grain requirement

To calculate the food grain requirement of the country the following formula was used:

$$\text{Food grain requirement (Million ton)} = \frac{\text{Population x gram per capita per day intake x 365 days}}{1000000}$$

b) Self-sufficiency ratio (SSR)

The self-sufficiency ratio expresses magnitudes of production in relation to domestic utilization (FAO 2001). It is another way of expressing the food deficiency in the country. SSR is defined as;

$$\text{SSR} = \frac{\text{Domestic production x 100}}{\text{(Production + Imports – Exports)}}$$

c) Growth rate

To estimate the growth rate of yield and production, the following exponential growth model was used:

$Y = ae^{bt}$

$\text{Ln } Y = \text{Ln } a + bt$

Where,

Y = dependent variables

T = time in year (1, 2, 3-------n)

B = coefficient of the variable

d) Factors affecting domestic food grain production

To estimate the contribution of inputs in domestic food production, double log production function along with some dummy variables like natural calamities, policy of governments etc. was considered in the study. The following type of production function was used to achieve the objectives:

$$\text{Ln } Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + d_1 z_1 + d_2 z_2 + u_i$$

Where,

Y = Aggregate crop production (‘000’ MT)

X_1 = Total cropped area (‘000’ ha)

X_2 = Area under MV (‘000’ ha)

X_3 = Irrigated area (‘000’ ha)

X_4 = Total fertilizer use (‘000’ MT)

X_5 = Annual rainfall (cm)

d_1 = Dummy for flood affected years (1 for 1987, 1988, 1998 and 2004; 0 for otherwise)

d_2 = Policy dummy (1 for the years up to 1991-92 to 2007-08 and 0 for the years 1975-76 to 1990-91)

b_1---------b_5 = Coefficients of independent variables to be estimated

z_1, z_2 = Coefficients of dummy variables to be estimated

u_i = Error term

RESULTS AND DISCUSSION

Availability of food grain in Bangladesh

Bangladesh has made remarkable progress in domestic food production over the past three decades. Total annual food grain production increased from less than 10 million tons in early seventies to more than 28 millions tons by the year 2006-2007 (Talukder 2008). Particularly rice production has doubled in the last two decades with the use of green revolution technology, positive shift in public policy and market forces. In 1990-1991, rice production was 17.78 million tons, which has steadily increased to 31.31 million tons in 2008-2009. Wheat production also

increased up to 1998-1999 then it started declining and production went down to 0.84 million tons in 2008-09 (Table 1). Similarly, pulses production also dipped mainly because of the loss of areas under these crops to boro rice (Irrigated rice). On the contrary, oilseed production increased in the last three years.

Table 1. Production of major crops in million ton (1990-1991 to 2008-2009)

Year	Rice	Wheat	Pulses	Oilseeds
1990-91	17.78	1.00	0.52	0.44
1991-92	18.25	1.06	0.51	0.46
1992-93	18.34	1.17	0.50	0.44
1993-94	18.04	1.13	0.53	0.47
1994-95	16.83	1.24	0.53	0.48
1995-96	17.68	1.36	0.52	0.47
1996-97	18.88	1.45	0.52	0.47
1997-98	18.86	1.80	0.51	0.48
1998-99	19.90	1.90	0.49	0.47
1999-00	23.06	1.84	0.39	0.40
2000-01	25.08	1.67	0.37	0.39
2001-02	24.30	1.60	0.35	0.39
2002-03	25.19	1.50	0.34	0.36
2003-04	26.18	1.25	0.33	0.28
2004-05	25.15	0.97	0.31	0.56
2005-06	26.53	0.73	0.27	0.65
2006-07	27.31	0.73	0.25	0.68
2007-08	28.93	0.84	0.20	0.70
2008-09	31.31	0.84	0.19	0.66

Source: various issues of BBS publications

Food grain requirements in Bangladesh

The food gap in Bangladesh for the period of 1990-1991 to 2008-2009 is presented in Table 2. The net food grain production (rice and wheat) level increased from 18.83 million ton in 1991-1992 to 24.28 million tons in 1999-2000. It further went up to 31.36 million tons in 2008-2009. Requirement of food (@ 465 gm/capita/day) was 19.18 million tons in 1991-1992, which increased to 24.47 million tons in 2008-2009 due to increase of population.

