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Supply and demand situations for major crops and food items in Bangladesh

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Abstract

This study explored historical food availability/supply and the market demand for food. Secondary data was used for analyzing demand-supply gap. The average growth in rice production was 2.9% per year in 1971/72 to 2008/09, of which 93% was contributed by yield growth. The overall growth rate of area under food grain was 0.3% in 1971/72 to 2008/09. The overall food grain production growth rate is higher than population growth rate from 1971/72 to 2008/09. The own price and income elasticities of rice were -0.108 and 0.199 respectively. It was projected that upto 2021, the annual demand for food exceed the supply of food which were -0.28% for rice and -1.76% for wheat. That implies the demands are greater than the supplies for both crops.

Keywords: Food supply and demand, Price and income elasticities

Introduction

The yields of crops in per hectare are low in Bangladesh compare to other countries. The farm prices of produces also low which turn in low income from farm and low purchasing power and low access to food. On the other hand, raising food price is a major concerning issue for the government of Bangladesh. For the stable food price and food security government has adopted various strategies such as efforts to increase production, intervention in markets, public distribution, direct sales, increase in import and purchase from local markets for the maintenance of national food security stocks which aims to increase welfare of the poor.

In a subsistence agrarian economy of Bangladesh, domestic food production has an important role to play in the quest for food security. The productivity in the agricultural sector is critically important if agricultural production is to increase at a sufficiently rapid rate to meet escalating demands for food (Hayami and Ruttan, 1985; Mellor, 1976). Major food items in Bangladesh are rice, wheat, pulses, potato, vegetables and fish. These food items contribute almost 85% of the total calorie and protein intake. Rice and wheat alone contribute to 71% and 53% of the total per capita calorie and protein intake respectively (BBS, 2008).

Bangladesh has pursued for decades a strategic goal of self-sufficiency in cereal production. The country passed a major milestone in its efforts to achieve food security in the sense of food grain availability at the national level at the end of the 1990s, since for the first time in its history, food grain production exceeded target requirement which is 454 gm/person/day (Hossain e*t al*., 2005). Whatever progress been made would be difficult to sustain it due to high vulnerability of climatic shocks and the growing pressure of population on scarce natural resources thus, yet food security has not been achieved.

The food insecurity of Bangladesh is not simply an economic problem. Reducing the food insecurity problem at national level requires that the food production and marketing system be efficient. The present study examines food availability/supply and the market demand for food and their relationship in terms of dynamic balance from the projection at national level.

Materials and Methods

The study was based on the secondary data from the Bangladesh Bureau of Statistics (BBS), Handbook of Agriculture Statistics, Ministry of Agriculture, Bangladesh Bank (Central Bank) reports, FAOSTAT and other published and unpublished sources. The data used cover the 29 years period from 1980/81 to 2008/09. The non-availability of time series price data prior to 1980/81 is the main reason for selecting the data period from 1980/81. The data are on annual averages because of the lack of monthly data. Descriptive statistics were widely used for reaching the objectives. Projection of food production, requirements and food deficits/surplus situation were also examined by using Ohkawa's equation.

Ohkawa's equation is a very rough estimate of the needed rate of growth in national food requirements. Ohkawa's equation is also crude because Engel's Law has been verified in a number of studies and showing that over time, the proportion of total expenditures allocated to food declines as income rises. However, most low-income consumers expand a larger share of their budgets to food and also buy significantly more food when income increases. Johnston and Mellor (1961) claimed that growth in food demand by population growth alone is substantial. Population growth and industrialization are the major factors for affecting the demand for food. They also reported that not only are there higher rates of population growth in the developing countries but the income elasticity of demand for food is also considerably higher than in the high-income countries. Mellor and Johnston (1984) have used a "food equation" which views in dynamic balance the relationship between food supply and food demand. The food equation is a race between food and population. McCalla (1994) agreed that in addition to population growth, income growth will also increase the demand for food.

There are four different views with regards to the projected trends in production. The conventional view argues the increase in food production must come from increased productivity. The second view is related to the Ohkawa's equation where rates of population growth are added to rates of income growth modified by the income elasticity of demand for food. Then, this rate is compared to the rates of growth in productivity. The model is, therefore, a projection of two compound growth rates where any deviation from these rates either leads to food deficits or food surpluses. A third view is more pessimistic which state future supply trends will be subject to declining fertilizer use, declining investments in agricultural research and increased environmental pressures. A fourth view as stated by Carruthers (1993) who argues that the traditional model of developed countries supplying the world with manufactured goods and financial services and developing countries providing primary products is not sustainable. He argued that in the long run, developing countries will produce manufactured goods and trade them for food from developed countries.

