

IMPACT OF CORRUPTION ON FARM PRODUCTION AND PROFIT

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ABSTRACT

By analyzing experiences of 210 rice farmers belonging to six villages of six different districts in Bangladesh this article estimates the impact of corruption on farm production and profit. Unlike existing literature corruption here is defined in broader term. Both explicit and implicit cost items are included while calculating the cost of corruption. Through estimating the marginal physical product of fertilizer, a relative impact of corruption on farm production is estimated. Then by hypothesizing different scenarios with different levels of corruption, changes in a farmer's benefit cost ratio is estimated. It has been observed that with reducing cost of corruption farmers observe higher benefit cost ratio and vice versa. Cost of corruption is found to be relatively higher in restricted input market situation and relatively lower when the market is more competitive. Thus our results are suggestive for competitive market policy to reduce corruption which will ultimately result in more farm production and profit.

KEY WORDS

Cost of corruption; Bangladeshi farm households; Marginal physical product; Benefit cost ratio; Scenario analysis.

Corruption as a research topic has gained much interests of the academicians and researchers. Since the last decade of the previous century, there has been an increasing trend in corruption literature. The economic literature about the impact of corruption can be classified into two broad categories. A group of researchers found inverse relationship between corruption and different development indicators and argued that corruption to be harmful for development.

Inverse correlation between corruption level and income across countries are well documented in literature (Treisman, 2000; Paldam, 2002; Chetwynd et al., 2003; Gundlach and Paldam, 2009). In general, countries with higher economic growth experience a low level of corruption and vice versa. Corruption increases costs and hence reduces incentives for investors. The entrepreneurs encounter higher costs while obtaining licenses and permits. It also creates uncertainty. Ultimately an investor's profit margin is at a lower level, and investment is discouraged. Mauro (1997) showed that high levels of corruption are associated with lower levels of investment as a share of GDP and with lower GDP growth per capita. Empirical evidence regarding negative impact of corruption on investment and capital accumulation are also well documented in the works of Lambsdorff (2003) and World Bank (2000).

Tanzi and Davodi (1997) tested four hypotheses to explain relationship between corruption and growth. Their results establish that higher levels of corruption are associated with: (1) increasing public sector investment, but productivity decreases, (2) reduced government revenues and fewer resources available for productive expenditures, (3) lower expenditures on operations and maintenance, and (4) reduced quality of public infrastructure i.e. road conditions, power and water losses, telecom faults, and the proportion of railway trains in use.

Del-Monte and Papagni (2001) observed bureaucratic corruption to reduce economic growth and the efficiency of public expenditures in Italy. Murphy et al. (1991) found that in a

corrupt environment, officials may find it profitable to be involved in rent-seeking activities rather than being involved in productive activities.

The literature also highlights the relationship between corruption and income inequality. Corruption is generally found at lower level in countries where income is more evenly distributed (Krueger, 1974; Rose-Ackerman, 1978; Gupta et al., 1998).

Contrary to this group of scholars, another group has mentioned some positive impacts of corruption. The most popular and common justification supporting such a positive role of corruption rests on the 'grease the wheels' hypothesis. The works of Leff (1964), