Domestic and International Competitiveness of Production of Selected Crops in Bangladesh

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Abbreviations and Acronyms

ADB	Asian Development Bank
AMS	Agreement measure of support
AoA	Agreement on Agriculture
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
BCR	Benefit cost ratio
BRRI	Bangladesh Rice Research Institute
DAE	Department of Agricultural Extension
DRC	Domestic Resource Cost
EPC	Effective Protection Coefficient
ERP	Effective rate of Protection
FAO	Food and Agricultural Organization
GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
ha	Hectare
ILO	International Labour Organizations
LDC	Least Developed Country
MP	Muriate of Potash
NPC	Nominal Protection Coefficient
NRP	Nominal rate of Protection
TFC	Total Fixed Cost
TSP	Triple super phosphate
UR	Uruguay Round
WB	World Bank
WTO	World Trade Organization

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EXECUTIVE SUMMARY

The study determines financial profitability of selected crops in the different locations in the country and examines the implications of Bangladesh's trade policies and comparative advantages of selected agricultural commodities like rice, wheat, maize, potato and lentil. Price distortions and agricultural incentives have been examined with the help of field survey data and time series observation on protection level for the period 2005-2009.

Both published and unpublished data of various national and international agencies were used in this study. The main sources are various publications of Bangladesh Bureau of Statistics (BBS), Bangladesh Bank, World Bank, The Economic Survey of Bangladesh, International Financial Statistics of the World Bank, Commodity Outlook of the FAO, Economic Trends of the Bangladesh Bank, Yearbooks of Agricultural Statistics, Food and Agriculture Organization (FAO) of the United Nations.

Three types of analyses were employed for this study. These are: profitability analysis showing gross margin and net return for the selected crops, measuring of policy incentives with nominal rate of protection (NRP) and comparative advantage with domestic resource cost (DRC).

Net return was found positive for all the crops studied. Highest benefit cost ratio was calculated for aromatic rice (1.71) followed by potato (1.69) and winter maize (1.62). Comparatively lower benefit cost ratio was calculated for summer maize (1.17), coarse rice and wheat (1.19 each). The domestic-to-border price ratio of rice was less than unity for most of the years for both import and export parity and was significantly negative. It indicates that domestic rice production was taxed and consumers were subsidized. The border price of wheat, maize, potato and lentil at producer level measured at official exchange rate was mostly higher than the domestic producer price at the investigated years. DRCs for rice were observed to be less than unity (under import parity price and most of the years under export parity) implying that Bangladesh had comparative advantage in rice production for import substitution and export promotion. The estimates of DRC showed that Bangladesh had comparative advantage in wheat production as the estimates of DRC were less than one in all the years investigated. DRC for potato and lentil was less than unity in all the years under investigation. Thus the results of the study implied that production of potato and lentil would be highly efficient for import substitution. For successful implementation of trade liberalization policies, Bangladesh must plan accordingly and take appropriate policies to materialize the likely gains in trade by increasing its trade capacity. Up to date and timely information regarding inputs, inputs prices, availability of improved varieties, output market prices, and agricultural and macroeconomic policies should be ensured to improve the competitiveness and comparative advantage of farmers. To exploit the export opportunities, Bangladesh will need to enhance its supply-side capacity and pursue a broad based diversified agricultural production and export strategy.

DOMESTIC AND INTERNATIONAL COMPETITIVENESS OF PRODUCTION OF SELECTED CROPS IN BANGLADESH

1. INTRODUCTION

Agriculture in Bangladesh remains the single most important sector of the economy and also it is the "life blood" of Bangladesh. Approximately 80 percent of the population lives in rural areas, and about 63 percent of the labour force is employed in agriculture, forestry and fisheries (SEDF, 2003). Agriculture contributes about 18 per cent to GDP (BBS, 2009).

Agriculture was brought under the purview of GATT, 1994 with a view to minimize distortions in global trade in agricultural and food products. Negotiations on agricultural sector trade had earlier been excluded from GATT on the ground of food security and socio-political stability, which makes agriculture different from other sectors of the economy. By the time the Uruguay Round of negotiations began, many countries had started voicing the need to liberalize agriculture, particularly for opening this highly protected sector in the developed countries to more efficient producers from developing countries. For implementation of the rules agreed during the Uruguay Round of multilateral trade negotiations, the GATT Secretariat has been transformed into the World Trade Organization (WTO) on January 1, 1995. As a member of the WTO, Bangladesh is committed to the rules and regulations which Uruguay Round (UR) applied to agriculture. The potential benefits of the UR agreements for Bangladesh would emerge from the trading regime in its present form and the potential trading opportunities for both import substitution and export promotion in Bangladesh (Shahabuddin & Dorosh, 2000).

The commitments under the Agreement on Agriculture (AoA) in GATT-UR may be broadly categorized into thee groups, a) market access, b) domestic support, and c) export competition.

The provisions under the market access call for conversion of non-tariff trade barriers to bound tariff equivalents, reduction of bound tariffs over time, and setting of "low" import tariffs for a fixed quota of imports. In case of commodities for which the import level was negligible, a minimum level of access of three percent of domestic consumption during the base year was required to be made for the developing countries and five percent for the developed countries. Being an LDC, Bangladesh is not required to undertake any such commitment. However, Bangladesh will not be allowed to increase its bound tariff. Tariff bound for Bangladesh has been set at a uniform ceiling rate of 200% for all agricultural goods except 13 items for which bound rate is 50%. Bound tariff rates for two agricultural products (green and black tea) were lower than actual operative tariff.

Under the provision of domestic support the countries were asked to quantify all trade distorting domestic policies, translate them into an aggregate measure of support (AMS) and progressively reduce them. The value of AMS should not exceed five percent of the value of output for the developed countries and 10% for the developing countries. Policies that are not trade distorting in nature are excluded from AMS calculations. These include investments in R&D, development of infrastructure and marketing information, programs for environmental protection and direct payments scheme based on fixed area and production that subsidize farmers' incomes.

Under the provision of export subsidies countries were committed to reduce subsidies on 22 different agricultural commodities, and the developed countries were required to reduce the value of export subsidies by 36% and reduce the quantities of subsidized exports by 21% during 1995 to 2000. The least developed countries (which include Bangladesh) are

exempted from commitments to reduce domestic support and export subsidy, while the developing countries have been allowed delayed implementation in these respects.

Historically, Bangladesh has used a number of policy instruments, including government monopolies on trade, producer support prices, and input subsidies on fertilizer and irrigation to influence agricultural output prices and the costs of production. Agricultural price policy has been a major instrument of government intervention, with the goal of increasing the contributions of agriculture to economic development or of enhancing the welfare of farm households. In other instances, price policy has been used to satisfy the rent-seeking demands of special interests. There are four well-known stylized facts about the agricultural policies of developing countries. First, most developing countries have attempted to encourage the growth of industry through policies of import substitution. Second, overvalued exchange rates have often been maintained through exchange-control regimes and import licensing mechanisms, even more restrictive than those that would have been adopted in connection with import substitution. Third, many developing countries have attempted to suppress producer prices of agricultural commodities through government policies, export taxation, and/or export quotas. Fourth, some governments have attempted to offset part or all of the disincentive effects on producers by subsidizing input prices and investing in irrigation and other capital inputs (Krueger et al. 1988).

From its inception, Bangladesh pursued a set of restrictive price and trade policies, pertaining more to agricultural commodities. While export of foodgrains was not permitted, the government had a monopoly on import. Most other agricultural commodities could be imported only under licensing schemes while many were subject to an outright export ban. Even in the case of jute, the main export crop, severe restrictions were imposed on its export in years of scarcity in order to maintain supplies to domestic jute mills. Until the early 1980s, the policy mix followed was subsidization of food to selected groups of consumers, occasional price support to producers, and subsidization of agricultural inputs namely fertilizers and irrigation equipments to provide incentive to producers. These policy measures imposed pressure on the budgetary resources of the government on the one hand, and raised objections from the donor agencies on the other.

As a result, the government undertook policy changes along the donor induced structural adjustment reforms from the early eighties. These policy reforms included gradual withdrawal of food subsidy and product price support, withdrawal of agricultural input subsidies, privatization of trade of agricultural inputs and products (Talukder 1995). In the case of external trade, reform moved moderately towards a liberalized trade regime with flexible exchange rate management with a goal to lowering the tariff rates and freeing imports from quantitative restrictions. The government also withdrew some of the subsidized rationing system of foodgrain.

The rate of growth in agricultural sector has an important bearing on the overall growth of an economy. This is especially true for a dualistic economy like Bangladesh consisting of a predominant but traditional agriculture and a rudimentary industrial sector; agriculture holds such an important position in the national economy that, any effort for development in Bangladesh, keeping agriculture aside cannot be fruitful. It can make its major contribution in the developmental process by giving favorable terms of trade to other sectors of the economy. Considering this inadequacy the present study has been designed for investigations.

The study is expected to give also some valuable information about farm “price parity”, its behavior in the past, its trends and the effects of "parity ratio" on agricultural production in the past and its expected effect in near future. Domestic competitiveness as well as comparative advantage of agricultural commodities would determine the position of the Bangladeshi cultivators in respect of production of commodities by using scarce resources.

An analysis of the level of protection is important to determine the incentive structure prevailing in the country in respect of production of food and non-food crops.

Again, the trading opportunities of the country's products depend on the comparative advantage, without subsidies or with limited subsidies that are permitted for all trading partners by the rules governing the new trading environment. All these information would be of much help to the planners and policy-makers in formulating appropriate policies for optimum and efficient resource allocation within agriculture and between agriculture and non-agricultural sectors, consistent with a balanced and integrated development of Bangladesh economy.

Objectives

i) To determining financial profitability of selected crops in the different locations in the country;
ii) To analyzes the effects of government input-output pricing policies in providing incentives for production of the selected crops;
iii) To evaluate the economic efficiency of production and ascertain comparative advantages in the production of the selected crops;
iv) To examine the policy implications arising from the findings.

2. METHODOLOGY

2.1 Data and Sample: The present study is based on published and unpublished data of various national and international agencies. The main sources of data is collected from various publications of the Bangladesh Bureau of Statistics (BBS), Bangladesh Bank, World Bank, The Economic Survey of Bangladesh, International Financial Statistics of the World Bank, Commodity Outlook of the FAO, Economic Trends of the Bangladesh Bank, Yearbooks of Agricultural Statistics, Food and Agriculture Organization (FAO) of the United Nations. However, various unpublished documents and sources were used extensively for obtaining data for the study. The study is also based on primary data for crops such as rice (coarse, non-aromatic fine and aromatic fine), wheat, potato, lentil and maize. Farm level data of these crops were obtained from purposively selected different locations. The locations were selected according to the intensive cultivation of the selected crops and varieties. The farmers were selected randomly for primary data collection. For individual crop variety or location a sum of 30 samples were chosen for interview. The distribution of sample size by location and commodity are shown in table 1.1.

Table 1.1 Distribution of samples according to commodity and location

Sl.no	Commodity type/variety	Location	No. of Sample
1.	Rice		
	- Coarse (BR-11/BRRI dhan33)	Comilla/Mymensingh	60
	- Non-aromatic fine (BRRI dhan29)	Bogra/Rangpur	60
	- Aromatic fine (Kataribhog, Chinigura)	Dinajpur	60
2.	Wheat	Rajshahi/Dinajpur	60
3.	Potato	Munshigonj/Rangpur	60
4.	Lentil	Kushtia/Pabna	60
5.	Maize		
	- Winter	Rangpur	30
	- Summer	Manikgonj	30
	Total	**-**	**420**

2.2 Analytical Techniques

2.2.1 Profitability analysis: Relative profitability of the selected crops was examined on the basis of gross margin and net return to understand the input-output relationship. Gross margin analysis gave an estimate of the differences between the total return and the variables costs. The analysis did not consider fixed cost (which includes costs for land rent). The gross margin analysis is widely used for short run analysis as well as for farm planning. The analysis is also easily understandable to the farmers as well as to the planners because of its simplicity. In calculating gross margin, all operating costs (for both family supplied and purchased inputs) considered as variable costs.

Strictly speaking gross margin is not the actual profit. Profit is actually gross margin minus fixed cost. Therefore, the technique of enterprise costing was applied. For this purpose the actively budget as suggested by Dillon and Harddaker (1980) was employed for deriving the profit equation. The profit equation of the following form was used.

$$Л = P_{yi} \cdot Y_i + P_{bi} \cdot B_i - \sum_{j=1}^{n} (P_{xji} \cdot X_{ji}) - TFC$$

Л = Profit per hectare from ith output,
P_{yi} = Per unit price of ith output,
Y_i = Total quantity per hectare of ith output,
P_{bi} = Per unit price of the by-product of ith output,
B_i = Total quantity per hectare by-product of ith output,
P_{xji} = Per unit price of jth input used for producing ith output,
X_{ji} = Total quantity per hectare of jth input used for producing of ith output,
TFC = Total fixed costs involved in producing per hectare ith output
i = Number of individual crop produced by the farmers,
j = Number of relevant individual inputs used for producing of the relevant product,
n = 1,2,3……., n

2.2.2 Measuring the Impact of Policies on Economic Incentives

A wide range of government policies influence economic incentives in agricultural production. Price and subsidy policies, import and export policies, and more general macro economic policies such as exchange rate and interest rate policies may affect relative incentives in agriculture. This effect is measured by the proportional difference between the domestic price and the border price (import or export parity price) generally at the prevailing official exchange rate. These effects can be measured by using the nominal and effective protection rates as indicators.