The second view of Ohkawa's equation which provides a quick and reliable figure to project changes in food demand was adopted for this study. The data requirements for this model are more modest which are available in developing countries like Bangladesh.

The basic Ohkawa's (1956) equation is:

$$\Gamma_D = \Gamma_S = \Gamma_P + \lambda\Gamma_g \text{ ---------- (1)}$$

Where, Γ_D is increased/growth in demand, Γ_p is growth in population, Γ_g is growth in per capita income and λ is income elasticity of food products. In general, people buy more as prices decrease. The elasticity of demand in relation to prices is therefore negative. So, it is necessary to deduce price elasticity from the Ohkawa's equation. If Γ_x is variation in prices and λ' is price elasticity of demand the model is:

$$\Gamma_D = \Gamma_S = \Gamma_P + \lambda\Gamma_g - \lambda'\Gamma_X \text{ ---------- (2)}$$

Economic theory suggests that the demand for food grain is a function of its price, the price of related goods and the income. Price of related goods is not included in the model because no other single commodity has a large budget share in comparison with rice. Demand function for rice is:

$$Q_D = \alpha_0 + \alpha_1 PR_t + \alpha_2 Y_t + \varepsilon_i \text{ ---------- (3)}$$

With, $\alpha_1 = \frac{\delta Q_D}{\delta PR_t} < 0$; $\alpha_2 = \frac{\delta Q_D}{\delta Y_t} > 0$.

where, Q_D is quantity demanded at current year (kg/capita/year), PR_t is price of rice at current year (Taka/kg) and Y_t is Real income (Taka/capita/year).

In addition to find out the elasticities, it was also estimated the market demand for food which is equal to total demand of food minus total distribution of food. Total demand of food is the sum of consumption and end stock. Consumption is equal to total production plus aid, plus import and minus domestic procurement. Retail prices were used for estimating demand elasticity. It is necessary to convert nominal prices into real prices. For that, Consumer Price Index (CPI) is a measure of overall inflation is used for deflating the nominal prices into real prices. It is also widely used deflator for the deflation of nominal values into real values (Shahabuddin, 1987; Alam, 1997 and Dorosh, 1999). The formula is:

$$\text{Real Price} = \frac{\text{Nominal Price}}{\text{Consumer Price Index (CPI)}} \times 100 .$$

The Analysis is done by using SPSS and Microsoft Excel. The function is estimated following OLS method and the double logarithmic form. The coefficient values indicate the elasticities. The price and income elasticity for wheat has not been estimated but taken from secondary sources.

Results and Discussion

Domestic production: growth in food grain production: Analysis shows that growth rates of food grain production in 1980/81 to 1989/90 were lower at 2.1% a year, but in 1971/72 to 1979/80 growth accelerated to 3.80% a year which was higher than other periods (Table 1). The decline in the production growth rate in 1980/81 to 1989/90 can be attributed to a decline in the area growth rate, but in 1990/91 to 1999/2000 the growth in yield per hectare accelerated from 2.5% to 3.6%. The long term (1971/72 to 2008/09) growth in food grain production was 3.0%, to which wheat contributed a large share with a production growth rate of 7.3%. Bangladesh achieved an impressive growth in wheat production during the period 1971/72 to 1979/80 (26.80%), which was more than ten times higher than the overall growth rate of food grain production; both area and yield per hectare contributed around 50% to this growth. The average growth in rice production was 2.9% per year in 1971/72 to 2008/09, of which 93% was contributed by yield growth. This impressive growth rate was due to the investment in irrigation, increased fertilizer use and adoption of HYV. In between 1971/72 to 1979/80 and 1990/91 to 1999/2000 there were substantial fluctuations in the growth of different varieties of rice production (Table 1). The overall growth rate of area under food grain was 0.3% in 1971/72 to 2008/09. This implies that increases in production need to come mainly from yield increases.

The overall food grain production growth rate is higher than population growth rate from 1971/72 to 2008/09 (Fig. 1). In 1970s, 1990s and 2000s the food grain production growth rates were higher than population growth rates. But in 1980s the population growth rate was higher than food grain production growth rate. It was due to flood and other natural disaster in the country of that time.

Growth of area, production and yield of other major food crops: The growth rate for production of pulses in 1971/72 to 2008/09 was 1.01%. In 1971/72 to 1979/80 and 2000/01 to 2008/09 both area and production growth rate for pulses was negative. It was mainly due to shift land from pulses to *Boro* cultivation. From 1980/81 to 1989/90 area, yield and production of potatoes showed negative growth rate (Fig. 2). The production growth rate of vegetable showed increasing trend over the period.

Fish, meat, milk and egg production: Non-cereals are chief sources of protein, mineral and vitamin which remain far below the actual requirements to provide the balanced diet. The nutritional value of fish occupies a significant position in the dietary habits of Bangladeshi people. Fish production increased from 792.67 thousand M. tons in 1971/72 to 2563.30 thousand M. tons in 2008/09 (Table 2). Meat, milk and egg production has also increased significantly over the 38 years, but their demand has been growing faster, and therefore, the shortage is still high.

Table 1. Annual growth rates of area, production and yield of food grain in Bangladesh

Category/period	Growth rates (%)					
	Aus	*Aman*	*Boro*	Total Rice	Wheat	Total food grain
Area						
1971/72-1979/80	0.6	0.9	1.3	0.8	13.9	1.1
1980/81-1989/90	-3.0	-1.2	8.0	-0.1	0.7	-0.1
1990/91-1999/2000	-4.1	-0.5	3.7	0.1	4.6	0.4
2000/01-2008/09	-5.3	-1.1	2.8	-0.06	-10.1	-0.5
1971/72-2008/09	-3.8	-0.2	4.7	0.2	3.6	0.3
Production						
1971/72-1979/80	3.6	3.7	1.4	3.2	26.8	3.8
1980/81-1989/90	-2.2	0.8	8.3	2.3	-1.4	2.1
1990/91-1999/2000	-3.0	-0.4	5.7	2.0	7.6	2.4
2000/01-2008/09	-1.4	0.9	7.3	4.2	-7.9	3.6
1971/72-2008/09	-1.9	1.7	6.7	2.9	5.5	3.0
Yield						
1971/72-1979/80	3.2	2.8	0.0	2.4	12.9	7.9
1980/81-1989/90	0.7	1.9	0.3	2.4	-2.4	-0.2
1990/91-1999/2000	1.1	0.1	2.4	1.8	3.1	2.5
2000/01-2008/09	9.1	1.6	10.0	6.9	-0.9	3.6
1971/72-2008/09	2.3	1.9	2.3	2.9	1.5	2.2
Population growth rate (%)						
1971/72-1979/80	2.67					
1980/81-1989/90	2.35					
1990/91-1999/2000	1.73					
2000/01-2008/09	2.11					
1971/72-2008/09	2.50					

Source: Authors' calculation data from BBS (2008).
http://www.bbs.gov.bd/index5.php?category=106

Table 2. Production of fish, meat, milk and egg production (thousand M. tons)

Item/period	Three years average			
	Fish	Meat	Milk	Egg
1971/72-1973/74	792.7	236.5	1100.9	58.0
1981/82-1983/84	686.7	224.0	1199.1	70.0
1991/92-1993/94	945.9	327.6	1173.1	92.8
2002/03-2004/05	1998.2	448.6	2262.9	160.5
2006/07-2008/09	2563.30	593.2	3059.8	281.0

Source: Authors' calculation data from BBS (2008).
FAOSTAT (2010)