Food grain requirement on the basis of 435 gm/capita/day and 495 gm/capita/day, instead of 465 gm/capital/day gives clear information about the food gap at different situation in Bangladesh. The surplus is expected to further rise to around 8.47million tons in 2008-2009 on the basis of per capita intake of food grain at 435 gm. If per capita per day intake is 495 gm then the surplus in 2008-2009 expected to be round 5.31 million tons. Food gap for pulses and oilseeds were also calculated on the basis of daily and recommended intake. If per capita per day intake is 60 gm and 32 gm for pulses and oilseed than the deficit in 2008-2009 is expected to be around –2.97 and –1.08 million ton respectively (Table 3).

Table 2. Food gap analysis on the basis of alternative levels of per capita requirement

Year	Popl^n (Million)	Food grain requirement			Net food grains prod.*	Food deficit/surplus		
		435g	465g	495g		435g	465g	495g
1991-92	113.00	17.94	19.18	20.42	18.83	0.89	-0.34	-1.58
1992-93	115.00	18.26	19.52	20.78	19.03	0.77	-0.49	-1.75
1993-94	117.00	18.58	19.86	21.14	18.70	0.12	-1.16	-2.44
1994-95	119.00	18.89	20.20	21.50	17.62	-1.27	-2.57	-3.88
1995-96	122.10	19.39	20.72	22.06	18.57	-0.82	-2.15	-3.49
1996-97	124.30	19.74	21.10	22.46	19.83	0.09	-1.27	-2.63
1997-98	126.50	20.09	21.47	22.86	20.15	0.06	-1.32	-2.71
1998-99	128.10	20.34	21.74	23.14	21.26	0.92	-0.48	-1.89
1999-00	129.80	20.61	22.03	23.45	24.28	3.68	2.25	0.83
2000-01	131.50	20.88	22.32	23.76	26.09	5.21	3.77	2.33
2001-02	133.45	21.19	22.65	24.11	25.26	4.07	2.61	1.15
2002-03	135.00	21.43	22.91	24.39	26.03	4.60	3.12	1.64
2003-04	136.20	21.63	23.12	24.61	26.76	5.13	3.64	2.15
2004-05	138.05	21.92	23.43	24.94	25.48	3.56	2.05	0.54
2005-06	139.10	22.09	23.61	25.13	26.59	4.51	2.98	1.46
2006-07	141.80	22.51	24.07	25.62	27.35	4.84	3.29	1.73
2007-08	142.40	22.61	24.17	25.73	29.04	6.43	4.87	3.31
2008-09	144.20	22.90	24.47	26.05	31.36	8.47	6.89	5.31

* Net production is estimated by reducing 2.43 and 3.01% from domestic production of rice and wheat respectively for seed, feed and wastage (BBS 2009)