2.2.2.1 Nominal Protection

The nominal protection co-efficient (NPC) is the simplest indicator of price distortion and the easiest to measure. It is equal to the ratio of the domestic price of a commodity i to its border price using the official exchange rate.

Conceptually, NPC is expressed as:

$$NPC_i = P_i^d / P_i^b \quad \text{---------- (1)}$$

Where, P_i^d is the domestic producer price of a tradable agricultural commodity i and P_i^b is the actual border price of that commodity, evaluated at the official exchange rate, adjusted for

quality, transport, storage and other margin, measured under competitive conditions and expressed in local currency.

Thus,

If $NPC_i > 1$, producers are protected and consumers are taxed,

If $NPC_i < 1$, producers are taxed and consumers are subsidized, and

If $NPC_i = 1$, the structure of protection is neutral.

The estimates of world price at import parity level are based on the assumption that imports compete with domestic production at the producer level. In case of exportable commodity, domestic-to-border price comparison will be made at producer level. The border prices of selected commodities will be adjusted for marketing cost (which includes handling, transportation, storage cost) and price spent between the wholesale market to the farmers level. Border prices of commodities are used as reference prices in measuring the effects of government intervention polices. Without government intervention, the domestic producer prices are expected to be closely related to the border prices.

Alternatively, this can be written as the nominal rate of protection (NRP), defined as the amount by which the domestic price of a tradable output deviates from its border price. It can be stated as:

$$NRP_i = (P_i^d/P_i^b) - 1 \quad \text{---------- (2)}$$

If $NRP_i > 0$, producers are protected and consumers are taxed; if $NRP_i < 0$, producers are taxed and consumers are subsidized. Thus, if NPC>1 or NRP>0, producers receive a price which, after direct interventions, is above the border price, giving them incentives to produce more of the crop than if equilibrium prices prevailed.

In calculating NRP_i's for agricultural tradable, the market point for compression is of crucial importance. Since NRP_i's are indictors of output incentives or disincentives, there are two marketing points where comparisons can be made. One is at the production point to determine the incentives that farmers receive at the farm level. The other is at the wholesale or consumption point to determine the effects of pricing policy over a broader spectrum of farm production-processing-marketing activities. This study will evaluate NRP_i's at both the farm and wholesale levels.

2.2.2.2 Effective Protection

Price distortions affect use of inputs as well as products. It is often the case, for instance, that disprotection of products is partially compensated by subsidies of some inputs (such as fertilizer, fuel and irrigation equipment). From the standpoint of incentives, it is important to capture net effect of these distortions. For calculating Effective Protection Co-efficient (EPC), which is expressed as-

$$EPC = \frac{\text{Value of output at domestic price} - \text{Value of traded inputs per unit of output at domestic price}}{\text{Value of output at world price converted at the official exchange rate} - \text{Value of traded inputs per unit of output of world prices converted at the official exchange rate}}$$

The symbolic expression of the term is as follows:

$$EPC = \frac{P^d_i - \sum a_{ij} P^d_j}{P^b_i - \sum a_{ij} P^b_j} \qquad \text{---------- (3)}$$

If EPC > 1, domestic producers of commodity i are directly protected, if EPC < 1, domestic producers of i are disprotected, if EPC= 1, the structure of prices is neutral in terms of incentives.

Where, P_i^d is the domestic price of ith commodity, P_i^b is the border price of that commodity and aij are the technical co-efficients measuring the number of units of traded inputs j per unit of production of output i, P_j^d is the domestic price of traded inputs j, P_j^b is the border price of traded inputs j. The study will also measure these indicators in the form of Effective Rate of Protection (ERP_i). Formally, it is conventionally expressed as

$$ERP_i = \frac{P^d_i - \sum a_{ij} P^d_j}{P^b_i - \sum a_{ij} P^b_j} - 1 = \frac{V^d_i}{V^b_i} - 1 = EPC_i - 1 \qquad \text{---------- (4)}$$

Where, V_i^d is the value added in domestic prices, and V_i^b is the value added in border prices expressed in local currency.

2.2.3 Measures of Comparative Advantage

Comparative advantage in the production of a given crop for a particular country is measured by comparing its border price with the social or economic opportunity costs of producing, processing, transporting, handling and marketing an incremental unit of commodity. If the opportunity costs are less than the border price, then the country has a comparative advantage in the production of that crop. In most developing countries, social or economic profitability deviates from private profitability because of distortions in the factor and output markets, externalities and government policy interventions that tend to distort relative prices. Comparative advantage or efficiency of producing different crops in Bangladesh agriculture is analyzed here using Domestic Resource Cost (DRC). This indicator is formally defined as follows:

2.2.3.1 Domestic Resource Cost (DRC)

While the EPC and NPC serve to measure levels of incentives, with implications for the efficiency in which the corresponding commodities will be produced, the domestic resource cost (DRC) provides a measure of efficiency, with implications for the level of incentives offered to producers. Whether it is efficient for a country to produce a commodity as opposed to importing it, depends on the opportunity cost of domestic production relative to the value added it creates in foreign currency.

The DRC is the ratio of the cost in domestic resources and non-traded inputs (valued at their shadow prices) of producing the commodity domestically to the net foreign exchange earned or saved by producing the good domestically.

Formally DRCs is defined as

$$DRC = \frac{\text{Cost of domestic resource and non-traded inputs for producing per unit of output}}{\text{Value of tradable output} - \text{Value of tradable inputs}}$$

$$DRC = \frac{\Sigma f_{ij} P^{d}_{j}}{U_i - \Sigma a_{ik} P^{b}_{k}} \quad (j = 1 \text{ ----------} m, \; k = 1 \text{ --------} n) \quad \text{---------- (18)}$$

Where,

f_{ij} = domestic resource and non-traded inputs j used for producing per unit commodity i

P^{d}_{j} = price of non-traded intermediate inputs and domestic resource

U_i = Border price of output i

a_{ik}= Amount of traded intermediate inputs for unit production of i

P^{b}_{k} = Border price of traded intermediate input

If DRC < 1, the economy saves foreign exchange by producing the good domestically either for export or for import substitution. This is because the opportunity cost of domestic resources and non-traded factors used in producing the good is less than the foreign exchange earned or saved. In contrast, if DRC > 1, domestic costs are in excess of foreign exchange costs or savings, indicating that the good should not be produced domestically and should be imported instead.

2. 3 General Assumption

Traded Intermediate Inputs: There are commodities which are either imported or exported. In the case of Bangladesh, as stated earlier three types of chemical fertilizer viz., Urea, TSP and MP were considered as traded intermediate inputs. Irrigation equipment and pesticides are also traded intermediate inputs, but detailed cost of production figures for irrigation equipment was not available. Since the cost of imported pesticide constituted minor proportion of input cost, the item was not taken into account in the estimation of cost of traded intermediate input costs. The cost of fertilizers was measured by border price (import parity) at farmer's level. The co-efficient of the fertilizer inputs were obtained from Rashid (2009) and the Year Book of agricultural Statistics various issues. The co-efficient of crop production per tonne were not found directly from the documents. These were derived from hectare cost of Urea, TSP and MP by dividing their respective prices. Then the amounts of fertilizer used for crop production per tonne were estimated by adjusting with the hectare coefficients.

Non-Traded Intermediate Inputs and Domestic Resources: In Bangladesh, unskilled agricultural labour, animal power, land, seed, manure , irrigation charge, interest on operating capital are generally considered as non-traded intermediate inputs and domestic resource because these components do not usually enter the international market. Time series of costs of human labour, animal labour, seed, manures, irrigation charge, and land rent from 2005-2006 were obtained from Yearbook of Agricultural Statistics (2007) and Rashid (2009). The time series of cost of these inputs were extended from 2007-2008 using non-agricultural wholesale price index and for 2009 it was from direct field survey. The payments for non-traded intermediate inputs and domestic resources were also converted into per unit of output by adjusting yields. Methodologically, these items were to be valued at opportunity cost. In

Bangladesh, the factor markets are fairly competitive; so payment for non-traded intermediate inputs and domestic resources fairly represented the opportunity cost of these resources.

3. RESULTS AND DISCUSSION

3.1 Financial Profitability of Producing Selected Crops

3.1.1 Coarse rice (BR-11 and BRRI dhan33): Per hectare average cost of coarse rice cultivation was Tk.40,912 and gross return was Tk.48,197 (Table 3.1). Per hectare average yield was recorded 3.544 ton. The farmers applied 188-60-30 kg/ha Urea, TSP and MP respectively at Comilla and 140-57-44-33 kg/ha Urea, TSP, MP and gypsum respectively at Mymensingh which is much lower than the recommended dose for T.aman rice cultivation. Gross margin, net return and BCR were found Tk.22,470, Tk.7,534 and 1.19 respectively. This return was much lower compared to other rice crops. The net return obtained by the farmers of Comilla was comparatively higher than that of Mymensingh mainly due to higher yield at Comilla. BRRI (2009) reported that yield of coarse rice was 4.4 t/ha, gross return and total cost were Tk. 64253/ha and Tk. 50617/ha respectively and BCR was 1.27 in 2007-08 which was more or less similar to this study.

Table 3.1 Per hectare cost and return of coarse rice varieties in two selected areas of Bangladesh

Items	Unit	Comilla (BR-11)		Mymensingh (BRRI dhan33)		Average
		Amount	Cost/return (Tk/ha)	Amount	Cost/return (Tk/ha)	
Variable costs:						
Human labour	Man-days	95	11400	98	11960	11580
Power tiller	-	-	3750	-	4152	3951
Seed	Kg	30	900	34	1020	960
Fertilizers:						
Urea	Kg	188	2068	140	1680	1874
TSP	Kg	60	2100	57	1995	2048
MP	Kg	30	1050	44	1540	1295
Gypsum	Kg	-	-	33	198	99
Pesticides	-	-	950	-	453	702
Irrigation charge	-	-	2125	-	3471	2798
Int. on operating capital	-	-	652	-	689	671
Total variable cost	-	-	24995	-	26958	25978
Fixed cost (Rental value of land)	-	-	14520	-	15352	14936
Total cost	-	-	39515	-	42310	40912
Grain yield	Kg	3652	41998	3435	41220	41609
Straw yield	-	-	6400	-	7276	6838
Gross return	-	-	**48398**	-	**48496**	**48447**
Gross margin	-	-	**23403**	-	**21538**	**22470**
Net return	-	-	**8883**	-	**6186**	**7534**
BCR	-	-	**1.22**	-	**1.15**	**1.19**

Source: Field survey (2009)

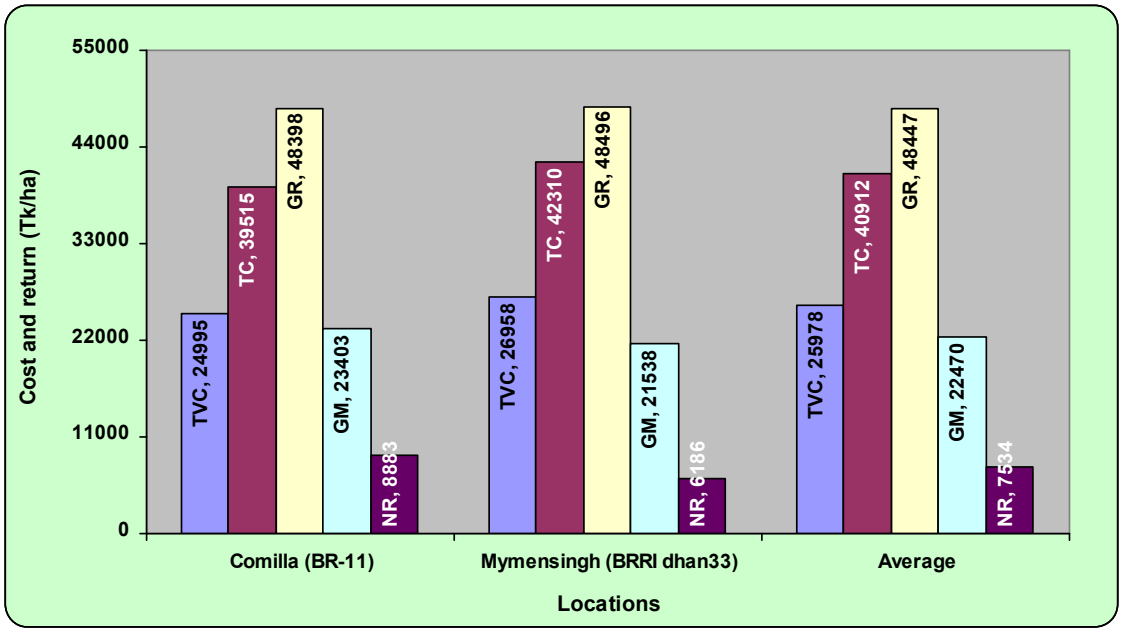

Figure 3. 1. Cost and return of coarse rice cultivation

3.1.2 Non aromatic fine rice (BRRI dhan29): Per hectare average cost of non-aromatic fine rice cultivation was Tk.64,422 and gross return was Tk.80,679 (Table 3.2). Per hectare yield was recorded 5.72 ton at Rangpur and 5.85 ton at Bogra. The farmers applied 207-103-111 kg/ha Urea, TSP and MP respectively at Rangpur and 195-75-156 kg/ha Urea, TSP and MP respectively at Bogra which is much lower than the recommended dose (250-100-120 kg/ha Urea-TSP-MP respectively) except MP at Bogra for boro rice cultivation. The farmers at Bogra applied higher rate of MP compared to the recommended rate. Average gross margin, net return and BCR were found Tk.31,340, Tk.16,256 and 1.26 respectively. This return was much lower compared to other rice crops. It is to be noted here that farmers at neither of the sites applied any kind of organic fertilizers to cultivate non-aromatic fine rice variety BRRI dhan29. The farmers in Bogra received higher amounts of returns compared to Rangpur mainly due to both higher yield and lower cost. The findings of this study was supported by BRRI (2009) findings where yield was recorded at 5.82 t/ha and BCR was 1.51

Table 3.2 Per hectare cost and return of non-aromatic fine rice (BRRI dhan29) in selected areas of Bangladesh

Items	Unit	Rangpur		Bogra		Average
		Amount	Cost/return (Tk/ha)	Amount	Cost/return (Tk/ha)	
Variable costs:						
Human labour	Man-days	155	20150	135	16200	18175
Power tiller	-	-	5646	-	6153	5899
Seed	Kg	30	948	30	948	948
Fertilizers:						
Urea	Kg	207	2448	195	2340	2394
TSP	Kg	103	3605	75	2625	3115
MP	Kg	111	3885	156	5775	4830
Pesticides	-	-	1482	-	1538	1510
Irrigation charge	-	-	12672	-	9512	11092
Int. on operating capital	-	-	1449	-	1299	1374
Total variable cost	-	-	52285	-	46390	49338
Fixed cost (Rental value of land)	-	-	14820	-	15350	15085
Total cost	-	-	67105	-	61740	64422
Grain yield	Kg	5724	71550	5853	73162	72356
Straw yield	-	-	8892	-	7754	8323
Gross return	-	-	**80442**	-	**80916**	**80679**
Gross margin	-	-	**28157**	-	**34524**	**31340**
Net return	-	-	**13337**	-	**19176**	**16256**
BCR	-	-	**1.20**	-	**1.31**	**1.26**

Source: Field survey (2009)

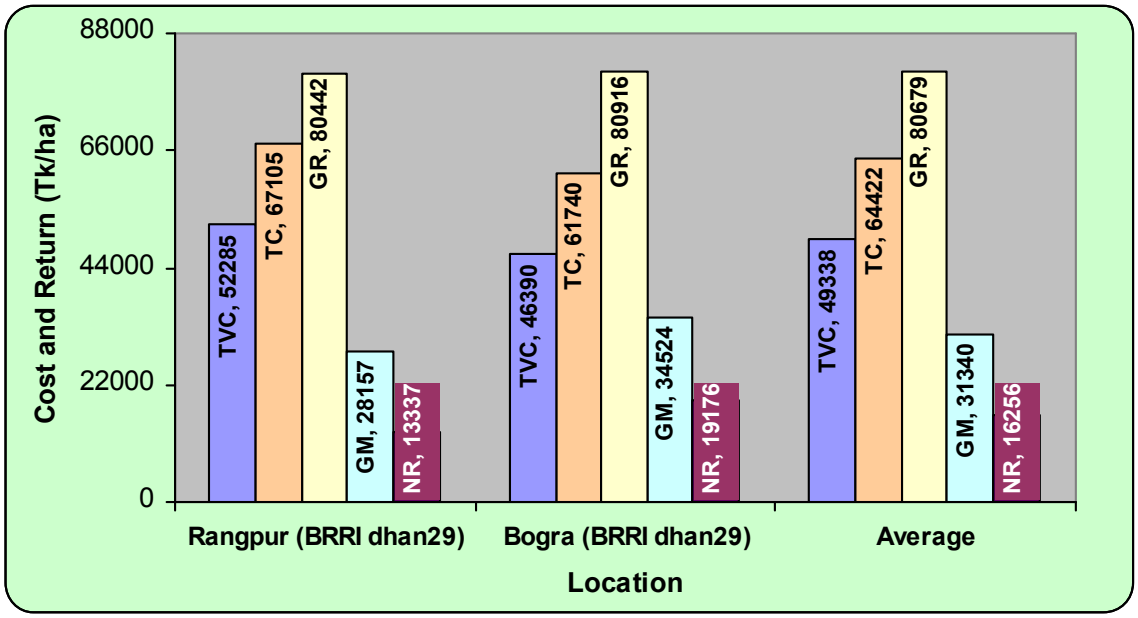

Figure 3. 2. Cost and return of non-aromatic fine rice cultivation

3.1.3 Aromatic fine rice (Kataribhog and Chinigura): Per hectare average cost of aromatic fine rice cultivation was Tk.39,286 and gross return was Tk.67,285 (Table 3.3). Between the two varieties yield was a bit higher for Chinigura (2.32 t/ha) compared to Kataribhog (2.28 t/ha). The farmers applied higher amounts of inorganic fertilizers for Chinigura compared to that of Kataribhog. Chinigura was found to sell with higher price. Due to higher yield and price, gross return, gross margin, net return and BCR was found higher for Chinigura (Tk.68,906/ha, Tk.47,893/ha, Tk.29,577/ha and 1.75, respectively). It is to be noted here that farmers applied lower amounts of fertilizers compared to the recommended dose for aromatic fine rice varieties. Ullah (2008) reported that yield of aromatic fine rice at Dinajpur was 2.15 t/ha and BCR was 1.87. Similar result was also observed in BRRI study where yield was 2.23 t/ha and BCR was 1.57 (BRRI, 2009).

Table 3.3 Per hectare cost and return of aromatic fine rice in Dinajpur areas of Bangladesh

Items	**Unit**	**Kataribhog**		**Chinigura**		**Average**
		Amount	**Cost/return (Tk/ha)**	**Amount**	**Cost/return (Tk/ha)**	
Variable costs:						
Human labour	Man-days	77	9989	66	8625	9307
Power tiller	-	-	2174	-	2663	2419
Seed	Kg	39	1560	51	2032	1796
Fertilizers:						
Urea	Kg	45	547	63	763	655
TSP	Kg	33	1160	39	1377	1269
MP	Kg	18	629	27	953	791
Pesticides	-	-	939	-	726	833
Irrigation charge	-	-	3705	-	3250	3478
Int. on operating capital	-	-	573		624	599
Total variable cost	-	-	21276	-	21013	21145
Fixed cost (Rental value of land)	-	-	17968	-	18316	18142
Total cost	**-**	**-**	**39244**	**-**	**39329**	**39286**
Grain yield	Kg	2283	57075	2317	61400	59238
Straw yield	-	-	8589	-	7505	8047
Gross return	**-**	**-**	**65664**	**-**	**68906**	**67285**
Gross margin	**-**	**-**	**44388**	**-**	**47893**	**46414**
Net return	**-**	**-**	**26420**	**-**	**29577**	**27998**
BCR	**-**	**-**	**1.67**	**-**	**1.75**	**1.71**

Source: Field survey (2009)

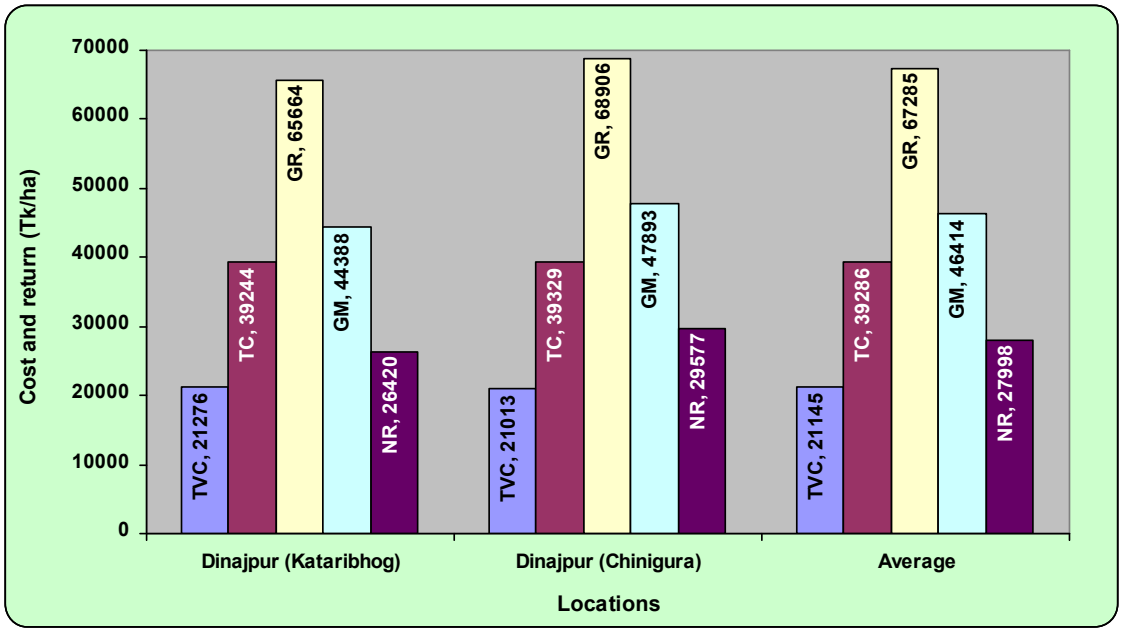

Figure 3. 3. Cost and return of aromatic fine rice cultivation

3.1.4 Wheat: Per hectare average cost of wheat cultivation was Tk.45,551 and gross return was Tk.54,2570 (Table 3.4). Average gross margin, net return and BCR were found to be Tk.22,799/ha, Tk.8,705/ha and 1.19, respectively. Between the two locations yield was higher at Dinajpur (2.77 t/ha) compared to Rajshahi (2.69 t/ha). The farmers at Rajshahi applied higher amount of urea and MP but lower amount of TSP compared to that of Dinajpur. Due to higher yield, gross margin, net return and BCR was found higher at Dinajpur. It is to be noted here that farmers at both the areas applied lower amounts of fertilizers than the recommended dose (180-220 kg urea, 140-180 kg TSP, 40-50 kg MP and 110-120 kg gypsum). Gypsum was found to apply only at Dinajpur with a lower rate of 39 kg/ha. Profitability was found to be lower compared to other grain crops. The findings of this study is comparable with the findings of Hasan *et al.* (2008) where yield of wheat was recorded at 2.49 t/ha at Dinajpur and 2.48 t/ha at Rajshahi. Similar result was also observed in BARI study where yield was 2.46 t/ha and BCR was 1.92 (BARI, 2010).

Table 3.4 Per hectare cost and return of wheat in selected areas of Bangladesh

Items	Unit	Rajshahi		Dinajpur		Average
		Amount	Cost/return (Tk/ha)	Amount	Cost/return (Tk/ha)	
Variable costs:						
Human labour	Man-days	109	13080	110	13200	13140
Power tiller	-	-	5796		4306	5051
Seed	Kg	153	3060	172	3440	3250
Fertilizers:						
Urea	Kg	161	1932	138	1656	1794
TSP	Kg	64	2240	68	2380	2310
MP	Kg	41	1435	38	1330	1383
Gypsum	Kg	-	-	39	234	117
Pesticides	-	-	1045	-	1126	1086
Irrigation charge	-	-	2675	-	2237	2456
Int. on operating capital	-	-	875	-	868	872
Total variable cost	**-**	**-**	**32138**	**-**	**30777**	**31457**
Fixed cost (Rental value of land)	-	-	14820	-	13368	14094
Total cost	**-**	**-**	**46958**	**-**	**44145**	**45551**
Grain yield	Kg	2693	45781	2765	47005	46393
Straw yield	-	-	7814	-	7913	7864
Gross return	**-**	**-**	**53595**	**-**	**54918**	**54257**
Gross margin	**-**		**21457**	**-**	**24141**	**22799**
Net return	**-**	**-**	**6637**	**-**	**10773**	**8705**
BCR	**-**	**-**	**1.14**	**-**	**1.24**	**1.19**

Source: Field survey (2009)

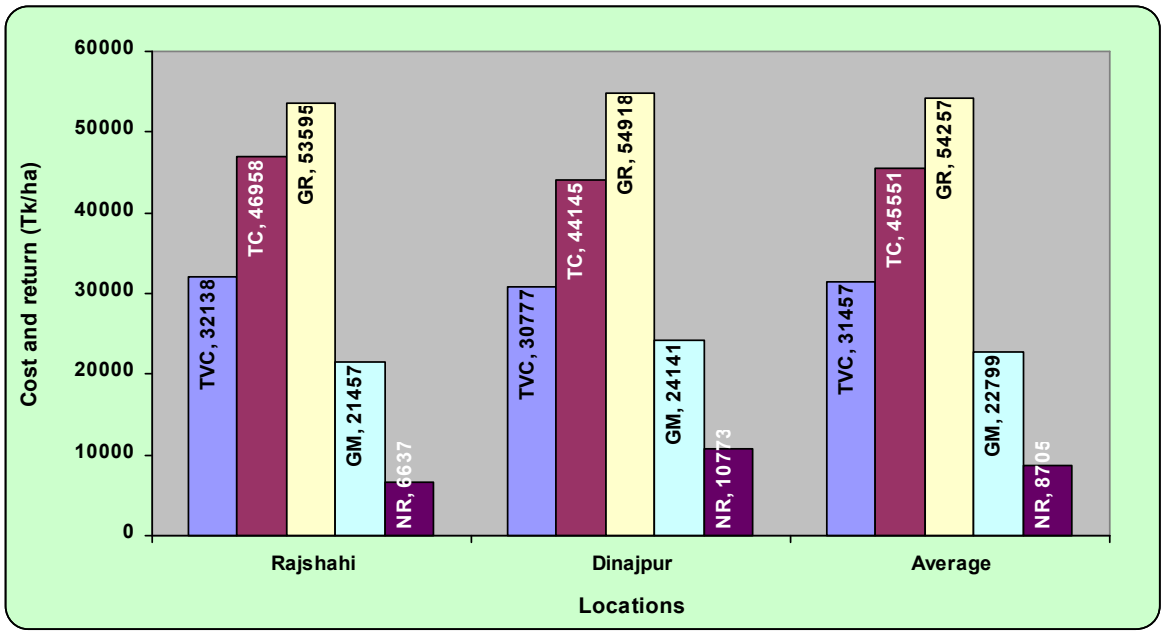

Figure 3. 4 Cost and return of wheat cultivation

3.1.5 Maize: Data on maize were collected from two separate production environments. Rangpur was selected for winter maize, whereas Manikgonj for summer maize. The difference between summer and winter maize was clear in respect of input use, yield and profitability. Per hectare average cost of winter maize cultivation was Tk.59,862 and gross return was Tk.96,829 (Table 3.5). On the other hand, per hectare average cost of summer maize cultivation was Tk.49,283 and gross return was Tk.57,831. BARI (2009) reported that per hectare average cost of summer maize cultivation was Tk.47,716 and gross return was Tk.74270 and BCR was 1.56.findings.