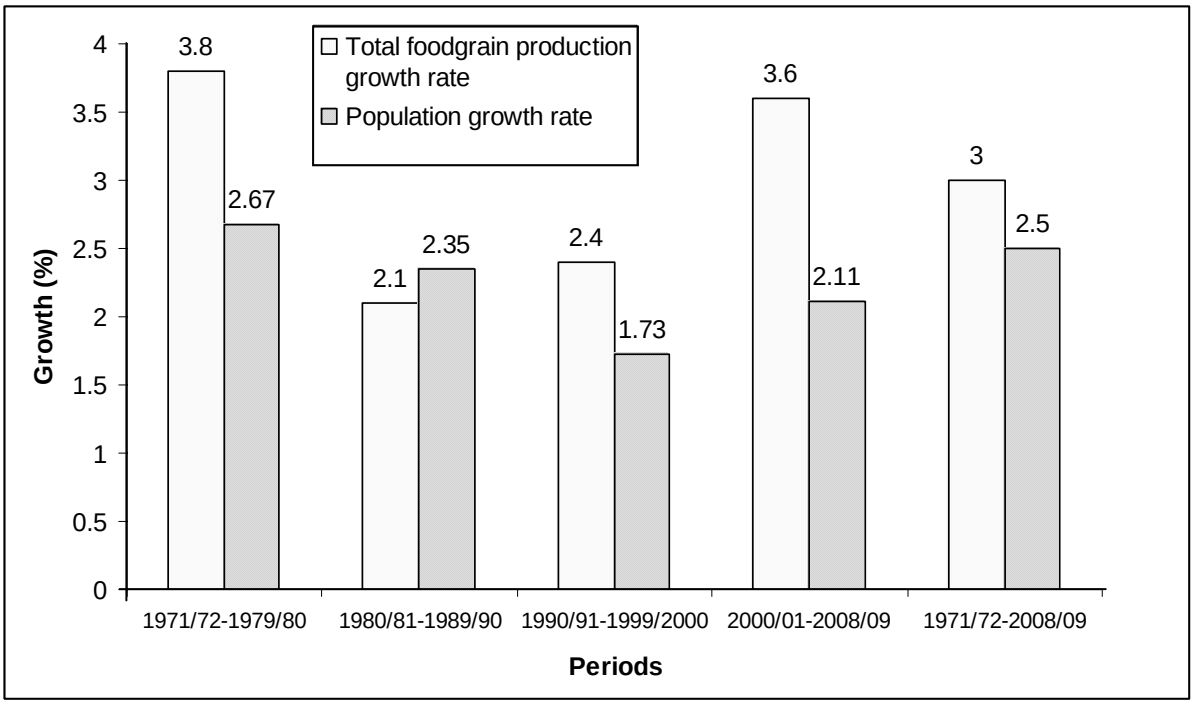

Fig. 1. Population growth rate and total food grain production growth rate over the period

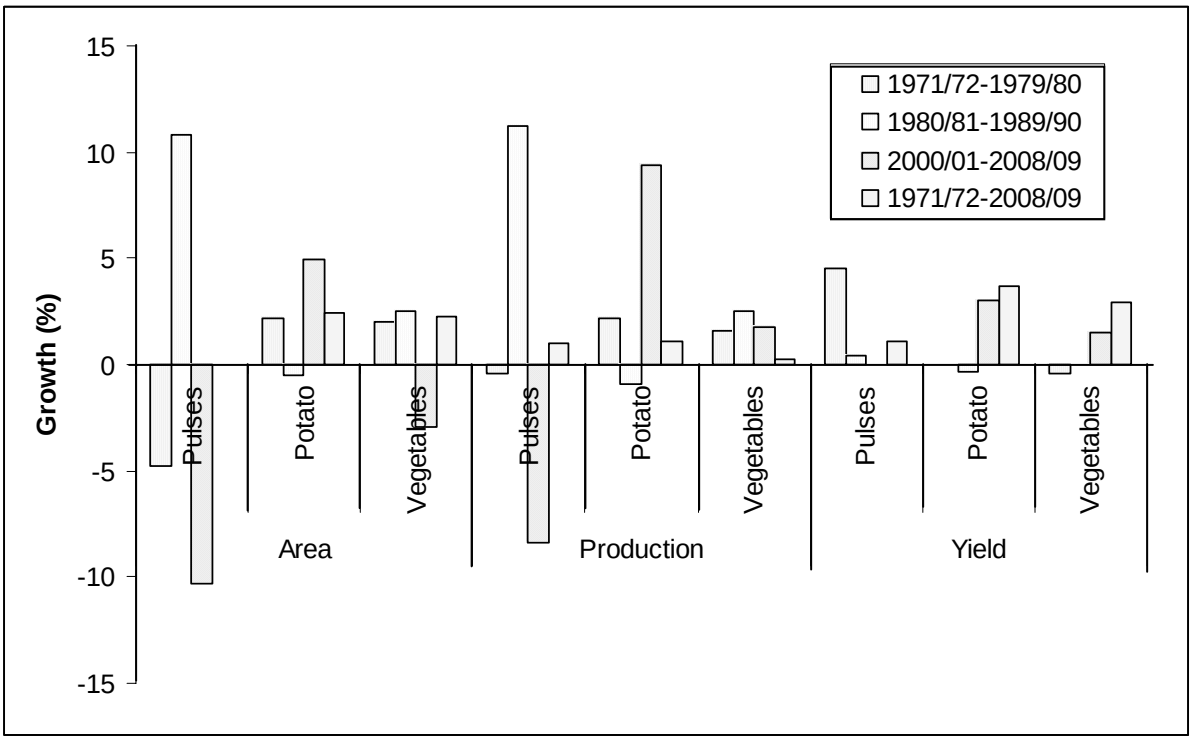

Fig. 2. Growth rates of area, yield and production of pulses, potato and vegetables

