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Analysis of crop sector diversification in Bangladesh

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Abstract

This study has examined the extent of diversification in the crop sector of Bangladesh using the Simpson Index of diversity. Results show that the extent of crop diversification has increased in the country slowly over time. Meanwhile, the value of specialization index in rice cultivation has slowly declined. The diversification in crop sector was accompanied by diversity in the pattern of consumption of the people. The extent of crop diversification was promoted mainly through a steady increase in the intensity of cropping. This can be further enhanced with the introduction of new production technologies for secondary crops. There is also a need to expand the horizon of appropriate processing techniques and value addition facilities for promoting the pace of diversification of consumption in the country.

Keywords: Crop sector, Simpson Index of diversity, Specialization Index, Income elasticity of demand, Diversification of consumption

Introduction

The new seed-fertilizer-irrigation technology has favoured rice and wheat production for achieving self-sufficiency in food grains. As a result, production of food grains has increased at an annual growth rate of 2.8% over the last 31 years mainly due to research and development efforts since 1970s. Meanwhile, secondary crops including coarse grains, pulses, roots and tubers, oil seeds, and spices that occupy a significant portion of the cropped area became less attractive. These crops grown in less favoured environments were largely untouched by the growth process. As a result, production of some of these crops, for example, some minor food grains, pulses, oil seeds and spices have either exhibited a declining trend or could not keep pace with the population growth rate over the years. Eventually the country became more dependent on imports of these secondary crop products. Currently there is a strong realization for promotion of these crops in the country for import substitution and export promotion. These crops provide substantial opportunities for value addition after processing and creation of employment for men and women. Moreover, a shift of emphasis form rice monoculture to a large mix of major and minor crops cultivation is likely to reduce the process of environmental degradation. Thus there has been a growing concern for crop sector diversification.

Conceptually, diversification of agriculture is considered as a shift of resources from rice to other cereal crops, from cereals to non-cereal crops, and from crops to non-crop (livestock, fisheries and forestry) agriculture. Farmers normally intend to diversify to minimize risk, stabilize income over seasons, optimize the use of land and other resources, maximize the portfolio of income and profit, change the food habit, increase protein intake, improve food security, promote export, substitute import, conserve natural resources, create employment opportunity and alleviate poverty. Diversification may not always imply movement of resources from low value commodity mix to a high value commodity mix, as it can increase the magnitude of specialization at the farm level and reduce the extent of diversity.

The main objective of this study is to determine the magnitude of crop sector diversification and to explore policy implications for its promotion in Bangladesh.

Materials and Methods

A number of methods have been used to quantify the magnitude of diversification. They include: (i) Herfindal Index, (ii) Simpson Index, (iii) Ogive Index, and (iv) Composite Entropy Index (Joshi, *et al.*, 2003). With a view to assessing the degree of diversity in crop sector, Simpson Index was used in this study. The index is simple and provides a clear dispersion of crop agriculture in a particular region. The index ranges between 0 and 1. When there is complete diversification, the value of the index moves towards 1. The index was constructed as follows:

$$SID = 1 - \sum_{i=1}^{n} P^2_i$$

where SID is the Simpson Index of diversity and P_i is the proportionate area of íth crop in the gross cropped area. Several factors influence the nature and speed of diversification from staple food crop to other crops. These factors include rapid technological change in other crops, diversification in food demand, and improvement in rural infrastructure. To determine the speed of diversification in favour of a particular crop, annual growth rates of area, production and yield of that crop were examined.

The magnitude of diversification obtained by using Simpson Index was again examined from a different angle. This was done by calculating the extent of concentration in rice cultivation over the years. The `specialization index' (SP) was of the following form:

$SPij = Rij / Ri, \quad Rij = Aij / \Sigma Aij, \quad Ri = Ai / \Sigma Ai$

SPij : Specialization index of commodity i in region j
Rij : Proportion of commodity i in harvested area in region j
Ri : Proportion of commodity i in harvested area in whole country
Aij : Harvested area of commodity i in region j
Ai : Harvested area of commodity i in whole country

If SPij is more than 1, it means region j is specialized in commodity i in the country (Alam, 2004a).