Table 3.5 Per hectare cost and return of maize in selected areas of Bangladesh

Items	**Unit**	**Rangpur (winter)**		**Manikgonj (summer)**		**Average Cost/return (Tk/ha)**
		Amount	**Cost/return (Tk/ha)**	**Amount**	**Cost/return (Tk/ha)**	
Variable costs:						
Human labour	Man-day	121	14520	133	15960	15240
Power tiller	-	-	2876	-	2959	2918
Seed	Kg	19	3230	18	2700	2965
Fertilizers:						
Urea	Kg	307	3684	186	2232	2958
TSP	Kg	233	8155	167	5845	7000
MP	Kg	129	4515	2	70	2293
Gypsum	Kg	117	585	-	-	293
Zinc	Kg	8	456	-	-	228
Borax	Kg	5	290	-	-	145
Lime	Kg	146	438	-	-	219
Pesticides	-	-	525	-	-	263
Irrigation charge	-	-	3428	-	1782	2605
Mechanical threshing	-	-	1093	-	-	547
Int. on operating capital	-	-	1919	-	1263	1591
Total variable cost			**45714**		**32811**	**39262**
Fixed cost (Rental value of land)	-	-	14148		16472	15310
Total cost			**59862**		**49283**	**54572**
Grain yield	Kg	7910	94920	4680	56160	75540
Stover yield	-	-	1909	-	1671	1790
Gross return	**-**		**96829**	**-**	**57831**	**78225**
Gross margin	**-**	**-**	**51115**	**-**	**25020**	**38067**
Net return	**-**	**-**	**36967**	**-**	**8548**	**22757**
BCR	**-**	**-**	**1.62**	**-**	**1.17**	**1.39**

Source: Field survey (2009)

Between the two production environments yield was much higher for winter maize (7.91 t/ha) compared to that of summer maize (4.68 t/ha). Winter maize required higher amounts of inorganic fertilizers compared to that of summer maize. Due to higher yield, gross margin, net return and BCR was found higher with winter maize. Among the variable costs, fertilizer cost shared more for winter maize followed by human labour cost. On the other hand, for summer maize human labour cost shared higher followed by fertilizer cost. It is to be noted

here that farmers cultivating winter maize applied seven types of inorganic fertilizers compared to summer maize's three types.

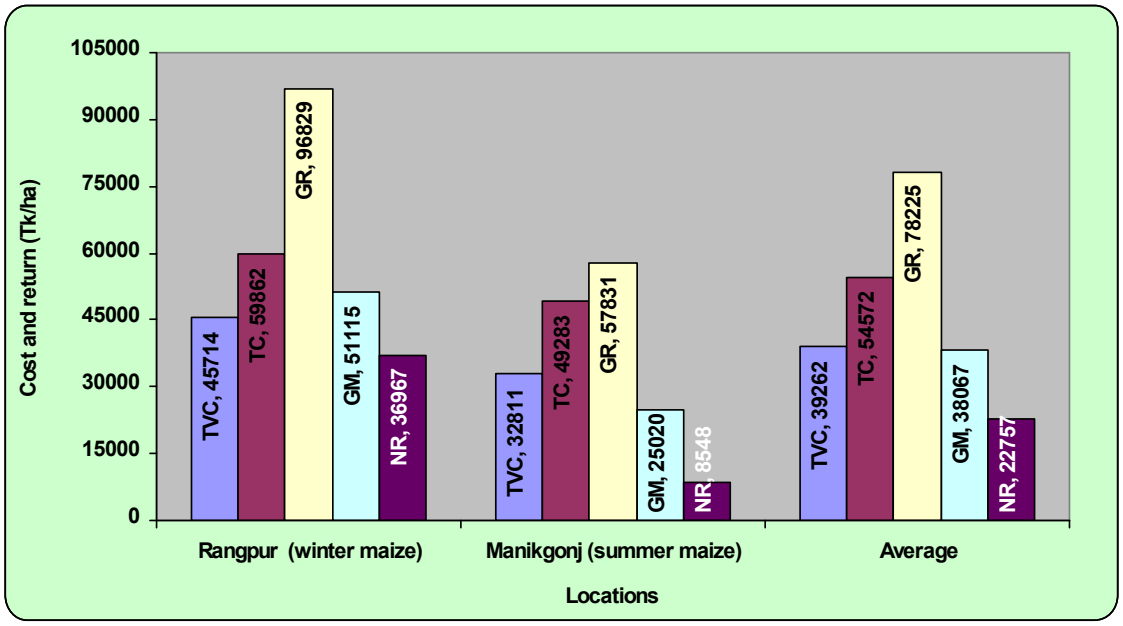

Figure 3.5 Cost and return of maize cultivation

3.1.6 Potato: Per hectare average cost of potato cultivation was Tk.143,852 and gross return was Tk.243,680 (Table 3.6). Average gross margin, net return and BCR was recorded Tk.120,262/ha, Tk.9,9827/ha and 1.69, respectively. Between the two locations yield was higher at Munshigonj (27.64 t/ha) compared to Rangpur (21.1 t/ha). The farmers at Munshigonj applied higher amounts of inorganic fertilizers compared to that of Rangpur. Due to higher yield, gross margin, net return and BCR was found higher at Munshigonj. Seed cost was found to be the single highest cost item for both the areas (37% for Rangpur and 31% for Munshigonj) followed by fertilizer cost (27% for Munshigonj and 17% for Rangpur). It is to be noted here that farmers at Munshigonj applied higher amounts of fertilizers than the recommended dose (220-250 kg urea, 120-150 kg TSP, 220-250 kg MP). The other recommended inorganic fertilizer Gypsum was not applied any of the locations but Zinc sulphate was found to apply at Munshigonj only. On the other hand, the farmers at Rangpur applied 4.2 t/ha cowdung for growing potato.

Table 3.6 Per hectare cost and return of potato in selected areas of Bangladesh

Items	Unit	Rangpur		Munshigonj		Average
		Amount	Cost/return (Tk/ha)	Amount	Cost/return (Tk/ha)	
Variable costs:						
Human labour	Man-days	172	22360	150	19500	20930
Power tiller	-	-	7114	-	13975	10545
Seed	Kg	2420	48409	2778	50004	49207
Fertilizers:						
Urea	Kg	229	2749	593	7116	4933
TSP	Kg	193	6743	480	16800	11772
MP	Kg	198	6928	556	19460	13194
Zinc sulphate	Kg	-	-	7	630	315
Cowdung	Kg	4204	6306	-	-	3153
Pesticides	-	-	7847	-	950	4399
Irrigation charge	-	-	4787	-	4891	4839
Int. on operating capital	-	-	3019	-	3555	3287
Total variable cost	**-**	**-**	**109956**	**-**	**136881**	**123419**
Fixed cost (Rental value of land)	-	-	14976	-	25892	20434
Total cost	**-**	**-**	**124932**	**-**	**162773**	**143852**
Tuber yield	Kg	21096	210960.	27640	276400	243680
Gross return	**-**	**-**	**210960**	**-**	**276400**	**243680**
Gross margin	**-**	**-**	**101004**	**-**	**139519**	**120262**
Net return	**-**	**-**	**86028**	**-**	**113627**	**99827**
BCR	**-**	**-**	**1.68**	**-**	**1.70**	**1.69**

Source: Field survey (2009)

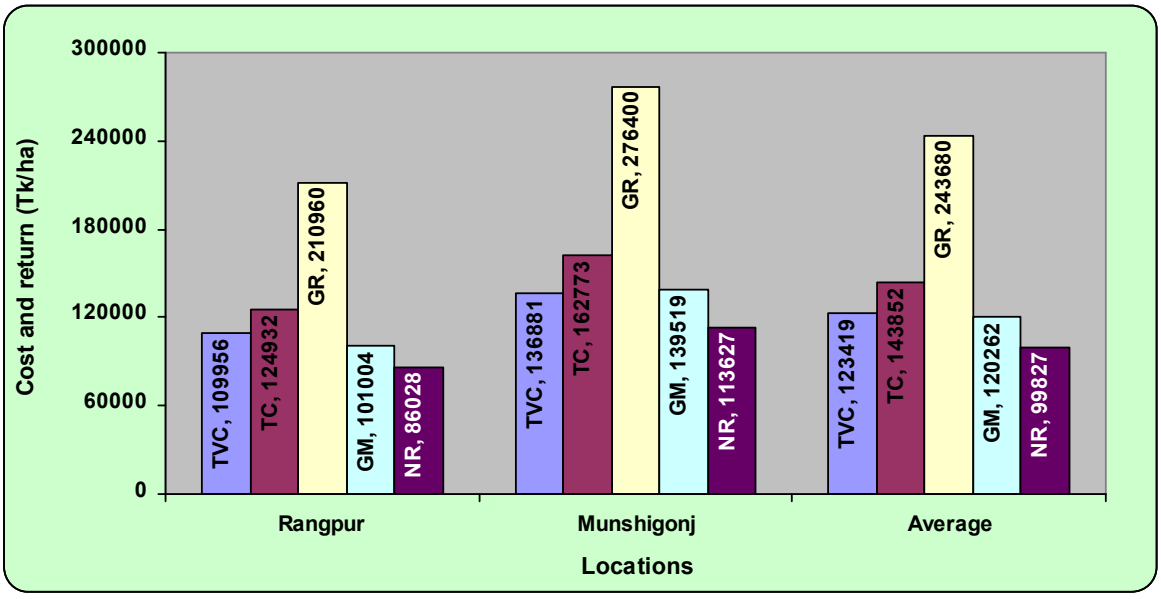

Figure 3. 6 Cost and return of potato cultivation

3.1.7 Lentil: Data on lentil were collected from two intensive lentil growing areas of Pabna and Kushtia. Results revealed that per hectare average cost of pulse cultivation was Tk.29,634.00 and gross return was Tk.45,419 (Table 3.7). Average gross margin, net return and BCR were Tk.26,919, Tk.15,785 and 1.54 respectively indicating that farmers received

good returns by cultivating lentil. Between the two locations yield was higher at Pabna (1.15 t/ha) compared to Kushtia (1.03 t/ha). A few amount of fertilizer (TSP @ 74 kg and MP @ 37 kg/ha) was found to apply by the farmers of Pabna. The farmers at Kushtia cultivated lentil in char areas and did not apply any organic and inorganic fertilizers. Due to higher yield, gross margin, net return and BCR were found higher at Pabna. Among the variable costs human labour shared the single highest cost item for both the areas followed by seed and power tiller. The finding of this study is comparable with the findings of Hasan *et al.* (2008) and BARI (2008) where yield of lentil was recorded at 1.15 t/ha and 1.04t/ha respectively.