Trend in imports of major food items: public and private imports: Imports of food grain in Bangladesh were dominated by public sector in 1971/72-1979/80 and 1981/82-1989/90. Total food grain imports are composed of rice and wheat. Table 3 reveals that wheat constituted the major part of imports for all the decades. The share of wheat in total imports increased from 70% in 1971/72-1979/80 to 95% in 2001/02-2008/09. It is due to comparatively cheaper and more available on the international market. Public food grain imports declined 46% during the 1971/72-2008/09.

In 1992, the Bangladesh government liberalized the markets, allow the private participants to import agricultural food crops. As a result large number of importers have started their business who buy, store, transport and sell food grain throughout the country. Table 3 indicates that over the last two decades, the private import of food grain has increased dramatically. Out of total private food grain import both rice and wheat import increased of that time.

Table 3. Imports of food grain by type of grain, 1971/72-2008/09

Period	Public imports (000 M. tons)			% of total imports of food grain		Private imports (000 M. tons)			% of total import	
	Rice	Wheat	Total food grain	Rice	Wheat	Rice	Wheat	Total food grain	Rice	Wheat
1971/72-1979/80	508.0	1181.2	1689.2	30.1	69.9	--	--	--	--	--
1980/81-1989/90	266.5	1571.5	1838.0	14.5	85.5	--	--	--	--	--
1990/91-1999/2000	131.1	1085.6	1216.7	10.8	89.2	677.3	401.6	1078.9	62.8	37.2
2000/01-2008-09	81.6	1530.1	1611.7	5.1	94.9	718.4	667.0	1385.4	51.9	48.1

Source: Authors' calculation data from BBS (2008).
FAOSTAT (2010)

Imports of other crops and animal products: In addition to decreased in food grain imports, the import of other food crops, fruits and animal products increased over the decades. Due to decreased in area under pulses production, the pulses import increased from 2.54 thousand M. tons in 1981-83 to 522.92 thousand M. tons in 2006-08. Potatoes and vegetables and milk import increased rapidly (Table 4).

Table 4. Imports of other food crops and animal products

Food item	Volume of imports '000 tons (Three years average)				
	1971-73	1981-83	1991-93	2003-05	2006-2008
Pulses	0	2.54	72.38	363.47	522.92
Potatoes	43.27	30.5	52.14	100.16	150.22
Vegetables	0	7.17	86.3	418.13	300.4
Fruits	0	18.67	25.91	182.01	254.33
Fish	0.13	0.01	0.07	3.39	5.24
Meat	0	0.01	0.73	4.17	9.71
Milk	88.89	217.55	281.61	307.77	342.70
Egg	0	0	0	0.06	0

Source: FAOSTAT, 2010

Food aid: Food aid has played an important role in meeting the domestic demand for food. Bangladesh has received a large amount of food aid since its independence in 1971 and the flow of food aid has a significant role in shaping the food policy. It is showed from the Table 5 that the amount of total food aid decreased over the year. Both rice and wheat food aid declined. Presently, increase in domestic production has resulted in the downward trend in food aid. Therefore, this share has decreased to less than 35% of total imports of food grain with wheat accounting for 98% of the total food aid.

Table 5. Food aid and share of rice and wheat

Period	Food aid (000 M. tons)			Food aid (%)	
	Rice	Wheat	Total food grain	Rice	Wheat
1971/72-1979/80	136.8	1021.6	1158.4	11.8	88.2
1980/81-1989/90	93.0	1128.9	1221.9	7.6	92.4
1990/91-1999/2000	14.3	944.3	958.6	1.5	98.5
2000/01-2008-09	14.8	293.8	308.7	4.8	95.2
1971/72-2008/09	83.5	851.8	935.3	8.9	91.1

Source: Authors' calculation data from Department of Food and Ministry of Food and Disaster
Note: Food aid includes only grant.