The main resource in crop agriculture is land and the degree of diversification or concentration is reflected on the pattern of utilization of cultivated land. It is expected that land would be judiciously shared by a large number of crops under complete diversification. For this study, data on the allocation of land to different crops were gathered from BBS (Various Years) and MOA (2003). These data on the allocation of land were then analyzed for three points of time covering the last three decades. The years chosen for this analysis were normal crop years, free from natural hazards.

The diversification of crop agriculture depends, among other things, on the demand for secondary crops products. This was determined by using the anticipated population growth rate, growth rate of income and income elasticity of demand for these crops. The income elasticity of demand was computed from cross section consumption figures obtained through the Household Income and Expenditure Survey 2000 (BBS, 2003).

Results and Discussion

Simpson Index of diversity

This study assembled secondary data of land use over different crops for a period of 31 years from the Bangladesh Bureau of Statistics (BBS). For computation of SID, all crops grown in Bangladesh were grouped into eleven categories. They include rice, wheat, minor grains (maize and millets), pulses, tubers, oil seeds, spices, vegetables, sugarcane, jute, and other crops. Calculated SID for three normal years of the three decades showed an upward trend over time, from 0.37 in 1972-73 to 0.42 in 1989-90, and 0.43 in 2001-2002 (Table 1). Again, forty four crops including all secondary crops were considered individually for SID computation without arranging them into groups. Time series data on land area under operation for different crops were taken from the Ministry of Agriculture (MOA, 2003). The analysis also showed that SID for the country slowly moved upward from 0.753 in 1971-72 to 0.768 in 2001-02 with fluctuation in different years. The values of SID averaged 0.755 for the seventies, 0.782 for the eighties and 0.784 for the nineties including first two years of the new millennium (Table A-1). This result supports Alam (2003) and Rahman *et al.* (2004), but contradicts Joshi, *et al.* (2003), who observed a downward movement of Simpson Index of crop diversity in Bangladesh. While it is recognized that Bangladesh has specialized in rice production over the years and about three-fourths of the area in the country is now under rice, it is also observed that within rice there is substantial diversity and the remaining one-forth is highly diversified.

Table 1. Share (%) of different crops in total cropped acreage and SID over time

Crops	1972-73	1989-90	2001-2002
Rice	78.76	75.66	75.05
Wheat	0.98	4.28	5.54
Minor grains	0.78	0.63	0.79
Total grains	80.52	80.57	81.39
Pulses	2.57	5.32	3.34
Oil seeds	2.14	3.33	3.21
Spices	1.25	1.08	1.88
Vegetables	0.85	1.17	1.82
Tubers	1.17	1.22	2.06
Sugarcane	1.05	1.35	1.21
Jute	7.34	3.91	3.41
Others	0.03	0.62	1.68
Cropping intensity	144.95	168.44	177.00
SID	**0.37**	**0.42**	**0.43**

Source: BBS (Various Years), MOA (2003) and author's calculation.

Specialization Index

Results obtained from calculation of SID were verified by calculating Specialization Index (SP). Results of SP by region are placed in Table 2 for two agricultural census years, 1983-84 and 1996. It appears from the table that Chittagong division was specialized in rice cultivation in 1983-84, when SP values for other three divisions were close to 1. The value of SP for the country ranged between 0.94 and 1.19 by divisions. These values have slowly declined in 1996 with SP values ranging from 0.80 to 1.14 in greater 4 divisions of the country. These results are consistent with our earlier results on crop diversification obtained from Simpson Index of diversity (SID).

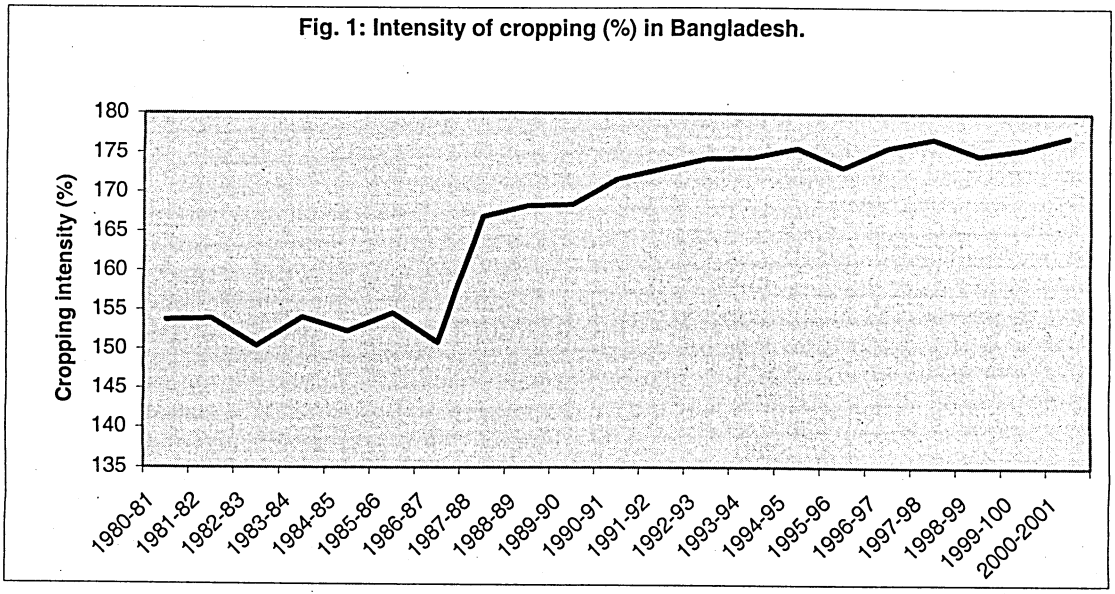
Table 2. Specialization index of rice cultivation in Bangladesh by region

Division	Value of index	
	1983-84	1996
Chittagong	1.19	1.14
Dhaka	0.94	0.80
Khulna	0.97	0.89
Rajshahi	0.98	0.97

Source: MOA (2003).

Crop diversification is promoted by area augmentation and crop substitution. Bangladesh does not have much fallow lands for utilization and the total area under cultivation has been declining in recent years (from 9.32 million hectares in 1983-84 to 8.29 million hectares in 1996; that means 235 hectares per day) (BBS, 1999). The intensity of cropping has, however, been increasing steadily over time (Fig. 1). This is certainly an important source of crop diversification. The other source of diversification is crop substitution. Over the years, area under rice and jute has declined, but the area under wheat and potatoes has increased (Table A-4). This is likely to proceed further if special policies are framed favouring the cultivation of secondary crops. It was observed during a field visit that those who diversify and cultivate their land most intensively are small farmers. They diversify their cropping pattern mainly to minimize risk and satisfy their consumption needs. Since most farmers in Bangladesh are small, diversification has been promoted in this country over the years due to pressing needs of the farmers. This can be further promoted by providing special extension services, supply of quality seed and other inputs, and credit support to the small farmers.

Fig. 1: Intensity of cropping (%) in Bangladesh.



Diversification of Consumption

Diversification of agriculture may be promoted through diversification in food consumption. For that reason the pattern of consumption of Bangladeshi people was examined from estimates given by household income and expenditure surveys over the nineties. The data have been summarized and placed in Table 3. It appears that considerable diversification has taken place in consumption of people during the last decade. The share of rice and wheat in total food basket has declined, while the share of potato and pulses has increased. This may lead to further diversification of crop agriculture in future, if there are enough incentives to cultivate non-cereal crops. Currently potato growers are expanding production through an increase in area and yield mainly due to a break through in the technological front. It indicates that there is a need to introduce appropriate technologies and create suitable institutions and infrastructure to accelerate the pace of diversification.

Recent market liberalization could have a positive impact on diversification through promotion of export and increase in prices of secondary crop products. But in the absence of appropriate processing techniques and value addition facilities that could not happen. Table A-2 shows that prices of all secondary crop products (maize, millets, lentil, potato and sweet potato) have declined in the world market and the magnitude of decline in real prices (in US dollar) was higher in Bangladesh. In the case of sweet potato, however, real prices showed an upward trend, but the area under this crop declined. The evidence suggests that a sort of domestic market adjustment may be required to support diversification. Moreover, appropriate measures would be needed to avail opportunities of diverse agriculture in several directions: geographically (increasing the magnitude of intensive cultivation in areas suitable for secondary crop production), horizontally (increasing the spread of secondary crop cultivation), and vertically (increasing agro-processing opportunities for value addition). Besides, marketing network has to be established at home and abroad for increasing the demand for consumption of secondary crop products, which will ultimately encourage their domestic production.

