

Demographic Change, Domestic Availability of Foodgrain and Nutritional Self Sufficiency in Bangladesh

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Bangladesh is the eighth populous country in the world. With about 108.0 million people inhabiting in 143000 sq. km. land. She is the most densely settled rural nation in the world⁽¹⁾. The economy of Bangladesh is overwhelmingly dominated by agriculture. Despite the dominance of agriculture Bangladesh has been suffering from a chronic food deficit. Food production is frequently disturbed by cyclone, monsoon failure and flood. These calamities occur when domestic demand for food is high, generated in part by a population growth rate of about 2.17 per cent per annum⁽¹⁾. Demographic projection showed that Bangladesh will have more than 153.3 million people by the year 2001. Pessimism regarding the capacity of Bangladesh to feed its growing population today and in the future have been strengthened. Without the progress in agriculture, long range food demand cannot be met unless rapid population growth is curbed.

The study reported here analyses the domestic production of food grain (rice and wheat) and population situation in Bangladesh over the period 1981-82 to 1990-91. Trends of foodgrain production and population growth are examined and

compared and their implications on calorie consumption are presented. Availability of food from domestic production and requirements and deficits of foodgrain are computed and area of production and yield per acre of foodgrain for self sufficiency are analysed.

Materials and Methods

Population, domestic production of foodgrain and area and yield per acre of foodgrains are the basic data for the study. population, domestic production of foodgrain, area, yield per acre, availability, requirements, production with self sufficiency and deficiency are the dependent variables and time period is the explanatory variable of this study. The data has been collected from BBS (1,2).

The total production of foodgrain (rice and wheat) in a country at time t is obtained by

$$Q_{jkt}^p = \sum \sum A_{jkt} \times Y_{jkt} \dots \dots \dots (1)$$

- Where : A = Area in acres ;
- Y= Yield in Mt/acre ;
- J= All varieties of rice ;
- K = All varieties of wheat ;

Total availability of foodgrain from domestic production in a country at time t is provided by

$$Q_t^a = \sum_j \sum_k [Q_{jkt}^p - W_{jkt} - S_{jkt}] \dots\dots\dots(2)$$

Where :

Q_{jkt}^p = Total production of foodgrain grown in the country at time t identified by j & k ;

W_{jkt} = Wastage of foodgrains at time t identified by j and k ;

S_{jkt} = Seeds preserved for the foodgrains at time t identified by j and k ;

j = All varieties of rice ;

k = All varieties of wheat ;

Percapita annual availability of foodgrain from domestic production at time t is calculated by

$$Q_t^a = Q_t^a / N_t \dots\dots\dots(3)$$

Where

Q_t^a = Total availability of foodgrain at time t ;

N_t = Total population at time t.

Average annual requirement (edible quantity only) of foodgrain at time t can be estimated as follows :

$$Q_t^r = (2273 \times 0.7) / 3.51 \times 365 \times N_t = 165,456 N_t \dots\dots\dots(4)$$

Where :

2273 = Average required caloric (3) (person/day) ;

0.7 = Assuming 70 % of the food energy in the average diet in Bangladesh is provided by foodgrain (rice and wheat) ;

3.51 = Average caloric (per gram) of rice and wheat ;

N_t = Total population at time t ;

Deficit of foodgrain at time t is predicted by

$$Q_t^d = Q_t^r - Q_t^a \dots\dots\dots(5)$$

Where :

Q_t^r = Average annual requirement at time t ;

Q_t^a = Total availability of foodgrain from domestic production at time t ;

Production of foodgrain for self sufficiency with respect to the population is estimated by

$$Q_t^{S_N} = [1 + (W_{jkt} + S_{jkt}) / 100] \times Q_t^r \dots\dots\dots(6)$$

Where :

W_{jkt} = Wastage of foodgrain ;

S_{jkt} = Seeds preserved for foodgrain ;

Q_t^r = Average annual requirement ;

Population for self sufficiency with respect to the present foodgrain production is computed by

$$N_t^{S_N} = Q_t^a \times N_t / Q_t^r \dots\dots\dots(7)$$

Where:

Q_t^a = Total availability of foodgrain at time t ;

N_t = Total population at time t ;

Q^f_t = Average annual requirement of foodgrain at time t;

Caloric of foodgrain can be estimated by

$$Q^k_t = [Q^{a}_{jkt} - Q^{i}_{jkt}] \times C_{jk} \dots\dots\dots (8)$$

Where :

Q^{a}_{jkt} = Availability of foodgrain at time t identified by j and k;

Q^{i}_{jkt} = Inedible part of foodgrain identified by j and k;

C_{jk} = Conversion factor of Kcal (4) identified by j and k;

j = All varieties of rice

k = All varieties of wheat ;

Average intake of caloric can be estimated by

$$Q^{Ak}_t = \sum_j \sum_k Q^k_{jkt} / N_t \dots\dots\dots(9)$$

Where:

Q^k_{jkt} = Estimated caloric of foodgrain at time t identified by j and k

N_t = Total population at time t;

j = All varieties of rice;

k = All varieties of wheat

Results

Table 1 depicts the area of foodgrain in acres, yield per acre and there annual growth rate during the period 1981-82 to 1990-91 Annual growth rate of area of rice and wheat were found to be -0.4 and 0.09 respectively.

Rate of yield per acre were 2.1 and -2.0 respectively. The combined growth rate of area and yield of rice and wheat were found to be -0.4 and 1.8 respectively.

Table 2 shows the population, domestic production of foodgrain, availability, requirement and deficit of foodgrain. It also shows the estimated domestic production, population, area and yield per acre of rice and wheat for self-sufficiency in Bangladesh during the period 1981-82 to 1990-91. Since production level very from year to year, trends of production, expressed as annual rates of growth, need to be computed. Over 10 intervening years, total population and estimated population for self-sufficiency increased by 25% and 14%, implying an average annual growth rate of 2.5% and 1.4% respectively. Significant difference in the growth

rate between two groups was noted. Production of foodgrain increased at the rate of 1.4% per year. This performance was significantly exceeded by estimated production for self-sufficiency (2.5%). It is remarkable that annual growth rate of deficit (15.1%) was found to be higher in proportion than the others. Estimated annual growth rate of area in acres and yield per acre for self-sufficiency were found to be 0.07% and 2.9% respectively. Annual growth rate of production, total availability and estimated population for self-its caloric equivalent over 10 intervening years. Annual growth rate of intake of foodgrain and caloric intake were found to be -1.1%.

Table 1 : Area of production, yield per acre and annual growth rate of foodgrain.

Year	Rice		Wheat		all grain	
	Acreage (^{'000} acre)	Yield (^{'000} M.ton) per acre	Acreage (^{'000} acre)	Yield (^{'000} M ton) per acre	Acreage (^{'000} acre)	Yield (^{'000} M.ton) per acre
1981-82	25847	0.527	1465.771	0.745	27312.771	0.539
82-83	26159	0.543	1283.445	0.854	27442.445	0.558
83-84	26064	0.557	1299.755	0.932	27363.755	0.575
84-85	25263	0.579	1670.765	0.876	26933.765	0.597
85-86	25696	0.585	1335.140	0.780	27031.14	0.595
86-87	26217	0.589	1445.00	0.755	27662.00	0.598
87-88	25507	0.604	1476.290	0.710	26983.29	0.610
88-89	25265	0.615	1384.030	0.738	26639.03	0.622
89-90	25192	0.628	1390.535	0.723	26582.525	0.633
1990-1991	25119	0.641	1397.071	0.708	26516.071	0.645
Annual growth rate	-0.4	2.1	0.09	-2.0	-0.4	1.8

Note : / e estimates and projections as of June, 1991

Annual rates of growth were computed by ordinary least-square regression of a logarithmic transformation of annual levels of production over time, using the following formula.

$$Q = Ac^{bt} \text{ or, } \log_e Q = A + bt$$

Where Q = Quantity on the trend line

A = quantity product at time O.

e = natural logarithm,

b = annual rate of growth

t = number of year from time O.

Table 2 : Population, availability of foodgrain from domestic production , requirement, Deficit and self sufficiency of Bangladesh (1982-1991).