Safety nets program: There are a number of safety nets programs against floods, cyclone and land erosions that help to insulate the poor from idiosyncratic shocks and to be food secure. One of them is relief programs which aim primarily at relieving immediate distress. These program interventions are typically for a limited period of time and are for targeted at the directly affected households. Eighteen hundred and four thousand M. tons of food was distributed by PFDS (Public Food Distribution System) through various food-based safety net programs in 2000/2001 to 2008/09 (Table 6). Food aid resources supplied about 17% of total PFDS distribution in years 2000/01 to 2008/09 (Table 5 and Table 6) and there is a danger that decline in food aid could ultimately lead to a cut in targeted distribution programs.

Table 6. Domestic procurement and public distribution of food grain

Period	Food procurement (000 M. tons)			Food distribution (000 M.tons)			Procurement/public distribution (%)		
	Rice	Wheat	Total	Rice	Wheat	Total	Rice	Wheat	Total
1980/81-1989/90	324.1	91.1	415.2	538.4	1604.2	2142.6	60.2	5.7	19.4
1990/91-1999/2000	456.3	104.0	560.3	615.1	1143.1	1758.2	74.2	9.1	31.9
2000/01-2008-09	1051.2	187.1	1238.3	1121.1	744.2	1865.3	93.8	25.1	66.4

Source: Authors' calculation data from BBS (2008).

Domestic Procurement and Distribution: The volume of food grain procurement increased substantially from 415 thousand M. tons in 1980/81-1989/90 to 1238.3 thousand M. tons in 2000/01-2008/09. Rice constituted the major share of total procurement (Table 6). The higher relative share of rice in total procurement was due to larger increase in rice production. Procurement is one source of the public food distribution. The ratio of procurement over total public distribution has increased over the decades.

Post harvest losses: High post harvest losses indicate reducing food supplies. Farmers also lost their share of income from post harvest losses which are also a constraint to achieve food security in Bangladesh. Post harvest losses depend on the season, crop and level of technological practices adopted for post- harvest handling. The losses can reach as high as 30% (GOB, 2000). Highly seasonal production of fruits, vegetables and spices causes gluts, leading to tremendous amount of crop losses and wastage. Moreover, technical changes occurring in threshing and milling may actually increase food losses (Greely, 1980). Besides direct production loss due to the vagaries of nature, crop losses can be caused by poor knowledge on post-harvest technology for storage, preservation, processing and handling.

The level of avoidable post-harvest losses of stored food grain in Bangladesh is still unacceptably high and varies from 10 to 25%. The loss occurs partly due to insect and fungal attack during storage. Insect losses incurred from 3-15% in stored grains, depending on the commodity and the container used for storage. Pulses and maize had incurred more than 20% losses in four months of storage (Azim, 1980).

Losses in rice at various stages after field harvest of paddy have been estimated between 6%-9% where transportation 1%; stacking and threshing 2-3%; winnowing-drying-storage-soaking and parboiling-drying-husking-polishing 2-4%; and storage-washing-cooking 1% (Huq, 1980). Field losses in cereals (consolidated) are 2-5%, and in vegetables 5-10% and stored grain losses are placed at 2-2.5% (Hopf, 1973).

Table 7 indicates that the highest percentages post harvest losses occurred in the case of vegetables and fruits (30%) while in the case of cereals it was 13% in 2004-05. Thus, reducing the post harvest loss as much as possible is a vital concerning issue in achieving food security in Bangladesh. Promotion of viable marketing systems to move the produces rapidly from producers to consumers, promotion of Integrated Pest Management (IPM) and Integrated Crop Management Program (ICM) to increase crop production and as well as to minimize post-harvest losses and support for investment and training of farmers in improved post-harvest technology (threshing, storing, transporting etc.), especially women's groups could help to minimize post harvest losses and increase food security in the country.

Table 7. Production and post harvest losses of crops in 2004-05

Food crops	Production (million M. tons)	Post harvest losses (million M. tons)	% of loss in total production
Cereals (rice, wheat, maize etc.)	28.38	3.68	12.96
Pulses	0.60	0.09	15.00
Vegetables including potatoes	6.13	1.84	30.02
Fruits	1.50	0.45	30.00

Source: BARI, (2007)

Food availability: Total supply of food available in Bangladesh is the sum of the total quantity of foodstuffs produced plus total quantity imported and aid received and adjusted for any change in stocks. On the utilization side, a distinction is made between the quantity exported (while nil in the case of food grain, pulses and potato), fed to livestock, used for seed, put to manufacture for food use and other uses, losses during storage and transformation (all of these account 10% losses from supply available) and food supply available for human consumption. The per capita supply of each food item available for human consumption is obtained by dividing its respective quantity by related data on the population in respective years.