Table 3. Average per capita daily intake of major food items (in grams).

Food Item	1991-92			1995-96			2000		
	National	Rural	Urban	National	Rural	Urban	National	Rural	Urban
Rice	472.8	481.6	416.0	464.3	479.0	390.3	458.54	478.84	372.66
Wheat	36.3	34.6	47.1	33.7	32.4	40.1	17.24	14.00	30.12
Potato	43.7	41.4	58.3	49.5	46.7	64.4	55.45	54.71	58.38
Pulses	17.9	17.3	21.7	13.9	12.9	19.4	15.77	14.97	19.04
Vegetables	137.4	135.3	150.9	152.5	154.4	142.9	140.47	141.11	137.92
Edible Oil	10.1	9.0	16.4	9.8	8.4	17.0	12.82	11.24	19.11
Onion	11.9	11.2	17.0	11.6	9.9	20.2	15.41	14.08	20.72
Beef	5.2	4.5	9.9	6.6	4.9	15.0	8.30	6.87	13.98
Mutton	0.9	0.8	1.3	1.0	0.8	1.6	0.49	0.43	0.71
Chick-duck	2.0	1.9	3.1	4.0	3.4	7.5	4.50	3.52	8.41
Egg	4.7	4.6	5.8	3.2	2.6	5.9	5.27	4.61	7.89
Fish	34.5	32.5	47.8	43.8	42.2	51.7	38.45	37.83	40.89
Milk	19.1	18.5	23.2	32.3	30.3	42.1	29.71	28.99	32.59
Fruits	16.9	15.9	23.4	27.6	25.3	39.8	28.35	26.53	35.63
Sugar/Gur	8.8	8.5	10.8	9.2	9.1	10.1	6.85	6.37	8.78
Others	64.0	60.5	85.7	50.9	48.2	64.6	55.44	54.58	54.86
Total	**886.2**	**878.1**	**938.4**	**913.9**	**910.5**	**932.6**	**920.06**	**898.68**	**861.69**

Source: (BBS, 2003).

Income Elasticities and Demand for Secondary Crops

Using 2000 Household Expenditure Survey (GOB, 2003a) data, this study has estimated income elasticity of demand for products from secondary crops. Overall income elasticity of demand for those products was less than one. The estimates of income elasticity of demand for pulses and tubers were 0.42 and 0.23, respectively and the estimate for maize, burley and millets together was 0.62. The elasticities were high for lentil (0.89) and mung bean (0.98), moderate for fruits (0.63) and oil (0.58), low for vegetables (0.16) and gram (0.04), and negative for lathyrus (-0.26).

The elasticities are quite low for cereals (Table 4). With the achievement of self-sufficiency in rice production in recent years, the elasticities for rice and wheat have declined. These are likely to decline further towards the end of this decade. But the elasticities for other cereals, such as maize and millets are likely to increase slightly with the creation of facilities for value addition and development of livestock and food processing industries in the country.

A demand projection of some selected crops was made for the year 2010, which was based on growth rate of population, economic growth and income elasticity of demand. For population estimates, we used inter-census growth rate of 1.5% per annum between 1991 and 2001 as the base that declining to 1.4% in 2005 and further to 1.3% in 2010. The aggregate per capita annual income growth was about 3.5% for ten years ended in June 2000. This growth rate is likely to continue through 2005 and will increase at 4% thereafter. Under such a situation, the required growth rate in production of maize and millets by the year 2010 would be 3.65%, the highest among cereals. Recent growth records for maize is quite impressive, but very disappointing for millets.

Table 4. Income elasticities of demand for selected secondary crops and required growth rates in production to meet the domestic demand

Crops	Income elasticities		Required growth rates (%)		Recent growth rates (%)
	2000 (Actual)	2010 (Projected)	2001-2005	2006-2010	
All cereals	0.08	0.04	1.68	1.46	2.70
Rice	0.04	0.02	1.41	1.38	3.63
Wheat	0.71	0.35	3.88	2.70	5.65
Other cereals (Maize and millets)	0.62	0.65	3.57	3.65	-0.93
All Pulses	0.42	0.31	2.87	2.54	-3.72
Lentil	0.89	0.72	4.51	4.18	-3.04
Lathyrus	-0.26	0.01	0.49	1.34	-1.99
Gram	0.04	0.04	1.41	1.46	-17.41
Mung	0.93	0.75	4.65	4.30	0.84
Other pulses	0.15	0.11	1.93	1.74	-0.57
Tubers	0.23	0.15	2.21	1.90	7.63
Vegetables	0.16	0.12	1.96	1.78	3.64
Oil and Fat	0.58	0.52	3.43	3.38	-1.40
Fruits	0.63	0.55	3.61	3.50	0.24

Income elasticity of demand for pulses has declined from 0.64 in 1995-96 to 0.42 in 2000. This will decline further to 0.31 in 2010. With increase in income, people will prefer consumption of more fish and livestock products to satisfy their protein requirements. As a result, the demand for lentil, mung and other pulses are likely to decline. But the income elasticity of demand for lathyrus will increase due to its increased use as feed. Thus the annual growth rate in production of each type of pulses has to be maintained between 1.34% and 4.30%, at per or well above the population growth rate, if the increased demand has to be met from domestic production. Currently production of all pulses, except lentil and mung, has been experiencing a negative growth rate.

The elasticity for roots and tubers has declined to 0.23 in 2000 from 0.41 in 1995-96. This is likely to decline further at 0.15 in 2010. This gives a required production growth rate of 1.9% over the next few years, much below the annual growth rate of 7.63% achieved during the last decade.

The elasticities for vegetables, oil and fat, and fruits have declined over the years. But till today, oil and fruits have moderately high income elasticity of demand. Their recent average growth rates of production are much below the anticipated required annual growth rates.

It appears that the current growth rates in production of maize, tubers and vegetables are matching with the required growth rates in demand for those products. But special promotional and incentive schemes are necessary to boost up production of pulses, oil seeds, fruits and millets, as the current growth rates for these products are well below the required growth rates.

Bangladesh is now self-sufficient in cereal production. Recent dietary pattern (Table A-3) suggests that a significant reduction in cereal consumption and production is desirable. At the same time, we need to increase production of vegetables, pulses, edible oil, fruits, sugar crops, fish, meat, eggs and milk. Because, we have a huge deficit in these consumable items. It is possible to have a significant increase in production of these crops and non-crop agricultural products provided new technologies are generated and policies are framed conducive to diversification.

Crop Diversification Project

Due to the priority given to the production of food-grain crops, particularly to rice, the acreage and production of non-cereal crops declined in 1970s and in 1980s. It was then felt necessary to give special attention to some selected non-cereal crops, such as tubers, pulses and oils for diversified consumption as well as import substitution. Consequently, a Crop Diversification Project (CDP) was undertaken jointly by the Government of Bangladesh and the Ministry of Development Cooperation of the Government of Netherlands, and the Canadian International Development Agency (CIDA) in 1989. The project had three main implementing agencies namely, Department of Agricultural Extension (DAE), Department of Agricultural Marketing (DAM) and Bangladesh Agricultural Research Institute (BARI). A number of crops included in the programme were:

Tubers	:	potato, sweet potato, aroid;
Oilseeds	:	mustard and rapeseed, groundnut, sesame, sunflower, soybean;
Pulses	:	lentil, black gram, mung bean, chickpea, field pea, cow pea and pigeon pea.

The effect of CDP on production of few secondary crops was positive. There was a modest increase in potato production, which was attributed to growth in acreage and yield. The yield of pulses and oilseeds had also increased mainly due to adoption of improved production practices. These crops gave significantly higher yield in 130 upazelas covered by the project (Alam, 2004) than their national average yield. Nevertheless, the growth in total production of some of these crops remained very insignificant due to limited extension of these crops and a decline in acreage (Table A-4). The work of the project is still in progress under financial assistance of the government. Such programmes are likely to be extended in future as Government policies are currently favouring diversification of the crop sector in Bangladesh.

Public Policies on Diversification

Government of Bangladesh has been encouraging diversification of agriculture in recent years. The Ministry of Agriculture in its agricultural policy document (GOB, 1999) stated that the crop production system dominated by rice is neither scientific nor acceptable from the economic point of view. The Ministry, therefore, emphasized the necessity of increasing the cultivation and production of other crops. The policy of Bangladesh government in this respect was also reflected in another document prepared earlier by the Planning Commission in which emphasis was given on increasing area and production of potato, sweet potato, pulses, oil seeds, spices, maize and millets (GOB, 1998).