Table 3. Food gap analysis of pulse and oilseed

Year	Popl^n (Million)	Food grain requirement				Net production*		Food gap			
		Pulse		Oilseed		Pulse	Oil seed	Pulse		Oilseed	
		14g	60g	12g	32g			14g	60g	12g	32g
1991-92	113.00	0.58	2.47	0.49	1.32	0.50	0.42	-0.08	-1.98	-0.07	-0.90
1992-93	115.00	0.59	2.52	0.50	1.34	0.49	0.40	-0.10	-2.03	-0.10	-0.94
1993-94	117.00	0.60	2.56	0.51	1.37	0.52	0.43	-0.08	-2.05	-0.08	-0.93
1994-95	119.00	0.61	2.61	0.52	1.39	0.52	0.44	-0.09	-2.09	-0.08	-0.95
1995-96	122.10	0.62	2.67	0.53	1.43	0.51	0.43	-0.12	-2.17	-0.10	-0.99
1996-97	124.30	0.64	2.72	0.54	1.45	0.51	0.43	-0.13	-2.22	-0.11	-1.02
1997-98	126.50	0.65	2.77	0.55	1.48	0.50	0.44	-0.15	-2.27	-0.11	-1.04
1998-99	128.10	0.65	2.81	0.56	1.50	0.48	0.43	-0.18	-2.33	-0.13	-1.06
1999-00	129.80	0.66	2.84	0.57	1.52	0.38	0.37	-0.28	-2.46	-0.20	-1.15
2000-01	131.50	0.67	2.88	0.58	1.54	0.36	0.36	-0.31	-2.52	-0.22	-1.18
2001-02	133.45	0.68	2.92	0.58	1.56	0.34	0.36	-0.34	-2.58	-0.23	-1.20
2002-03	135.00	0.69	2.96	0.59	1.58	0.33	0.33	-0.36	-2.63	-0.26	-1.25
2003-04	136.20	0.70	2.98	0.60	1.59	0.32	0.26	-0.37	-2.66	-0.34	-1.33
2004-05	138.05	0.71	3.02	0.60	1.61	0.30	0.52	-0.40	-2.72	-0.09	-1.10
2005-06	139.10	0.71	3.05	0.61	1.62	0.26	0.60	-0.45	-2.78	-0.01	-1.03
2006-07	141.80	0.72	3.11	0.62	1.66	0.24	0.63	-0.48	-2.86	0.00	-1.03
2007-08	142.40	0.73	3.12	0.62	1.66	0.20	0.64	-0.53	-2.92	0.02	-1.02
2008-09	144.20	0.74	3.16	0.63	1.68	0.19	0.61	-0.55	-2.97	-0.02	-1.08

* Net production is estimated by reducing 2.5 and 8% for pulses and oilseeds respectively for seed, feed and wastage (Akhter 2005)

Self sufficiency ratio (SSR)

It is evident from Figure 1 that food grain SSR for Bangladesh is almost static during last five years. The lowest SSR for food grain was found in 2004-2005, which could be attributed to the crop damage during flood of that year. The average SSR for food grain was about 97%. The estimated figure lead to the inference that food grain crisis in Bangladesh is an outcome of access and utilization rather then availability. Average SSR for pulses and oilseeds were about 60 and 83 per cent respectively. This indicates that domestic production of these crops is much behind than the required level of production.

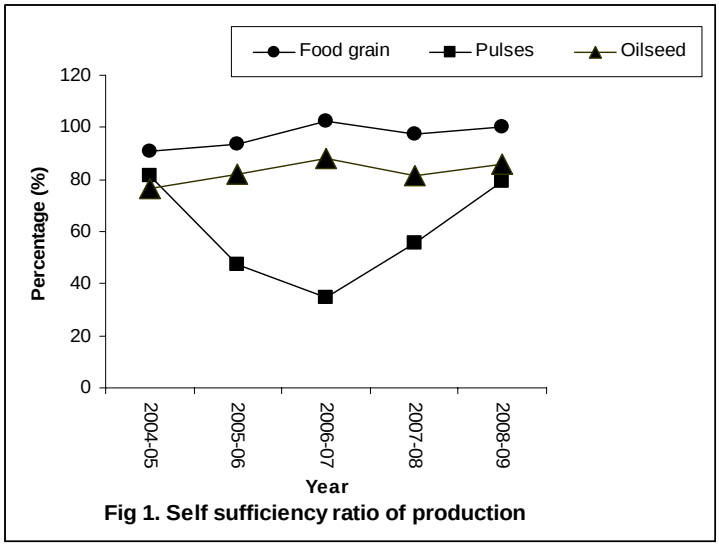

Fig 1. Self sufficiency ratio of production

Growth rates of area and production of food grain

Rice:

The production of rice increased significantly both in period I and II and the growth rates of production were 2.46 and 3.42% per annum respectively. Aggregate rice production grew positively @2.70% per annum whereas aggregate rice area grew positively @0.11% per annum in both the period (Table 4).