Table 8 reveals that the per capita availability of food grain, fruits, fish and animal product increased slowly. In 1991-93, pulses, potatoes, vegetables were 13.05 gms, 25.54 gms and 32.15 gms while in 2006-08, it were 13.15 gms, 73.70 gms and 53.97 gms respectively. But fruit availability decreased over the periods. Fish, meat, milk and egg availability shows increasing trends.

Table 8. Availability (gms/person/day) of major food items, 1971-2008

Food item	1971-73	1981-83	1991-93	2003-05	2006-08
Food grain	367.60	401.60	419.44	477.76	535.89
Pulses	15.07	16.65	13.05	13.31	13.15
Potatoes	25.04	26.28	25.54	55.39	73.70
Vegetables	38.98	31.09	32.15	39.83	53.97
Fruits	48.15	37.53	29.49	31.61	33.70
Fish	31.07	20.67	21.59	34.51	40.82
Meat	9.31	6.79	7.83	8.61	9.86
Milk	31.95	31.95	37.86	41.96	44.38
Eggs	1.83	1.7	1.77	2.52	3.56

Source: Authors' calculation data from, BBS (2008) and FAOSTAT (2010), Food Balance Sheet.

The per capita availability of food grain in Bangladesh shows considerable improvement during the recent years. According to FPMU (2003), the per capita minimum food grain requirement is 454 gms/capita/day. In 2000/01, per capita consumption for the first time has exceeded the per capita requirement (Table 9). This means that there is no consumption gap of food grain in recent years in Bangladesh.

Table 9. National per capita food grain availability and requirement

Period	National availability (gms/capita/day)	Consumption requirement (gms/capita/day)	Consumption gap (gms/capita/day)
1971-72	352.16	454.00	-101.84
1972-73	348.16	454.00	-105.84
1973-74	402.47	454.00	-51.53
1974-75	370.59	454.00	-83.41
1975-76	413.10	454.00	-40.90
1976-77	374.13	454.00	-79.87
1977-78	401.83	454.00	-52.17
1978-79	390.40	454.00	-63.60
1979-80	385.50	454.00	-68.50
1980-81	419.23	454.00	-34.77
1981-82	396.98	454.00	-57.02
1982-83	403.40	454.00	-50.60
1983-84	404.41	454.00	-49.59
1984-85	382.85	454.00	-71.15
1985-86	398.09	454.00	-55.91
1986-87	390.11	454.00	-63.89
1987-88	392.07	454.00	-61.93
1988-89	383.76	454.00	-70.24
1989-90	378.90	454.00	-75.10
1990-91	421.57	454.00	-32.43
1991-92	425.59	454.00	-28.41
1992-93	423.24	454.00	-30.76
1993-94	409.49	454.00	-44.51
1994-95	406.54	454.00	-47.46
1995-96	374.00	454.00	-80.00
1996-97	387.72	454.00	-66.28
1997-98	406.59	454.00	-47.41
1998-99	405.77	454.00	-48.23
1999-00	420.38	454.00	-33.62
2000-01	505.95	454.00	51.95
2001-02	480.38	454.00	26.38
2002-03	486.88	454.00	32.88
2003-04	488.75	454.00	34.75
2004-05	457.65	454.00	3.65
2005-06	465.12	450.00	15.12
2006-07	482.72	450.00	32.72
2007-08	493.11	450.00	43.11

Source: Authors' calculation data from BBS (2008).
Note: '-' indicates the food deficit.

Estimated results of demand function: Before estimate demand function multicollinearity test was done. The results showed no major problems of multicollinearity among the independent variables. The Durbin Watson value of 1.6 which is shown in Table 10 indicates that there is no major problem of autocorrelation. The estimated demand function for rice performs moderately. The coefficient of price elasticity of rice is -0.108 which is insignificant at 10% level (Table 10). It means, if other thing remaining same (factors that shift demand), prices of rice increase 1% then the demand for rice decreases 0.108%.