Table 3.7 Per hectare cost and return of lentil in selected areas of Bangladesh

Items	**Unit**	**Pabna**		**Kushtia**		**Average Cost/return (Tk/ha)**
		Amount	**Cost/return (Tk/ha)**	**Amount**	**Cost/return (Tk/ha)**	
Variable costs:						
Human labour	Man-days	52	7800	48	7200	7500
Power tiller	-	-	2964	-	2779	2872
Seed	Kg	37	4810	40	5200	5005
Fertilizers:						
TSP	Kg	74	888	-	-	444
MP	Kg	37	1295	-	-	648
Pesticides	-	-	1853	-	2223	2038
Int. on operating capital	-	-	523	-	464	494
Total variable cost	**-**	**-**	**20133**	**-**	**17866**	**19000**
Fixed cost (Rental value of land)	-	-	11115	-	10154	10635
Total cost			**31248**		**28020**	**29634**
Grain yield	Kg	1152	46080	1030	41200	43640
Stover yield	-	-	1964	-	1593	1779
Gross return	**-**	**-**	**48044**	**-**	**42793**	**45419**
Gross margin	**-**	**-**	**27911**	**-**	**24927**	**26919**
Net return	**-**	**-**	**16796**	**-**	**14773**	**15785**
BCR	**-**	**-**	**1.54**	**-**	**1.53**	**1.54**

Source: Field survey (2009)

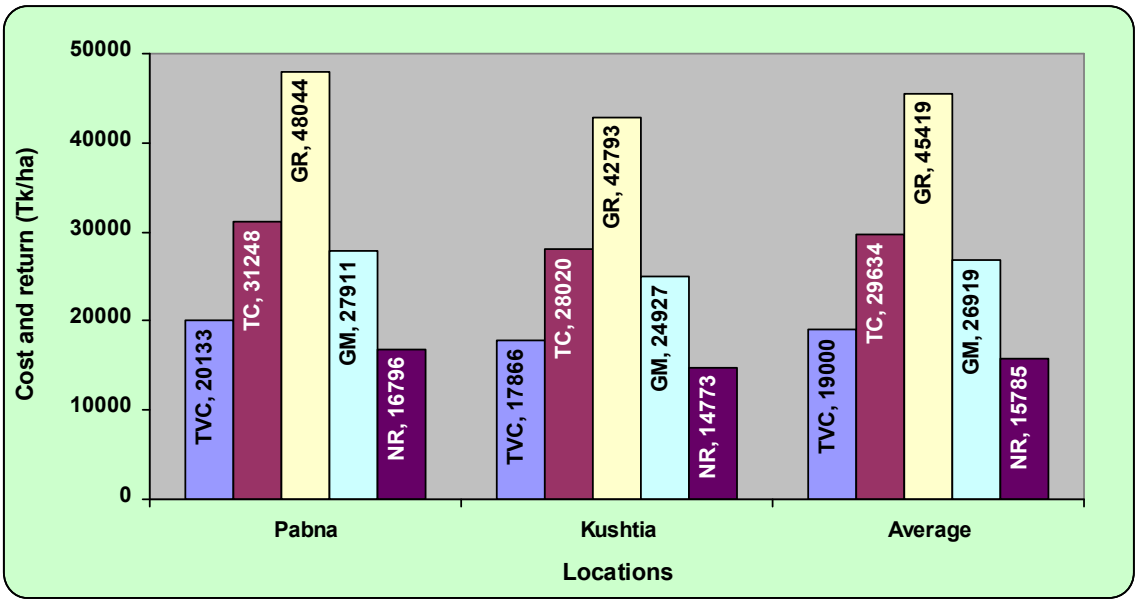

Figure 3. 7 Cost and return of lentil cultivation

3.1.8 Comparison of financial profitability: It is observed from the financial analysis that among the studied crops highest gross margin (Tk.120,262/ha) was found for potato followed by winter maize (Tk.51,115/ha), aromatic fine rice (Tk.46,414/ha) and non-aromatic fine rice (Tk.31,340/ha). More or less similar trend was also observed for net return among different crops (Table 3.8 and Figure 3.8). Highest benefit cost ratio was calculated for aromatic fine rice (1.71) followed by potato (1.62) and winter maize (Figure 1.2). On the other hand, lowest benefit cost ratio was obtained from summer maize (1.17) followed by coarse rice and wheat (1.19 each) (Table 3.8 and Figure 3.9).

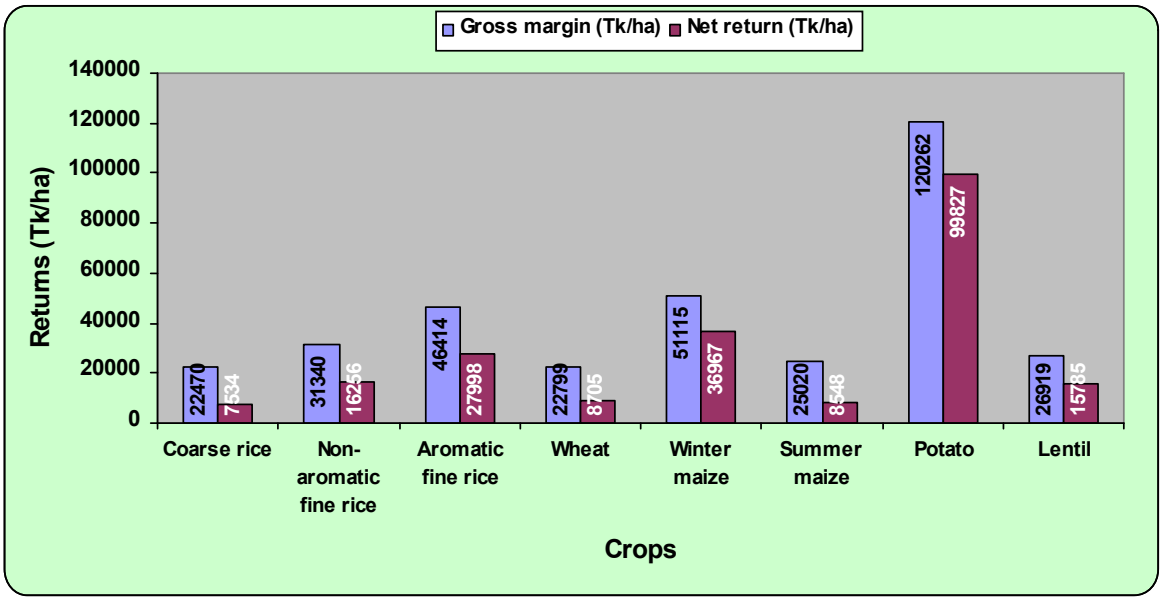

Figure 3. 8 Gross margin and net return of different crop cultivation

Table 3.8 Comparison of financial profitability among different crops

Crops	Total variable cost (Tk/ha)	Fixed cost (Rental value) (Tk/ha)	Total cost (Tk/ha)	Gross return (Tk/ha)	Gross margin (Tk/ha)	Net return (Tk/ha)	BCR

1. Coarse rice	25978	14936	40912	48447	22470	7534	1.19
2. Non-aromatic fine rice	49338	15085	64422	80679	31340	16256	1.26
3. Aromatic fine rice	21145	18142	39286	67285	46414	27998	1.71
4. Wheat	31457	14094	45551	54257	22799	8705	1.19
5.Winter maize	45714	14148	59862	96829	51115	36967	1.62
6. Summer maize	32811	16472	49283	57831	25020	8548	1.17
7. Potato	123419	20434	143852	243680	120262	99827	1.69
8. Lentil	19000	10635	29634	45419	26919	15785	1.54

Source: Field survey (2009)

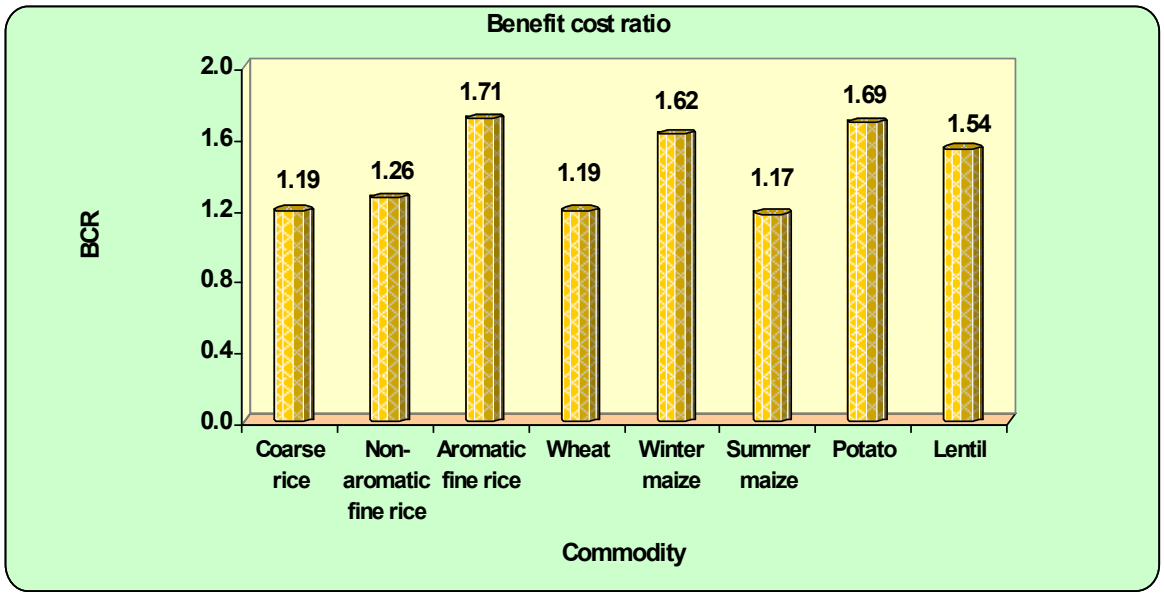

Figure 3. 9 Benefit cost ratio (BCR) of different crop cultivation

3.2. Measuring the Impact of Policies on Agricultural Incentives

3.2.1 Nominal Protection

3.2.1.1 Rice: Rice is a predominant crop in Bangladesh agriculture. So the impact of trade policy on agricultural incentives would be largely through the effects on the rice sector. The border price comparison for rice is in the respect of coarse-quality rice, non-aromatic fine rice and aromatic fine rice which accounts for most of the rice produced in the country. We have, chosen Kolkata price, Thai parboiled 100% and Pakistan basmati ordinary price as the reference grade for comparison with domestic coarse rice, non-aromatic fine rice and aromatic fine rice for import parity and export parity respectively. The evidence of protection on coarse rice for import parity and export parity from 2005 to 2009 is presented in Table 3.9,

and 3.10 respectively. The domestic-to-border price ratio was greater than unity for import parity of coarse rice from 2005 to 2007, indicating that the nominal rate of protection was mainly positive for coarse rice. Whereas it was less than unity from 2008 to 2009, indicating that NRP was significantly negative at the import parity price indicating that domestic coarse rice producers was taxed and consumers were subsidized (Table 3.9). Out of the 05 years for export parity of coarse rice, the NRP was positive all of the years. The low reference price for export parity from 2005 led NRP to be positive upto 2009. It suggests that domestic coarse rice production was protected and trade liberalization resulted in a decline in the domestic price to bring it closer to the world price (Table 3.10). The domestic-to-border price ratio was less than unity for most of the years on non-aromatic fine rice and aromatic fine rice, indicating that NRP was significantly negative both for import parity and export parity. Interestingly, the domestic price has always been below the world prices as shown in Figure 3.11 -3.14.

However this interpretation depends on the assumption of reference price. In most cases, the average import prices recorded in the country's trade statistics cannot be used to represent competitive market prices, because these imports were often financed by foreign grants (Mahmud *et al.* 1993). On the other hand, there is a strong consumer preference for the domestic coarse rice over the imported rice, which was studied by Rahman (1993). So it is difficult to really on international reference price for comparison.

Table 3.9 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of coarse rice[a] (import parity) at official exchange rate

Year	Import parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	14980	14624	1.024	0.024
2006	15940	14666	1.087	0.087
2007	17730	16976	1.044	0.044
2008	22970	25091	0.915	-0.085
2009	23240	24374	0.953	-0.047

Source: Own estimation
Note: a. Coarse rice; b. Wholesale price of coarse rice; c. Import parity border price.

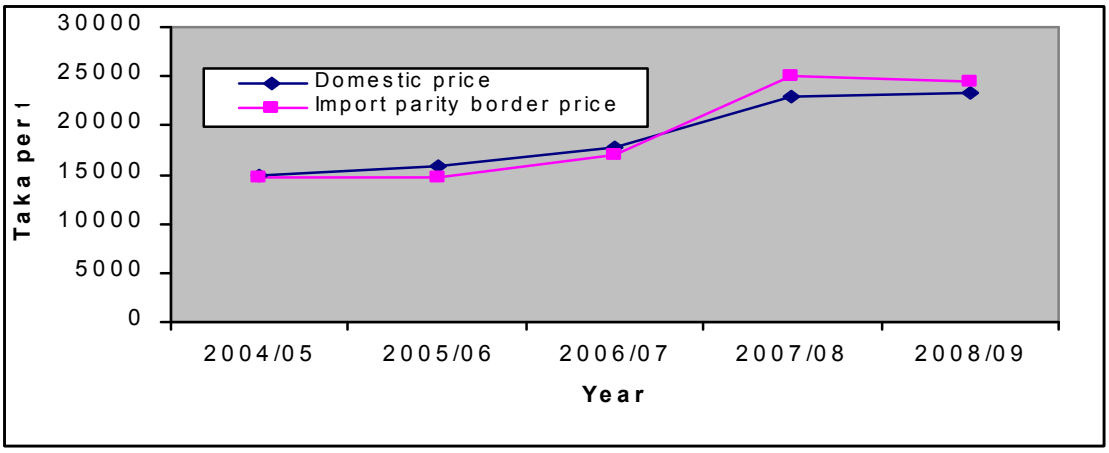

Figure 3.10 Coarse rice price in Bangladesh (import parity)

Table 3.10 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of coarse rice[a] (export parity) at official exchange rate

Year	Export parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	14980	12633	1.186	0.186
2006	15940	12633	1.262	0.262
2007	17730	14902	1.190	0.190
2008	22970	22980	1.000	0.000
2009	23240	22216	1.046	0.046

Source: Own estimation

Note: a. Coarse rice; b. Wholesale price of coarse rice; c. Export parity border price.