Wheat:

During period II, wheat production showed significantly negative growth because of lack of suitable environment and management practice. The growth rate of production during period I was found positive (8.45%) and significant. The growth rate of area was found positive (8.73%) and significant during period I, but negative in period II.

Pulse:

The growth rate of production of pulse was positive and significant in period I. The positive growth rate was 8.07% in period I. But the growth rate of production was found negative (-5.79%) in period II. The overall growth rate of production was positive (0.86%) but not significant.

The growth rate of area was positive in period I and negative in period II. But overall growth rate of area of pulses was found positive and insignificant.

Oilseeds:

Production of oilseeds exhibited positive and significant growth rate during period I. In period II it was found positive and insignificant. But in total period the production of oilseeds increased significantly and the positive growth rate was 2.41% per annum. On an average, growth rate of area of oilseed was found positive and insignificant.

Table 4. Growth rate of different crops during two time periods

Period	Type of crops	Annual growth rate (%)
I (1975-76 to 1990-91)	Area	
	Rice	0.22**
	Wheat	8.73***
	Pulses	7.70***
	Oilseeds	4.99***
	Production	
	Rice	2.46***
	Wheat	8.45***
	Pulses	8.07***
	Oilseeds	5.47***
II (1991-92 to 2007-08)	Area	
	Rice	0.40***
	Wheat	-2.26
	Pulses	-6.59***
	Oilseeds	-4.11***
	Production	
	Rice	3.42***
	Wheat	-2.32*
	Pulses	-5.79***
	Oilseeds	1.20
Total period (1975-76 to 2007-08)	Area	
	Rice	0.11***
	Wheat	2.51***
	Pulses	0.15
	Oilseeds	0.57
	Production	
	Rice	2.70***
	Wheat	2.77***
	Pulses	0.86
	Oilseeds	2.41***

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance

Factors affecting food grain production in Bangladesh

Food grain production (mainly Rice and Wheat) can be changed due to various factors. Here, total cropped area, area under modern variety, irrigation and annual rainfall were considered. Contribution of the government policy and management during 1990s is also examined. The policy dummy can capture the contribution of the government's overall policy and management on aggregate crop production for period I and II. Yearly differences in agro climatic factors can also capture by a flood dummy.

Table 5 represents the estimated coefficient of the Cobb-Douglas production function. Total cropped area had a significant positive contribution to the aggregate food grain production and it was significant at 1% level of significance. It indicates that one per cent increase in the total cropped area will increase the food grain production by 2.53%. Area under MV increased the food grain production by 0.37% and it was significant at 10% level of significance. Irrigated area and annual rainfall had positive and significant effect on aggregate crop production. Flood dummy constructed to capture the effects of the flood showed a negative and significant effect on food grain production. It's indicate that food grain production in the flood affected years was significantly reduced compared to normal years. Overall government policy and management had positive significant effect on food grain production. It's indicate that overall management of agriculture by the government such as relative contributions of inputs, technology and policy contributed significantly to better performance of the food grain production.

Table 5. Estimated co-efficients of Cobb-Douglas production function

Variables	Co-efficients	t-value
Constant	-18.20***	-3.87
Total cropped area (x_1)	2.53***	4.63
Area under MV(x_2)	0.37*	1.92
Irrigated area (x_3)	1.04***	4.99
Total fertilizer use (x_4)	-0.13	-1.28
Annual rainfall (x_5)	0.16**	2.17
Flood dummy (d_1)	-0.05*	-1.93
Policy dummy (d_2)	0.06*	1.95
Adjusted R^2	0.96	
F-value	113.93***	

Note: ***, ** and * indicates significant at 1%, 5% and 10% level of significance respectively

Projected requirement and availability of food grain in 2015

According to the projected level of requirements and production of important crops for target year 2015, there will be a surplus of 4.15 million tons of food grain. The projected requirement of food grain was estimated on the basis of 156.7 million people in 2015 by using consumption rate of 465 g m/capita/day. However, deficit will continue to persist in pulses and oilseed. It was accounted –2.37 and -0.90 million tons in 2015 for pulses and oilseed respectively.

