

Economic Liberalization and Structural Change in Major Agricultural Sub-Sectors in Bangladesh

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Abstract: *A structural change has taken place in agricultural sub-sectors since 1990 when tax in the agricultural sector had been replaced by subsidy. To know the impact of subsidy in the crops, livestock and fisheries in Bangladesh, 'Kinked Exponential Growth Model' was used to estimate the impact of subsidy and other liberalization policies on those sectors. The results show that growth in the above mayor sub-sectors since 1990 are significantly higher than before. This was caused due to the different liberalization measures taken by the government in the concerned sub-sectors. This study justifies the governments' investment (subsidy) in agricultural sub-sectors.*

1. Introduction

The economy of Bangladesh is primarily dependent on agriculture. Agriculture is one of the most important sectors of Bangladesh economy (Nargis and Lee, 2013). The sector contributes around 16.77 percent to the gross domestic product (GDP) of the country and employs around 47.5 percent of the total labour force. Moreover, the sector feeds up around 160 million people of the country and provides food and nutrition for the farm households of rural areas (GoB, 2014). In addition, this sector provides raw materials to argo-based and other industries operating in the country. Agriculture being a pillar of Bangladesh economy, has been using more than 70 percent of land area (FAOSTAT, 2009) and accounting for nearly 20 percent of gross domestic product and 65 percent of the labour force, employed primarily on small-holder farms (Yu *et al.*, 2010).

The agricultural sector being the single largest contributor to income and employment generation is a vital element in the country's challenge to achieve food secu-

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rity, reduce poverty and foster sustainable economic development. Agricultural growth as an indicator of economic development is necessary for rural poverty alleviation (Ravallion and Datt, 1996; Odhiambo and Nyangito, 2005). However, this sector's relative contributions as well as the contribution of crop sub-sector to the GDP have decreased over time. Several reasons may be responsible for this phenomenon: reduction in arable land, deterioration of land productivity, lack of proper land use planning and lack of capital and appropriate technologies.

Government can play an important role to sustain agricultural productivity and growth by reforming agricultural policy and execution of it. This study is designed to evaluate the impact of the government policy reforms on agricultural growth for the period of 1971-2012. The objective of the study is to evaluate the impact of government subsidy policy along with liberalization policy on agricultural growth.

This paper is organized into five sections. Section 2 describes government's activity in agriculture, while Section 3 deals with the analytical techniques. Results are presented and discussed in Section 4. Conclusions and policy implications are presented in the final section.

2. Economic Liberalization and Agriculture

Recently the terms 'governance' and 'good governance' are being increasingly used in development literature. Governance describes the process of decision-making and the process by which decisions are implemented. Good governance is epitomized by predictable, open and enlightened policy making (that is, transparent processes) in which a bureaucracy is imbued with a professional ethos and an executive arm of government is accountable for its actions. Good governance is an essential ingredient to ensure appropriate public expenditure management for rural services and to create a positive climate for private sector investment in rural areas. To generate substantial agricultural growth, Bangladesh also needs good governance. Like many other developing countries, Bangladesh needs appropriate steps from the government to strengthen its agriculture and fulfill the demands of the population. The government has therefore accorded the highest priority to this sector to enable the country to meet the demands of the people and to make this sector commercially viable. In Bangladesh, the government has been taking several steps to boost agriculture for several years. Now the government is giving 25 percent fertilizer subsidy to reduce the production cost for farmers and allocated Taka 12 billion in 2005-2006, which is double the amount of Taka 6 billion in 2004-2005 (Rahman, 2005). In fiscal year 2010-11, an amount of Tk. 5000.00 crore was allocated in the revised budget to provide subsidy on fertilizer and for other agricultural inputs. It is a temporary measure of the government to encourage farmers to produce more output. The government has also established the National Agricultural Research System (NARS) consisting of ten research institutes under the umbrella of Bangladesh Agricultural Research Council. Goletti (1994) men-

tioned that two main features of the food grain sector in Bangladesh emerged in the 1970s and 1980s. First, a sustained growth of rice production moved the country toward declining food gaps. Second, policy removed several constraints to the operations of private markets and reduced the presence of government intervention in the sector. Other policy reform measures of the government are described below:

- I. **Liberalization of trade in minor irrigation sector and the promotion of the private sector for the supply of minor irrigation equipments in the country:** This happened gradually in step with the removal of import restrictions on small diesel engines in 1986-87 followed by the withdrawal of duties on such imports in 1988-89. The subsidy on deep tube wells (DTW) was removed in 1992 and the government organization BADC was removed from the procurement and distribution of minor irrigation equipment. These reform measures had a tangible effect on increasing the demand for irrigation equipment and consequently the rate of increase in the area under minor irrigation.
- II. **Privatization of fertilizer trade with the objective of transferring fertilizer management and distribution services exclusively to the private sector:** Imports of all fertilizers, including urea that has already been imported by the private sector, are now being undertaken by the private sector. All fertilizers are being distributed by private dealers through their network. The government has issued the revised Fertilizer Control Ordinance in 1995 in consultation with the private sector and the IFDC for quality control and regulation of fertilizer prices. This has led to the increased availability and the wider adoption of chemical fertilizer at the farm level and economic activities in rural areas have also increased manifold due to the withdrawal of government from fertilizer distribution.
- III. **Liberalization of trade and foreign exchange for the enhanced participation of the private sector in the trade of agricultural machinery:** The government has been continually reviewing the conditions affecting competitive trade and took actions to remove barriers.
- IV. **Liberalization of production, processing, distribution and importing of seeds to ensure the participation of private seed dealers for the seed industry's development:** The private sector is now allowed to import any germplasm for research and development and to develop its own facilities for producing foundation seeds. They are also allowed to import and sell seeds except those of five notified crops, (rice, wheat, sugarcane, potato, and jute). As regard to the notified crops, there are procedural formalities to be observed by the private sector before any

import. The private sector has now taken up programs for the production of hybrid rice seeds in the country.

- V. **Liberalization of imports of agricultural machines including power tillers:** This move has positive effects on the import of power tillers. The area under power tiller utilization also grew by about 3.5% per annum after the introduction of the liberalization policy.
- VI. **Structural changes were also made in food supply and management system:** Open market sale (OMS), procurement of food grains from farmers at market prices, abolition of rural rationing system, and allowing the import of food grains by the private sector were the measures so far implemented by the Government of Bangladesh.

3. Analytical Technique for Measuring Agricultural Growth

This study is based on secondary or time series data. Forty five years (1971-2012) time series data derived from the Bangladesh Bureau of Statistics (BBS) were used in this study. Both descriptive and inferential statistics have been used to describe the impact of government's agricultural policy on agricultural growth. To identify the government's influence on productivity and growth, a Kinked Exponential Growth Regression analysis has been carried out. In this analysis, total time period is divided into two sub-periods: 1980-89 and 1990-2012. In the mid-1980s, the Government of Bangladesh reformed agricultural input markets and deregulated the import of minor irrigation equipment (Hossain, 1996). But Bangladesh has experienced a democratic government since 1990 and most of the policy reforms have taken place since 1990. The democratic government is assumed to be more accountable to the society and the people. That is why the period is sub-divided as mentioned above in this study.

Kinked Exponential Growth (single-kink) Model

Now let K be the year in which a structural change took place. The growth rate can be seen from the following trend regression:

$$\ln(Q_t) = \mu + \beta t + \varepsilon_t \quad (1)$$

Typically, to account for such change, the equation can be transformed as follows:

$$\ln(Q_t) = \mu_1 D_1 + \mu_2 D_2 + (\beta_1 D_1 + \beta_2 D_2)t + \varepsilon_t \quad (2)$$

Where D_1 and D_2 are the values of dummy variable D , which takes the value 1 up to year k and zero otherwise.