Year	POPULATION (Million)	Total production of Foodgrain ('000 M.ton)	Total Availability ('000 m.ton)	Requirement ('000 m.ton)	Deficit ('000 m. ton)	Production for self sufficiency w.r.t. population ('000 m.ton)	Estimated population for self sufficiency w.r.t.0.The present, production	Estimated acreage for self sufficiency ('000 Acre)	Estimated yield for self sufficiency ('000 m.ton)
	N_t	Q_t^p	Q_t^a	Q_t^r	Q_t^d	Q_N^s	N_t^s	Q_N^s / Y_t	Q_N^s / A_t
1981-82	92.1	14721.6	14349.5	15238.5	889.0	16067.5	86.7	29809.833	0.588
82-83	94.4	15312.9	14922.2	15619.1	696.9	16468.8	90.2	29513.785	0.600
83-84	96.8	15734.2	15339.8	16016.2	676.4	16887.5	92.7	29369.565	0.617
84-85	99.2	16079.5	15669.14	16413.3	721.9	17306.2	94.8	28988.61	-.643
85-86	101.7	16083.5	15676.9	16826.9	1150.0	17742.3	94.7	29818.992	0.656
86-87	104.1	16541.9	16124.7	17223.9	1099.2	18160.9	97.5	30369.398	0.657
87-88	106.6	16459.8	16048.5	17637.6	1589.1	18597.1	97.0	30487.049	0.689
88-89	109.1	16569.5	16151.1	18051.3	1900.2	19033.3	97.6	30600.161	0.714
89-90	113.0	16826.7	16411.2	18696.6	2285.5	19713.7	99.2	31141.548	0.742
90-91	115.5	17102.9	16669.4	19110.2	2448.8	20149.8	100.7	31240.0	0.760
Annual growth rate (%)	2.5	1.4	1.4	2.5	15.1	2.5	1.4	0.7	2.9

Note : $1 Q_t^a$ Deduction for seeds, wastage, etc./ has been taken as 2.43% of total production of rice and 3.01% of total production of wheat (Master Survey of Agriculture).

Table 3 : Average food and caloric intake (person/day) from domestic production of foodgrain (rice and wheat).

Indicators	1981-82	82-83	83-84	84-85	85-86	86.87	87-88	88-89	89-90	90-91	Annual growth rate (%)
Food intake (gm)	427	433	434	433	422	424	413	406	398	395	-1.1
Catorie intake (Kcal)	1499	1520	1523	1520	1441	1488	1450	1425	1397	1386	-1.1
% of require ment (2273 Kcal Xo.70)	94.2	95.5	95.7	95.5	93.1	93.5	91.1	89.6	87.8	87.1	-1.4

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Food intake (g/p/d)	418.5	14.66
calorie intake (p/d)	1468.9	51.52

Discussion

Domestic production of foodgrain has failed to keep up with demand generated by rapid population growth over the past decade. As a result, there has been a perceptible decline of foodgrain availability and consumption. Availability from domestic production and requirement were found to be parallel. Population distribution and changing patterns of foodgrain production over the past one decade have led to a remarkable narrowing in the gap of per capita availability from domestic production. If this trend continues, the deficit of foodgrain will continue. Average consumption of foodgrain was 418 ± 14.66 (gram per person per day) against 452 gm (From equ. 4) to provided 1468.9 Calories. The deficit from this source was 34.5 gm (121.1 Kcal) per person per day.

Regardless of the performance in agriculture, long range food demand cannot be met without immediate, substantial and sustained reduction of population growth rate. Albeit the disappointing annual growth rate of population (2.5%) remain steady, it is quite encouraging that self-sufficiency of foodgrain might be obtain, if the annual growth rate of production of foodgrain would be increased from 1.4 % to 2.5 %. Alternatively, if the annual growth rate of area of production could be increased from -0.4 % to 0.7% or annual growth rate of yield per acre could be increased from 1.8% to 2.9%, then the country might attain the self-sufficiency in foodgrain.

Summary

The paper reports the findings of a comparative study conducted to determine

the relationship among demographic change, trend of foodgrain production, availability from domestic production, requirements, deficit, area under foodgrain, yield per acre and estimated domestic production of foodgrain for self-sufficiency in Bangladesh for 1981-82 to 1990-91. Disappointing annual growth rate of population and domestic production of foodgrain were found. It is observed that if the annual growth rate of production of foodgrain would be increased from 1.4% to 2.5% or population growth rate could be reduced from 2.5% to 1.4% or annual growth rate of area of production could be increased from -0.4% to 0.7% or annual growth rate of yield per acre could be increased from 1.8% to 2.9%, then the country might attain the self-sufficiency in foodgrain.

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