Table 6. Projected requirement and production in 2015

Crop	Production in 2015 (Million T)*	Requirement in 2015 (Million T)	Surplus/gap (Million T)
Rice and wheat	30.75	26.59	+4.15
Pulse	1.06	3.43	-2.37
Oilseed	0.93	1.83	-0.90

* Projected production as per DAE, 2008 estimation; estimated population in 2015 is 156.70 million

Adoption of improved variety

To meet up the shortfall of pulses and oilseed production in Bangladesh it is necessary to replace the existing land under local variety by high yielding varieties. By replacing 25% of land under local variety, we can produce up to 10.53 and 19.83 thousand metric ton of pulses and oilseed respectively which will help to reduce the food gap of these crops.

Table 7. Impact of adoption of improved variety

Crop	Forecasting year	Total area (ha)	Area covered by local variety (ha)	Area assumed to be replaced	Area under MV after replacing	Additional production (Thousand MT)
Pulse						
Lentil	2015	134700	92943	25%	23236	9.50
Mung bean	2015	22400	10080	25%	2520	1.03
Oilseeds						
Mustard	2015	216800	130080	25%	32520	16.65
Ground nut	2015	29400	26460	25%	6615	3.18

CONCLUSION AND RECOMMENDATIONS

The aggregate national production and per capita availability of food grain increased in Bangladesh over the last three decades. The growth rate of area and production are also increasing day by day. Although the per capita consumption of pulses and oilseeds are much behind the required level of consumption. Functional analysis suggests that total cropped area, area under modern variety and irrigation significantly influence the aggregate food grain production in Bangladesh.

In order to ensure sustained availability of foods, domestic production will have to be enhanced. This will call for increased investment in agricultural research and technology dissemination programme. Government must have to play on important role in ensuring sufficient supply of quality input. Government should also strengthen its monitoring, supervision and facilitating role. In order to meet the challenges, Government, NGOs and the private

sector should establish a viable partnership and strategy to work together in the field of research, extension and delivering of services to the desired distributions in the right manner.

REFERENCES

Akhter S (2005) Food Security and Food Self-sufficiency in Bangladesh: Achievements and Prospects, *Journal of Progressive Agriculture*, Vol. 16(1), pp. 223-234.

BBS (2009) Statistical Year Book of Bangladesh, Bangladesh Bureau of Statistic, Ministry of Planning, Dhaka, Bangladesh.

BER (2009) Bangladesh Economic Review, Economic advisor's wing, Finance division, Ministry of Finance, Govt. of the People's Republic of Bangladesh, Dhaka.

DAE (2008) Cultivation of Indigenous Fruits for Food and Nutritional Security, Department of Agril. Extension, Ministry of Agriculture, Dhaka, Bangladesh.

FAO (2001) Food Balance Sheet- A Handbook, Food and Agriculture Organization, Rome.

Hossain M (2004) Food Security and Nutrition in Bangladesh: Progress and Determinants, A Report Prepared for FAO, Rome.

Hossain M, Shahabuddin Q (1999) Sustainable Agricultural Development in Bagladesh: Challenges & Issues, Bangladesh Rice Research Institute, Dhaka.

Talukder RK (2008) Food Security in Bangladesh: National and Global Perspective, Conference Paper, Bangladesh Agril. Economist Association, Dhaka, Bangladesh.

Talukder RK (2002) Food Security, Self sufficiency and Nutrition Gap in Bangladesh, EWFIS, Report no-4, Ministry of Food, Dhaka.