Since equation (2) is equivalent to running two separate regressions, the trend lines may not necessarily intersect at the break point k . To eliminate this discontinuity, we follow BOYCE (1986) by imposing the following linear restriction:

$$\mu_1 + \beta_1 k = \mu_2 + \beta_2 k \quad (3)$$

Restriction (3) ensures that the trend lines intersect at k . Solving (2) for μ_2 , substituting the resulting expression in (2), and rearranging the terms, we get the restricted form:

$$\ln(Q_t) = \mu_1 + \beta_1(D_1t + D_2k) + \beta_2(D_2t - D_2k) + \varepsilon_t \quad (4)$$

The hypothesis that $\beta_1 = \beta_2$ is then tested and rejection would indicate that a structural break did occur in year k . As Boyce (1986) argued, equation (4) is preferable to (2) in the absence of special circumstances. Further, equation (4) has the advantage of ruling out the possibility that the growth rate derived from equation (1) falls outside the interval (β_1, β_2) as derived from equation (2).

The growth rates in the two sub-periods are now given by the OLS estimates of the coefficients of the resulting composite variables. The Kinked Exponential Growth model reduces discontinuity bias, provides better basis for growth rate comparison, reduces instability or cyclical fluctuations, and uses a full set of available information to estimate the growth rates for each sub-period in a single step.

4. Results and Discussion

The growth rates of two sub-periods are reported in this section. To allow for a structural break due to the policy reforms of the government, growth rates were estimated for the sub-periods 1971-89 and 1990-2012 by using a Kinked Exponential Growth regression following Boyce (1986). A Kinked Exponential Growth regression ensures continuity in the growth path at the time the structural break (kink) occurs, allowing for the path dependency on the growth rate. Boyce (1986) mentioned that the 'discontinuity bias' and the sensitivity of growth rate estimates to instability are reduced by the Kinked Exponential Methods.

For the sub-periods 1971-89 and 1990-2012, the annual growth rates in total rice production were estimated at 0.022 and 0.033 percent. It is obvious (Table 1) that growth in total rice production was significantly higher in the 1990-2012 compared to the 1971-1989 sub-period. Meaning is that a positive structural change (kinked) took place in farming practices in the sub-period 1990-2012 rather than in the sub-period 1971-1989. The middle panel of Table 1 also reports that growth in total maize production was significantly higher in the 1990-2012 compared to the 1971-1989 sub-period. It indicated that a highly positive structural change (kinked) took place in farming practices in the sub-period 1990-2012 rather than in the sub-period 1971-1989. These structural breakthroughs might have taken place due to the positive impact of policy reforms by the government on farm efficiency and productivity in the 1990s. However, the lower panel of Table 1 indicates that total wheat production was significantly lower in the 1990-2012 compared to the 1971-1989 sub-period. This is due to the substitution of wheat production by Boro rice production. The principle of enterprise choice is applicable in this case.

Table 1. Growth rates of crop sub-sector in Bangladesh

Variable	Parameter	Coeff.	Std. Error	t-value	Sig
Rice production					
Intercept	μ_1	9.285	0.024	386.819	0.000
D1t + D2k	β_1	0.022	0.002	12.191	0.000
D2t - D2k	β_2	0.033	0.001	22.828	0.000
R-Square		0.977			
Adjusted R-square		0.976			
F-value		781.640**			
Maize production					
Intercept	μ_1	0.842	0.396	2.127	0.040
D1t + D2k	β_1	-0.037	0.030	-1.222	0.230
D2t - D2k	β_2	0.331	0.024	13.844	0.000
R-Square		0.879			
Adjusted R-square		0.873			
F-value		134.736**			
Wheat production					
Intercept	μ_1	11.874	0.175	67.694	0.000
D1t + D2k	β_1	0.135	0.013	10.022	0.000
D2t - D2k	β_2	-0.032	0.011	-2.992	0.005
R-Square		0.756			
Adjusted R-square		0.743			
F-value		57.270**			

Source: Authors' calculation based on secondary data. ** indicates significance at 0.01 probability level.