The income elasticity is 0.199, which is significant at the 10% level and has positive sign. It indicates that if consumer income increases 1%, the demand for rice also increase 0.199%. The price elasticity of demand varies from -0.12 (Ahmed and Shams, 1993) to -1.32 (Pitt, 1983). Alamgir and Berlage (1973) used national time series data in their study and found price elasticity of rice -0.29. Karim (1983) also used national time series data and found rice price elasticity -0.39. Rice price elasticity in Dorosh (1999) study was -0.15, and Talukder (1989) study was -0.73. Price elasticity of wheat in Talukder (1989) study was -0.88. According to Pitt (1983) study, the elasticity of rice was -1.32 for low income group. He also calculated wheat price elasticity which was -0.72. The price and income elasticities that were found from different authors studies are shown in Table 11.

Table 10. Estimated results of demand function for rice

Explanatory variables	Elasticity at mean level	t-values
Constant	4.671	3.382**
PRt	-0.108	-0.839
Y	0.199	2.018*
Method	OLS	
R^2	0.425	
DW statistics	1.601	

Notes: The equation/ 'Income and price elasticities' were estimated from the market demand function by using double log function. Quantity of market demand is the dependent variable.
** Significant at 5% level, * Significant at 10% level.

Table 11. Estimates of price elasticities and income elasticities for rice and wheat in Bangladesh and comparison with other studies

Author	Data	Study type	Own price elasticities		Income elasticities	
			Rice	Wheat	Rice	Wheat
Present study (2007)	1980/81 to 2004/2005	National	-0.108	--	0.199	--
Alamgir & Berlage (1973)	1950/50 to 1969/70	National	-0.29	--	--	--
Mahmud (1979)	--	Survey	-0.39		0.55	
Karim (1983)	--	National	-0.39			
Pitt (1983)	--	High income Low income	-0.83 -1.32	0.06 -0.72		
Rahman (1989)	--	National	-1.18	-0.17		
Talukder (1989)	HES 1981/82	National	-0.73	-0.88		
Ahmed & Shams (1993)	IFPRI, 1991/92	Rural	-0.12	-1.3	0.60	
Dorosh (1999)	--	National	-0.15	--		
Ahmed (1997)	--	National	-0.50		0.35	
Goletti (1994)						
Alam (2005)		Survey			0.04	0.71
HIES (1991)		1983/84 1985/86 1988/89			0.56 0.40 0.30	

It shows from the above studies that depending on the types of data and methods of estimation used, estimates of price elasticities and income elasticities of rice vary widely. For the forecasting of future demand the study used authors' calculated price and income elasticities for rice; and for wheat price elasticity are taken from Talukder (1989) and for income elasticity for wheat taken from Alam (2005).

It is projected that total population will grow at a rate of 1.44 from 2001/02 to 2020/21. It is expected that per capita GDP growth rate/income growth rate is 5.74 per year in 2004/05 to 2020/21 (BBS, 2005). The price of rice and wheat grew at a rate of 0.054 and 0.045 per year in 1980/81 to 2004/05. Income and price elasticities for rice and wheat are 0.199 and -0.108 (Table 10), and 0.71 (Talukder, 1989) and -0.88 (Alam, 2005) respectively. The supply and demand gaps are shown in Table 12.

Table 12. Projected annual rates of growth in food grain requirements, production growth rates, and demand-supply gaps, 2020/21

Food grain	Projected production growth (2004/05-2020/21) (Percent/year)	Projected consumption growth (2004/05-2021) (Percent/year)	Supply-Demand gap (Percent/year)
Rice	2.30	2.59	-0.28
Wheat	3.80	5.56	-1.76

Notes: Projected consumption growth was calculated from the equation (2).

The projected production growth is 2.3% for rice and 3.8% for wheat from 2004/05 to 2020/21. The difference between growth in production and consumption represents the gap of food requirement of the country. A positive figure implies excess supply while a negative figure implies excess demand. So, it is showed from the Table 12 that the both rice and wheat supply-demand gap is negative. Excess demand must be filled up by import.

Conclusions

Domestic food production has an important role to play for food security in Bangladesh. Although the acreage of foodgrain production shrinkage, but production of foodgrain increases due to increase in per acre yield and better management of post harvest losses.

The coefficient of rice price elasticity is -0.108 and the income elasticity is 0.199 both are significant at the 10% level. It is shown from the study that the both rice and wheat supply-demand gap is negative which implies the projected change in demand are greater than supply. This analysis showed that increases in production come mainly from yield increases. So, excess demand should be met up by increasing yield.

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