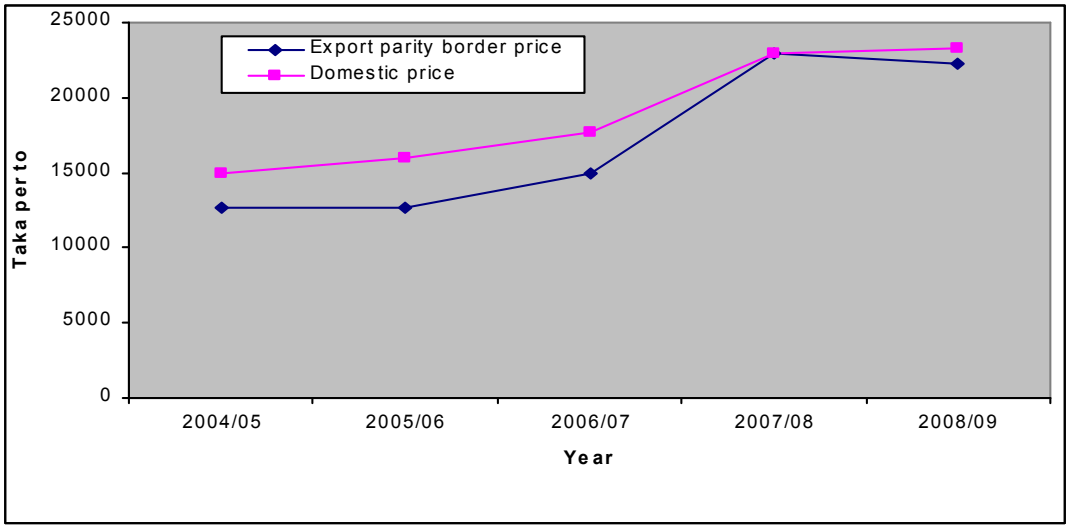

Figure 3.11 Coarse rice price in Bangladesh (export parity)

Table 3.11 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of non-aromatic fine rice[a] (import parity) at official exchange rate

Year	Import parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	7556	17269	0.438	-0.562
2006	7580	17209	0.440	-0.560
2007	7604	18745	0.406	-0.594
2008	18528	42434	0.437	-0.563
2009	9929	21456	0.463	-0.537

Source: Own estimation

Note: a. BRRI Dhan-29.
b. Harvest time market price of BRRI Dhan-29.
c. Import parity border price.

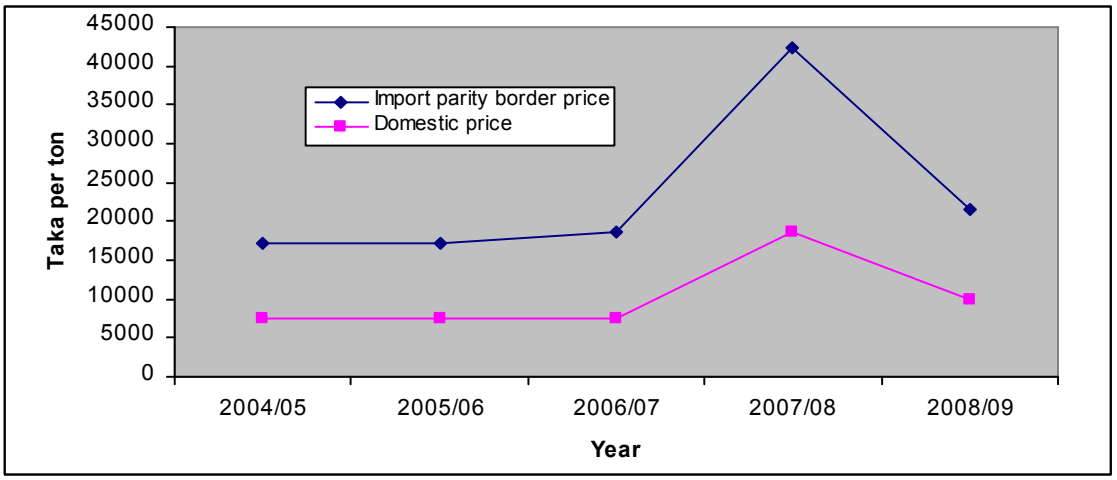

Figure 3.12 Fine rice price in Bangladesh (import parity)

Table 3.12 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of non-aromatic fine rice[a] (export parity) at official exchange rate

Year	Export parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	7556	7788	0.970	-0.029
2006	7580	7268	1.042	0.042
2007	7604	9842	0.772	-0.227
2008	18528	27149	0.444	-0.555
2009	9929	15408	0.644	-0.355

Source: Own estimation

Note: a. BRRI Dhan-29.
b. Harvest time market price of BRRI Dhan-29.
c. Export parity border price.

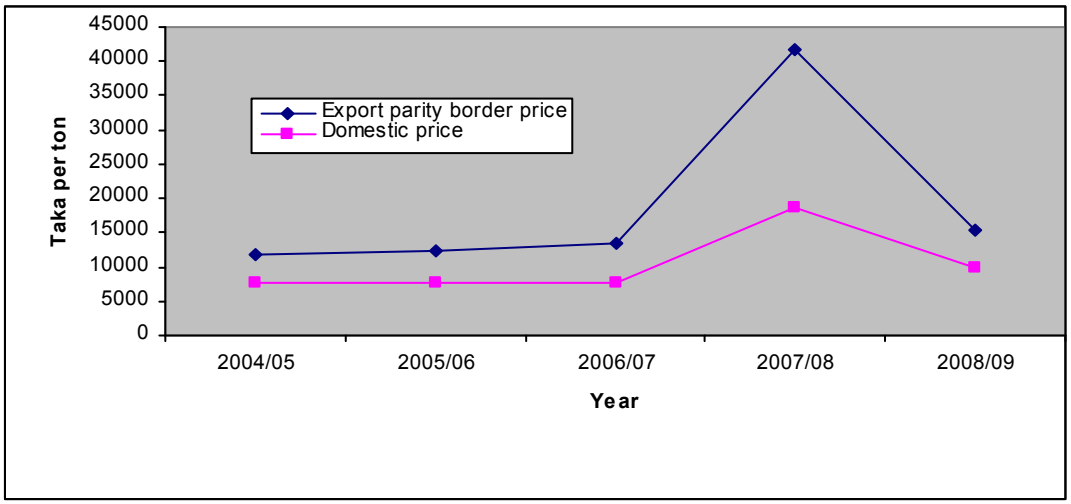

Figure 3.13 Non-aromatic fine rice prices in Bangladesh (export parity)

Table 3.13 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of aromatic fine rice[a] (import parity) at official exchange rate

Year	Import parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	10924	13095	0.577	-0.423
2006	13548	32006	0.423	-0.577
2007	16172	39608	0.408	-0.592
2008	25795	56323	0.458	-0.542
2009	17081	47161	0.362	-0.638

Source: Own estimation

Note: a. Aromatic rice; b. Harvest time market price of aromatic rice; c. Import parity border price.

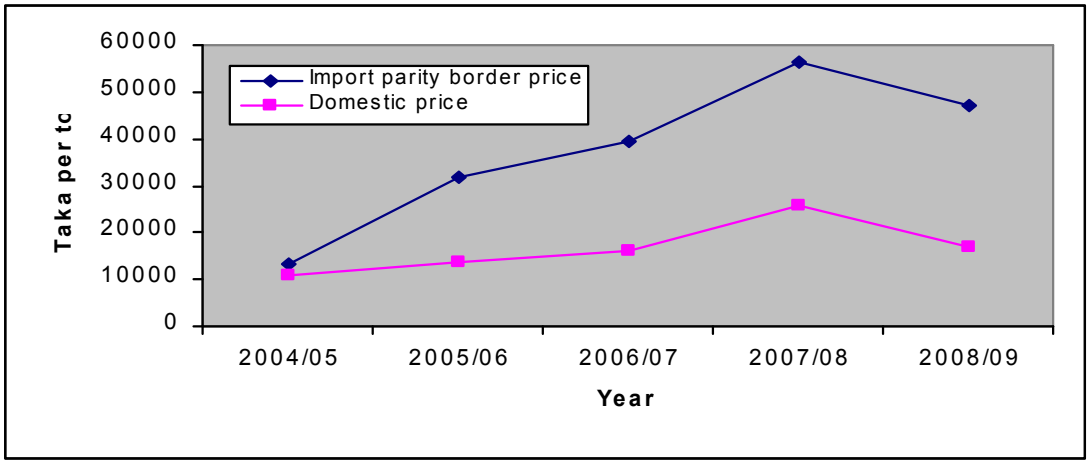

Figure 3.14 Aromatic rice price in Bangladesh (import parity)

Table 3.14 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of aromatic fine rice[a] (export parity) at official exchange rate

Year	Export parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	10924	24807	0.440	-0.560
2006	13548	25720	0.527	-0.473
2007	16172	32290	0.501	-0.499
2008	25795	47480	0.453	-0.457
2009	17081	38007	0.449	-0.551

Source: Own estimation
Note: a. Aromatic rice; b. Harvest time market price of aromatic rice; c. Export parity border price.

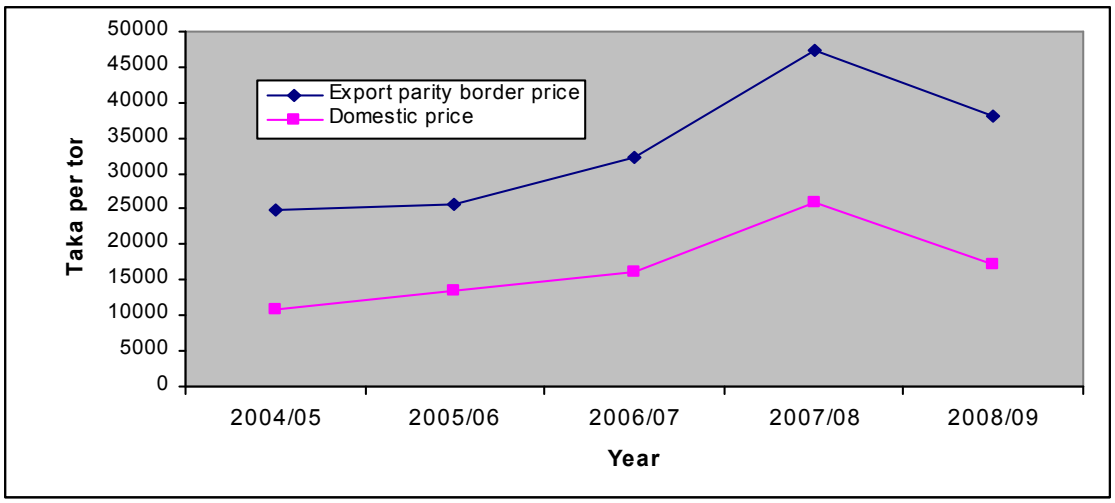

Figure 3.15 Aromatic rice price in Bangladesh (export parity)

3.2.1.2 Wheat: The foodgrain deficit of the country has historically been made up mainly through wheat imports. Wheat is clearly an importable and domestic production substitutes for imports. Farmgate prices have been used as the domestic producer prices, while the US Hard Winter No.2 wheat price has been used as the world wheat price.

Table 3.15 indicates that from 2005 to 2009, NRP for wheat was significantly negative at the import parity, indicating that domestic wheat production was taxed and consumers were subsidized. Therefore, the border parity price of wheat at producer level measured at official exchange rate was mostly higher than the domestic producer price, with average NRP of 13 per cent for the period under review.

Table 3.15 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of wheat[a] (import parity) at official exchange rate

Year	Domestic price[b] Tk/ton	Border price[c] Tk/ton	NPC	NRP (percent)
2005	11850	13318	0.889	-0.110

2006	14320	14407	0.993	-0.006
2007	16790	18281	0.918	-0.081
2008	19260	26193	0.735	-0.264
2009	16691	20458	0.815	-0.184

Source: Own estimation

Note: a. US hard winter No. 2; b. Harvest time domestic price and c. Import parity border price

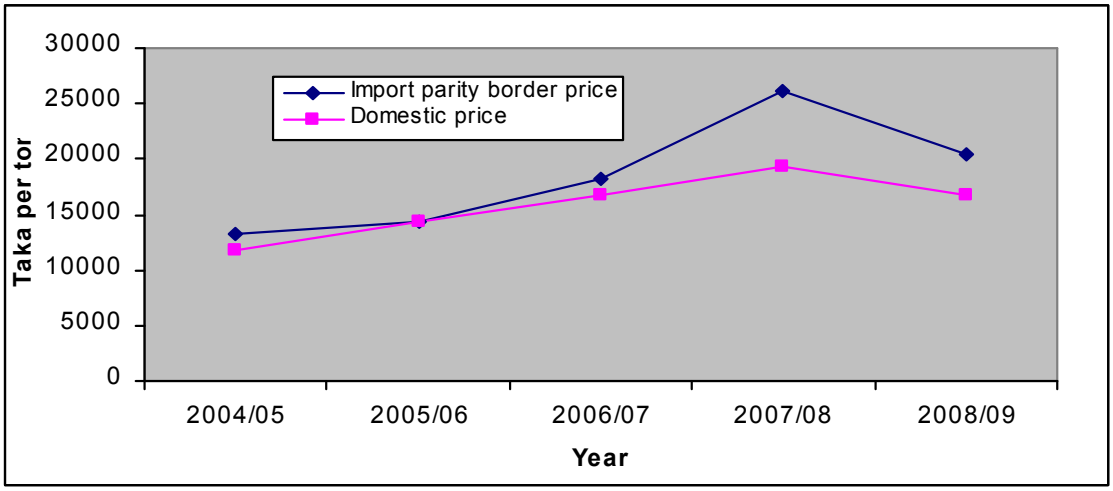

Figure 3.16 Wheat price in Bangladesh (Import parity)

3.2.1.3 Maize

Among all food grain crops, maize is clearly an importable and domestic production only supplements the imports. From Table 3.16 focused that maize production was negatively protected for investigated years indicating that domestic maize production was taxed and consumers were subsidized. Therefore, the border parity price of maize at producer level measured at official exchange rate was always higher than the domestic producer price, with average NRP of 25 per cent for the period under review.