The Fifth Five Year Plan (1997-02) has categorically mentioned the desire of the government to introduce diversified cropping systems in order to free upland areas in winter season for non-rice crops. The *plan* envisaged crop rotation with shallow rooted crops by deep rooted ones and legumes followed by non-legumes to enrich and maintain soil fertility. Besides, the *Plan* intended to promote diversification of cropping pattern to enhance farmers' income and to help maintain a better soil structure for long term sustainability. The draft poverty reduction strategy paper (PRSP) of the Ministry of Finance (GOB, 2003a) has also advocated for agricultural diversification with a view to rural employment generation and poverty alleviation in the country.

In spite of policy support and constant encouragement from the government for diversification, the index of diversification appeared to have achieved low level of scores over the years. Lack of technological advancement is the main constraint to diversification of crops. In order to accelerate technological progress, genetic upgradation of minor crops and development of HYVs would be urgently required for higher productivity in near future.

Conclusion

Diversification of agriculture is persuaded to minimize risk, stabilize income, change the food habit, increase protein intake, promote export, substitute import, create employment opportunities and alleviate poverty. In Bangladesh, diversification of agriculture has been promoted slowly over time. As a result, diversification of food consumption has also been promoted. There is a need to expand appropriate processing techniques and value addition facilities to further promote the pace of diversification of consumption in future. It is also necessary to introduce new production technologies and create suitable institutions and infrastructure to accelerate the pace of diversification of products in the country.

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Appendices

Table A-1. Values of Simpson Index of Diversity over time

Year	SID	Average of decade
1971-72	0.753535	
1972-73	0.782523	
1973-74	0.756836	
1974-75	0.752394	
1975-76	0.739617	
1976-77	0.740509	
1977-78	0.753944	
1978-79	0.75936	
1979-80	0.757601	0.755147
1980-81	0.758371	
1981-82	0.754825	
1982-83	0.758936	
1983-84	0.784475	
1984-85	0.795371	
1985-86	0.79119	
1986-87	0.794423	
1987-88	0.800292	
1988-89	0.79003	
1989-90	0.788354	0.781627
1990-91	0.788784	
1991-92	0.78412	
1992-93	0.780957	
1993-94	0.787816	
1994-95	0.785125	
1995-96	0.778808	
1996-97	0.780059	
1997-98	0.793852	
1998-99	0.800989	
1999-00	0.791123	
2000-01	0.769552	
2001-02	0.768551	0.784145

Table A-2. Trend growth rates for real prices of CGPRT crops in the international market compared with Bangladesh during 1991-2001

Crops	Market location	Annual growth rate (%)
Maize	USA	-4.83
	India	-3.23
	Bangladesh	-4.42
Millets	USA	-3.37
	India	-4.44
	Bangladesh	-1.37
Lentil	USA	-0.34
	Turkey	0.33
	Nepal	0.20
	Bangladesh	-0.48
Potato	USA	-2.67
	Netherlands	2.16
	Bangladesh	-5.09
Sweet potato	USA	-0.78
	Australia	-1.64
	Bangladesh	1.90

Note: Growth rates have been calculated by fitting semi-logarithmic trend lines.
Source: FAO.

Table A-3. Current dietary pattern in Bangladesh compared with an expected pattern

Food items	Adequate intake [1] (grams)	Target intake[2] (grams)	Current intake[3] (grams)	Minimum required intake (grams)	Energy		Food gap (%)
					Kcal	%	
Cereals	490	372	475.8	450	1555.2	70.2	-5.7
Tubers	100	130	70.9	70	61.7	2.8	-1.3
Vegetables	125	132	140.5	150	65.8	3.0	6.3
Pulses	30	66	15.8	30	105.0	4.8	47.3
Edible oil	20	38	12.8	20	180.0	8.2	36.0
Fruits	50	57	28.4	50	50.0	2.3	43.2
Sweeteners	10	28	6.85	10	40.0	1.8	31.5
Fish	45	50	38.5	60	60.0	2.7	35.8
Meat	20	22	13.3	30	33.0	1.5	55.7
Eggs	14	7	5.3	10	16.7	0.7	47.0
Milk	30	47	29.7	50	32.6	1.5	40.6
Total	934	949	837.8	930	2200	100	9.9

[1]Bangladesh National Nutrition Council, Dhaka.
[2]Ministry of Food, Dhaka.
[3]BBS (2003).