Table 2 reveals that large animals and poultry production were significantly lower in the 1990-2012 compared to the 1971-1989 sub-period. It could happen because of the fact that this sub-sector was not liberalized during that period and no subsidy was given to develop livestock sub-sector.

Table 2. Growth rates of livestock sub-sector in Bangladesh

Variable	Parameter	Coeff.	Std. Error	t-value	Sig
Large animals					
Intercept	μ_1	3.108	0.064	48.225	0.000
D1t + D2k	β_1	0.093	0.011	8.335	0.000
D2t - D2k	β_2	0.008	0.004	2.067	0.051
R-Square		0.867			
Adjusted R-square		0.855			
F-value		68.547**			

Poultry					
Intercept	μ_1	3.686	0.237	15.568	0.000
D1t + D2k	β_1	0.119	0.041	2.912	0.008
D2t - D2k	β_2	0.080	0.014	5.771	0.000
R-Square		0.810			
Adjusted R-square		0.792			
F-value		44.712**			

Source: Authors' calculation based on secondary data. ** indicates significance at 0.01 probability level.

Table 3 reports that marine fish production was significantly lower in the 1990-2012 compared to the 1971-1989 sub-period because marine fish culture was not influenced by the government's liberalization policy. Many uncontrolled factors are associated with marine fish culture. For the sub-periods 1971-89 and 1990-2012, the annual growth rates in inland fish production were estimated at -0.004 and 0.070 percent. The growth in inland fish production was significantly higher in the 1990-2012 compared to the 1971-1989 sub-period. The result confirmed a positive structural breakthrough in inland fish production. The result of the total fish production revealed that a positive structural change (kinked) took place in farming practice in the sub-period 1990-2012. This occurs due to the positive impact of policy reforms by the government in the 1990s.

Table 3. Growth rates of fisheries sub-sector in Bangladesh

Variable	Parameter	Coeff.	Std. Error	t-value	Sig
Marine fish production					
Intercept	μ_1	11.247	0.033	339.692	0.000
D1t + D2k	β_1	0.062	0.003	24.228	0.000
D2t - D2k	β_2	0.041	0.002	20.326	0.000
R-Square		0.985			
Adjusted R-square		0.984			
F-value		1239.016**			
Inland fish production					
Intercept	μ_1	13.408	0.044	302.855	0.000
D1t + D2k	β_1	-0.004	0.003	-1.110	0.274
D2t - D2k	β_2	0.070	0.003	26.106	0.000
R-Square		0.965			
Adjusted R-square		0.963			
F-value		505.068**			
Total fish production					
Intercept	μ_1	13.503	0.038	355.053	0.000
D1t + D2k	β_1	0.008	0.003	2.753	0.009

D2t - D2k	β_2	0.064	0.002	27.759	0.000
R-Square		0.973			
Adjusted R-square		0.972			
F-value		677.729**			

Source: Authors' calculation based on secondary data. ** indicates significance at 0.01 probability level.

5. Conclusions and Policy Implications

Based on the findings of the impact of economic liberalization on major agricultural sub-sectors in Bangladesh, it can be concluded that a positive structural change (kinked) took place in farm practices during 1990-2012 compared to the 1971-1989 sub-period. The positive impact of economic reforms by the government on agricultural sub-sectors in the 1990s might have contributed to this structural breakthrough. Rice and maize production are highly benefited from economic liberalization, although livestock production and marine fish culture failed to enjoy the benefit. On the other hand fisheries sub-sector, especially inland fisheries growth rate were highly increased due to policy reforms by the Government of Bangladesh. However, the future prospects for growth in agricultural sub-sectors are not promising for Bangladesh as the potentials for most of the growth promoting factors are likely to be exhausted in the near future. As a policy option, a preemptive action by the government is necessary to promote and sustain the growth in agriculture for some years in future. Government needs to ensure the sustainability of present growth for all the sub-sectors of agriculture. Like other developing countries, Bangladesh needs to take proper measures for sound environment and also needs to ensure safe food for her large population in the coming years. To make it possible, government can continue with subsidy policy in agriculture.

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