Table 3.16 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of maize[a] (import parity) at official exchange rate

Year	Domestic price[b] Tk/ton	Border price[c] Tk/ton	NPC	NRP (percent)
2005	8045	9021	0.892	-0.108
2006	8865	9759	0.908	-0.092
2007	9685	12262	0.790	-0.210
2008	10505	18016	0.583	-0.417
2009	8809	14805	0.595	-0.404

Source: Own estimation
Note: a. US hard winter No. 2; b. Harvest time domestic price and c. Import parity border price

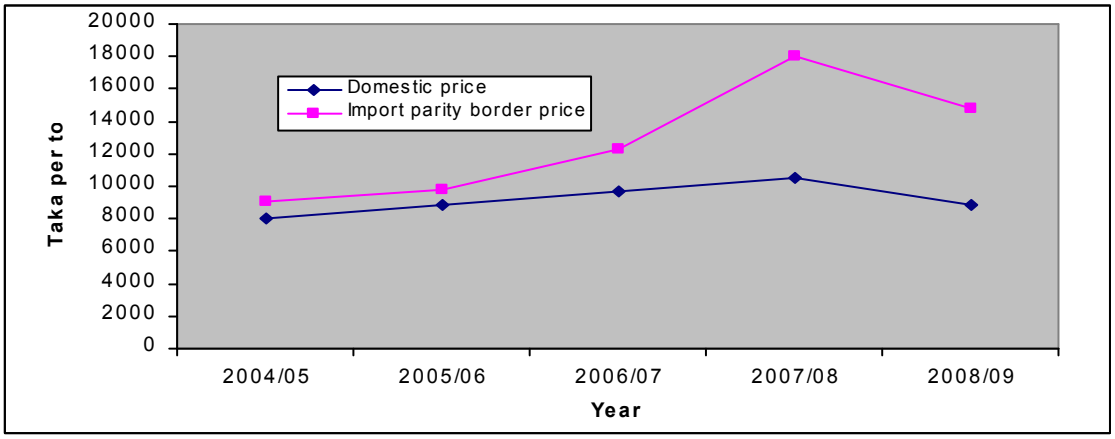

Figure 3.17 Maize price in Bangladesh (Import parity)

3.2.1.4 Potato: Bangladesh is virtually self-sufficient in potato production. However, seed potatoes are imported by the BADC from Holland every year. On the other hand, a very small quantity is reported to have been exported under the government initiative. Due to large production instability induced by weather shifts, periods of scarcity and surplus arise, altering the potential trade status of the country for this commodity (Huda, 2001). In calculating protection rates, import parity prices at producer level were used as the reference price under free trade. The results indicated that potato production was negatively protected for the investigation period 2005 to 2009. The Nominal Rate of Protection (NRP) was -68 per cent, on average, at import parity prices (Table 3.17).

Table 3.17 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of potato[a] (import parity) at official exchange rate

Year	Import parity			
	Domestic price[b] Tk/tonne	Border price[c] Tk/tonne	NPC	NRP (percent)
2005	7725	22729	0.339	-0.660
2006	7740	23851	0.324	-0.675
2007	7755	24973	0.310	-0.689
2008	7770	26095	0.297	-0.702
2009	7785	27217	0.286	-0.713

Source: Own estimation
Note: a. Potato (US Gulf); b. Harvest time market price of Potato; c. Import parity border price.

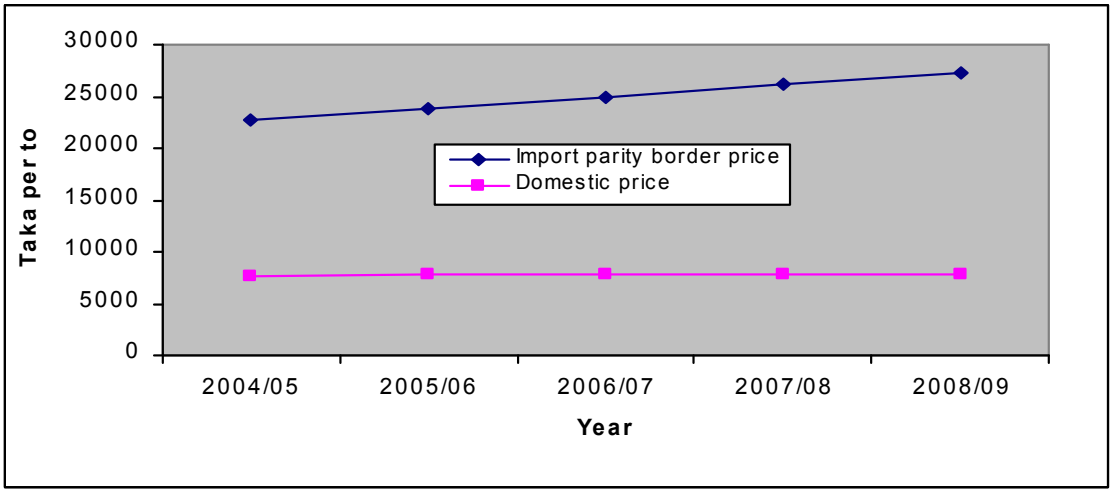

Figure 3.18 Potato price in Bangladesh (Import parity)

3.2.1.5 Lentil: Masur and Khesari are the most important pulse varieties produced and consumed in Bangladesh. However, internationally traded Turkish lentils are closely comparable to masur. Turkish prices of lentils were therefore, used in the parity price calculations. Table 3.18 indicates that out of 05 years NRP for lentil was negative all years. Therefore, the border parity price of lentil at producer level at the official exchange rate has remained higher than the domestic producer price, with average NRP of 31 per cent for the period under review (2005 to 2009).

Table 3.18 Trends in domestic-to-border price ratio (NPC) and nominal rate of protection (NRP) of lentil (import parity) at official exchange rate

Year	Lentil[a]			
	Domestic price[b] Tk/ton	Border price[c] Tk/ton	NPC	NRP (percent)
2005	27050	36004	0.751	-0.248
2006	29150	43143	0.675	-0.324
2007	31250	43357	0.720	-0.279
2008	33350	51070	0.653	-0.346
2009	22691	52712	0.430	-0.569

Source: Own estimation

Note: a. Turkish Lentil; b. Harvest time market price; c. Import parity border price.

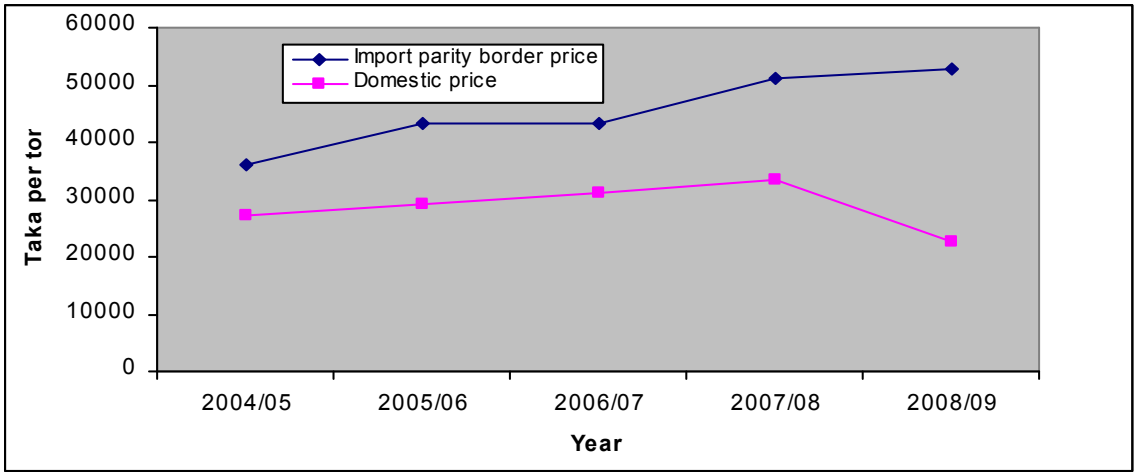

Figure 3.19 Lentil price in Bangladesh (Import parity)

3.2.2 Effective Protection

Trade and exchange rate policies influence not only the prices of agricultural outputs but also the prices of tradable inputs used in agricultural production. Thus, in general, the effective rate of protection is the more relevant measure of incentives. While the direct effects of trade and exchange rate policies on output price are measured by the nominal rate of protection (NRP) discussed earlier, the direct effects on value-added per unit of output of a commodity (defined as gross output value minus cost of marginal inputs) are measured by the Effective Rate of Protection (ERP), thus, a better measure of policy incentive takes into account the effect of policies on input prices such as a subsidy on fertilizer, irrigation, fuel and credit.

Government policy in Bangladesh often tries to compensate producers for low farm prices by subsidies on inputs. So the present study has been estimated the level of effective protection as it is a relevant measure of incentive. EPC and ERP have been calculated for each crop based on technical co-efficient (e.g. units of fertilizer for producing per tonne rice) which has been discussed in Appendix section.

Table 3.19 Effective rates of protection for selected agricultural commodities

Year	Coarse rice				Non-aromatic fine rice				Aromatic fine rice			
	Import parity		Export parity		Import parity		Export parity		Import parity		Export parity	
	EPC	ERP	EPC	ERP	EPC	ERP	EPC	ERP	EPC	ERP	EPC	ERP
2005	1.06	0.06	1.24	0.24	0.43	-0.57	0.64	-0.36	0.85	-0.15	0.43	-0.57
2006	1.13	0.13	1.33	0.33	0.43	-0.57	0.63	-0.37	0.42	-0.58	0.52	-0.48
2007	1.08	0.08	1.24	0.24	0.40	-0.60	0.57	-0.43	0.40	-0.60	0.49	-0.51
2008	0.94	-0.06	1.03	0.03	0.43	-0.57	0.44	-0.56	0.45	-0.55	0.54	-0.46
2009	0.94	-0.06	1.04	0.04	0.41	-0.59	0.58	-0.42	0.34	-0.66	0.43	-0.57

Contd...

Year	Wheat		Maize		Potato		Lentil	
	Import parity		Import parity		Import parity		Import parity	
	EPC	ERP	EPC	ERP	EPC	ERP	EPC	ERP
2005	0.92	-0.07	0.94	-0.05	0.31	-0.68	0.75	-0.24
2006	1.04	0.04	0.95	-0.04	0.30	-0.69	0.67	-0.32
2007	0.94	-0.05	0.79	-0.20	0.28	-0.71	0.72	-0.27
2008	0.73	-0.27	0.55	-0.44	0.27	-0.72	0.65	-0.34
2009	0.80	-0.19	0.54	-0.45	0.24	-0.75	0.38	-0.61

Source: Own estimation

3.2.2.1 Rice: As noted in Table 3.19, the EPCs for non-aromatic fine rice and aromatic fine rice both for import parity and export parity was less than one in all of the years while it was more than unity at export and import parity on coarse rice in most of the years investigated. So the estimates of ERP implied that domestic coarse rice market was protected. The policy of self-sufficiency in food grain production has been achieved at the expense of protection for coarse rice.

3.2.2.2 Wheat and Maize: The EPCs for wheat and maize were less than one in most of the years investigated (Table 3.19). The average EPCs for wheat was 0.88 and maize was 0.75 at official exchange rate and direct effects of ERP estimates implied that the domestic wheat and maize market was marginally protected and the policy of self-sufficiency in foodgrain production has been at the expense of protection for wheat and maize. EPCs of wheat and maize was found similar to its NPC, as product specific fertilizer subsidies further reinforced only four per cent protection on the product side.

3.2.2.3 Potato: Traded input cost is very low in potato production, like other crops. As a result the effective rates of protection were similar to the nominal rates of protection presented earlier. The average effective protection co-efficient were worked out at 0.28 for the period 2005 to 2009. The estimates of ERP on an average for potato implied that the factor of production of potato could be paid up to 71 per cent considering import parity price under free trade.

3.2.2.5 Lentil: Due to low traded input component, the effective protection co-efficient for lentil was in general similar to nominal protection co-efficient presented earlier. The estimates of ERP on an average (Table 3.19) for lentil implied that the factors of production of lentil could be paid up to 31 per cent under free trade and still could remain competitive with import. There is an incentive for factors to be pulled into production of lentil.

3.3 Comparative Advantage of Selected Agricultural Production in Bangladesh

3.3.1 DRC for Rice: DRC indicates whether the domestic economy has a comparative advantage in producing a particular crop relative to other countries. If the DRC ratio is greater than one, it implies that the economy loses foreign exchange through domestic production of the crop (in the sense that it uses more domestic resources than it generates net value added to tradable goods and services), while a DRC ratio of less than one implies that the production is efficient and make positive contribution to domestic value added. The estimates of DRC ratios for all types of rice for the period 2005 to 2009 at import and export parity prices are presented in Table 3.20. Thus the results of the study implied that production of those varieties would be highly efficient for import substitution and export, the case being stronger for import substitution than export. These results were also supported by findings of earlier studies by Talukder et.al (2004) and Anik (2003).

3.3.2 DRC for Wheat: The estimates of DRC in Table 3.20 show that Bangladesh had comparative advantage in wheat production as the estimates of DRC were less than one in all of the years investigated. The major cause of comparative advantage in recent years was higher world price of wheat.