Table A-4. Long-term growth rates in area, yield and production of some major and secondary crops in Bangladesh

Crops	1971-1980			1981-1990			1991-2002			1971-2002		
	Area	Yield	Production	Area	Yield	Production	Area	Yield	Production	Area	Yield	Production
Rice	0.83	2.52	3.35	-0.15	2.90	2.75	0.63	2.89	3.52	0.18	2.44	2.62
Wheat	16.91	11.49	28.40	1.07	-2.93	-1.85	3.40	2.10	5.50	6.32	2.27	8.59
Other cereals	-3.39	-0.81	-4.19	2.45	0.20	2.65	-1.92	0.99	-0.93	-0.05	0.28	0.23
Maize	-4.37	-3.95	-8.32	3.88	7.31	11.19	20.51	17.31	37.82	7.97	7.15	15.12
Millets	-2.44	-0.79	-3.24	2.57	0.32	2.89	-1.65	-0.09	-1.74	0.98	0.08	1.06
All cereals	1.21	2.81	4.02	-0.06	2.53	2.47	0.81	2.85	3.66	0.40	2.41	2.81
Pulses	-4.05	3.79	-0.26	8.46	0.37	8.84	-4.75	1.03	-3.72	2.28	1.16	3.44
Lentil	3.48	-2.52	0.98	9.58	1.85	11.43	-2.76	0.19	2.57	4.45	0.81	5.26
Mung	1.05	-3.68	-2.65	12.97	-0.02	12.98	-0.84	1.68	0.83	5.87	0.01	5.97
Lathyrus	1.42	-1.64	-0.22	9.69	-0.56	9.13	-3.27	1.28	-1.99	4.10	0.27	4.37
Black gram	-0.55	-1.91	-2.45	4.17	0.93	5.10	-10.09	-0.69	-10.78	-0.24	-0.06	-0.30
Gram	-1.27	-0.74	-2.03	0.56	-0.07	0.49	-17.52	0.11	-17.96	-0.11	-0.00	-0.11
Tubers	2.0	-0.04	1.96	-0.39	-0.80	-1.19	6.09	1.54	7.63	1.55	0.57	2.12
Potato	2.91	-0.95	2.72	1.23	-0.64	0.59	8.12	1.60	9.72	3.22	0.92	4.14
Sweet potato	0.83	0.22	1.05	-3.58	-0.98	-4.56	-214	-0.61	-2.75	-2.32	-0.49	-2.80
Oilseeds	0.79	0.35	1.14	7.06	-2.21	4.85	-2.89	1.02	-1.88	2.36	0.46	2.82
Vegetables	1.99	-0.46	1.53	2.7	-0.33	2.37	3.85	-0.22	3.63	2.80	0.06	2.86
Spices	-0.23	-1.21	-1.44	-0.40	1.19	0.79	5.66	-3.28	2.38	0.75	0.00	0.75
Tea	-0.28	0.27	-0.01	0.78	0.16	0.94	0.23	0.44	0.67	0.47	1.18	1.66
Cotton	-4.67	3.53	-1.14	0.01	3.89	3.9	7.49	-10.44	-2.95	7.80	3.04	10.84
Jute	-0.70	2.34	1.64	-1.56	1.31	-0.25	-2.06	1.31	-0.75	-1.73	1.37	-0.36
Sugarcane	1.06	0.79	1.85	1.65	-1.08	0.57	-1.23	0.04	-1.19	0.93	-0.33	0.60
Fruits	1.42	-1.46	-0.04	0.91	-0.59	0.32	0.98	-0.74	0.24	1.14	-0.87	0.27
Tobacco	1.83	0.65	2.48	-3.29	-1.08	-4.37	-2.24	2.05	-0.19	-1.83	0.93	-0.91

Note: Growth rates have been calculated by fitting semi-logarithmic trend lines.
Source: Bangladesh Bureau of Statistics (BBS), GOB (2003), MOA (2003) and author's calculation.