Table 3.20 Domestic resource costs for selected agricultural commodities

Year	DRC					
	Fine rice		Aromatic rice		Coarse rice	
	Import parity	Export parity	Import parity	Export parity	Import parity	Export parity
2005	0.570	0.857	0.474	0.474	0.681	0.798
2006	0.621	0.900	0.347	0.188	0.738	0.868
2007	0.612	0.882	0.325	0.153	0.680	0.783
2008	0.279	0.284	0.131	0.108	0.482	0.529
2009	0.561	0.800	0.406	0.354	0.433	0.477

Contd...

Year	DRC			
	Wheat	Maize	Potato	Lentil
	Import parity	Import parity	Import parity	Import parity
2005	0.704	1.149	0.374	0.308
2006	0.659	1.067	0.380	0.258
2007	0.513	0.822	0.385	0.259
2008	0.352	0.535	0.391	0.221
2009	0.822	0.568	0.388	0.429

Source: Own estimation

3.3.3 DRC for Maize: In maize production, Bangladesh had disadvantage position in the year 2005-2006 but it turned to comparative advantage in 2007 to 2009 years investigated.

3.3.4 DRC for Potato: Potato is treated as a non-traded product for economic valuation, yet the study estimated its comparative advantage considering trade potential under alternative import regimes. Table 3.20 shows that DRC for potato was less than unity in all over investigated years. Thus the results of the study implied that production of potato would be highly efficient for import substitution.

3.3.5 DRC for Lentil: Lentil has traditionally been grown in dry land soil during seasonal intervals. The estimates of DRC in Table 3.20 show that Bangladesh had comparative advantage in lentil production as the estimates of DRC were less than unity in all years investigated.

4. KEY FINDINGS

- Net return was found positive for all the crops studied. However highest net return was estimated for potato (Tk 99,827/ha) followed by winter maize (Tk 36,967/ha) and aromatic fine rice (Tk 27,998/ha). Comparatively lower net return was calculated for coarse rice (Tk 7,534/ha), summer maize (Tk 8,548/ha) and wheat (Tk 8,705/ha).

- Highest benefit cost ratio was calculated for aromatic rice (1.71) followed by potato (1.69) and winter maize (1.62). Comparatively lower benefit cost ratio was calculated for summer maize (1.17), coarse rice and wheat (1.19 each).

- The domestic-to-border price ratio of rice was less than unity for most of the years both import and export parity and was significantly negative. It indicates that domestic rice production was taxed and consumers were subsidized.

- The border price of wheat at producer level measured at official exchange rate was mostly higher than the domestic producer price at the investigated years.

- The effects of maize pricing and trade policies resulted in negative protection. Thus domestic producer prices have always been below the world prices. Maize was negatively protected.

- Potato was also negatively protected at import parity prices.

- The border parity price of lentil at producer level with the official exchange rate was higher than the domestic producer price at the investigated years.

- DRCs for rice were observed to be less than unity (under import parity price and most of the years under export parity) implying that Bangladesh had comparative advantage in rice production for import substitution and export promotion.

- The estimates of DRC showed that Bangladesh had comparative advantage in wheat production as the estimates of DRC were less than one in all the years investigated.

- DRC for potato and lentil was less than unity in all over investigated years. Thus the results of the study implied that production of potato and lentil would be highly efficient for import substitution.

5. RECOMMENDATIONS AND POLICY SUGGESTIONS

The most obvious policy implications are laid as follows:

- Rice production, particularly for coarse and non-aromatic fine rice could be expanded for substitution of imports by using more improved technology as the country's rice demand is partially met by imports. Because sometimes price of rice in the international market goes up for imposition of taxes. Emphasis should also be given on local production of aromatic fine rice as the export parity is favourable for the country.
- Wheat and maize production could also be expanded for substitution of imports by using more improved technology as the country's wheat and maize demand is met largely from imports every year.
- Up to date and timely information regarding inputs, inputs prices, availability of improved varieties, output market prices, and agricultural and macroeconomic policies should be ensured to improve the competitiveness and comparative advantage of farmers.
- To exploit the export opportunities, Bangladesh will need to enhance its supply-side capacity and pursue a broad based diversified agricultural production and export strategy.

6. AREAS FOR FURTHER RESEARCH

The trading opportunities of the country's products depend on the comparative advantage, without subsidies or with limited subsidies that are permitted for all trading partners by the rules governing the new trading environment. The results obtained from this study would be of much help to the planners and policy-makers in formulating appropriate policies for optimum and efficient resource allocation within agriculture and between agriculture and non-agricultural sectors, consistent with a balanced and integrated development of Bangladesh economy. However, the usefulness and effectiveness of any policy formulation is constrained by the limitation of the study as the study covered small number of samples and based on one year survey data.

Therefore, it would be desirable that the basic information (like export, import parity price) would be furnished to enrich the existing body of knowledge about the nature of price variability of both agricultural and non-agricultural products and the factors responsible for such variations.

Studies should be undertaken to cover all major crops covering main crop growing areas of the country. Further research may be undertaken covering minor crops which have international competitiveness.

7. CONCLUSIONS

Net return was found positive for all the crops studied. Highest benefit cost ratio was calculated for aromatic rice followed by potato and winter maize. The domestic-to-border price ratio of rice was less than unity for most of the years both import and export parity and was significantly negative. The border price of wheat, maize, potato and lentil at producer level measured at official exchange rate was mostly higher than the domestic producer price at the investigated years. DRCs for rice were observed to be less than unity implying that Bangladesh had comparative advantage in rice production for import substitution and export promotion. The estimates of DRC showed that Bangladesh had comparative advantage in wheat production. The results of the study implied that production of potato and lentil would be highly efficient for import substitution. For successful implementation of trade liberalization policies, Bangladesh must plan accordingly and take appropriate policies to materialize the likely gains in trade by increasing its trade capacity. To exploit the export

opportunities, Bangladesh will need to enhance its supply-side capacity and pursue a broad based diversified agricultural production and export strategy.

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The Authors

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APPENDIX TABLES

Appendix Table 1. Different rates used in the calculation of magnitudes of the related variables

Year	Official Exchange rate (Tk./US $)	Public transport freight per tonne per kilometer (Tk)	Ocean freight rates from US Gulf to Chittagong (US$/tonne)
2005	67	1.50	56.00
2006	67	1.50	50.00
2007	69	1.50	50.00
2008	69	1.50	50.00
2009	69	1.50	50.00

Source:1. Bangladesh Bank, Economic trends, various issues, 2. BBS, Statistical yearbook, various issues, 3. FAO, Trade Yearbook, various issues, 4. FAO, Food Outlook, various issues, 5. http://www.faostat.fao.org

Appendix Table 2. Selected agricultural commodity prices at international market

(US $/tonne)

Year	Coarse rice Kolkata price (LC settle price))	Non-aromatic fine rice (Thai parboiled100%)	Aromatic fine rice (Pak Basmati)	Wheat (US hard winter no.2)	Maize(US hard winter no.2)	Lentil
				US Gulf ports	US Gulf ports	Turkish ports
2005	203	285	516	168	98	617
2006	203	300	550	199	121	766
2007	230	332	677	264	163	776
2008	347	722	838	344	223	795
2009	336	329	687	253	171	776

Source: 1. FAO Commodity review and Outlook, 2 .Bangladesh Bank, Economic Trends, various issues, 3 .FAO Commodity Review and Outlook and Bangladesh Bank, Economic Trends (April 2000), 4 .FAO Trade Yearbook, various issue (For Export Value and Export Quantity).,5 .http://www.faostat.fao.org

Appendix Table 3. Estimated border prices of selected agricultural commodities

(Tk. / Tonne)

Year	**Coarse rice**		**Non-aromatic fine rice**		**Aromatic fine rice**		**Wheat** Import parity	**Maize** Import parity	**Potato** Import parity	**Lentil** Import parity
	Import parity	Export parity	Import parity	Export parity	Import parity	Export parity				
2005	14624	12633	17269	11840	13095	24807	13318	9021	22730	36004
2006	14666	12633	17209	12215	32006	25720	14407	9759	23851	43143
2007	16976	14902	18745	13358	39608	32290	18281	12262	24973	43358
2008	25091	22980	42434	41679	56323	47480	26194	18016	26095	51071
2009	24374	22216	21456	15408	47161	38007	20459	14805	27217	52713

Sources: Own estimation based on the official data on world prices, freight and import/export handling cost as reported by various publications mentioned in Appendix table 1 and 2.

Appendix Table 4. Estimated border prices of fertilizers

(Tk./Tonne)

Year	Urea (c.i.f. import price)	TSP (c.i.f. import price)	MP (c.i.f. import price)
2005	13180	15943	13795
2006	13969	16723	14429
2007	14758	17502	15063
2008	15547	18281	15698
2009	16336	19061	16332

Sources: Prices of fertilizers of the years 2005-2006 were obtained from Rashid (2009) and for rest of the years were calculated by extrapolation

Appendix Table 5. Calculation of import parity border prices for 2009

Items	Coarse rice	Non-aromatic fine rice	Aromatic fine rice	Wheat	Maize	Potato	Lentil
A. c.i.f price at port of entry Chittagong (Tk./tonne)	23184	26132	50816	20892	15238	27133	56952
B. Marketing margin from the port of entry to the wholesale market	1190	1301	1189	868	868	1327	2225
Import handling cost	673	784	672	359	359	814	1708
Transportation cost	396	396	396	396	396	396	396
Domestic trading cost	121	121	121	113	113	117	121
C. Border price at wholesale level (A+B)	**24374**	27433	52005	21760	16106	28460	59178
D. Components of the marketing spread between the wholesale market to the produce level	-	5977	4844	1301	1301	1242	6465
Cost from mill gate to wholesale	-	748	848	-	-	-	87
Milling cost	-	508	608	-	-	-	244
Adjustment at 67% milling rate for rice and 85% for lentil	-	3900	2525	-	-	-	3403
Interest cost	-	248	191	-	-	-	1134
Cost from farmer to mill gate	-	573	672	-	-	-	1597
E. Border price of farm produce at producer level (C-D)	-	21456	47161	20459	14805	27217	52713

Source: Own calculation by using different data sets from various publications and field survey.

Appendix Table 6. Calculation of export parity border prices for 2009

Items	**Coarse rice**	**Non-aromatic fine rice**	**Aromatic fine rice**
A. f.o.b price at port of exit Chittagong (Tk./tonne)	23184	22685	47369
B. Components of the marketing margin from border to producers level	968	7277	9362
Export handling cost	451	451	451
Transportation cost Dhaka to Chittagong	396	396	396
Trading cost	121	6430	8515
C. Border price at producer level (A-B)	22216	15408	38007

Source: Own calculation by using different data sets from various publications and field survey**.**

Appendix Table 7. Calculation of DRC for selected agricultural commodities in Bangladesh, 2009

Items	**Coarse rice** (Import parity)	**Coarse rice** (Export parity	**Non-aromatic fine rice** (Import parity)	**Non-aromatic fine rice** (Export parity	**Aromatic fine rice** (Import parity)	**Aromatic fine rice** (Export parity)	**Wheat** (Import parity)	**Maize** (Import parity)	**Potato** (Import parity)	**Lentil** (Import parity)
A.Traded inputs (Tk/Ton)	1201	1201	1201	1201	871	740	2186	2186	821	1633
B. Non-traded inputs and domestic resources (Tk/Ton)	10030	10030	11364	11364	16370	16370	15014	7171	10250	21928
Human labour	2573	2573	3460	3460	4046	4046	4815	2460	2859	5743
Animal labour	1115	1115	969	969	1052	1052	1851	471	597	2199
Seed	271	271	163	163	781	781	1191	479	3019	3832
Manure	349	349	601	601	832	832	773	339	329	-
Irrigation	790	790	2176	2176	1512	1512	900	421	372	-
Land rent	4743	4743	2545	2545	7887	7887	5164	2744	2839	8143
Int. on operating capital	189	189	249	249	260	260	320	257	135	378
C. Output price (Tk/Ton)	24374	22216	21456	15408	47161	32077	20458	14804	27217	52712
D. Value Added (Tradable) (Tk/Ton) (C-A)	23173	21015	20255	14207	46290	31337	18272	12618	26769	51079
E. DRC (B÷D)	0.433	0.477	0.561	0.800	0.354	0.522	0.821	0.568	0.388	0.429

Source: Own estimation by using different data sets and field survey.

The Competitiveness and Future Challenges of Bangladesh in International TradeThe Competitiveness and Future Challenges of Bangladesh in International Trade by anika3rahman.Â Market size. Only growth in productivity will allow firms to compete internationally and maintain and improve real income. produce goods and services which meet the test of international markets.1 Introduction: The determinants of competitiveness are many and complex. in turn. political. Movements in exchange rates also will impact the cost structure and relative output price in the short to medium-term. policies. National crop production target breaks down into district wise.Â The National Food Policy (NFP) 2006 provides strategic guidance to address the key challenges facing Bangladesh in achieving food security in all its dimensions. The three major objectives of NFP are: (i) adequate and stable supply of safe and nutritious food, (ii) increased purchasing power and access to food of people, and (iii) adequate nutrition for all individuals. To implement the objectives of the National Food Policy, a Plan of Action (2008- 2015) was developed along with 26 strategic areas of intervention and more than 300 action items were undertaken in short, medium and long term ov The Bangladesh Rice Research Institute is working with various NGOs and international organisations to reduce insecticide use in rice.[6]. Wheat is not a traditional crop in Bangladesh, and in the late 1980s little was consumed in rural areas. During the 1960s and early 1970s, however, it was the only commodity for which local consumption increased because external food aid was most often provided in the form of wheat. In the first half of the 1980s, domestic wheat production rose to more than 1 million tons per year but was still only 7 to 9 percent of total food grain production. Record prod...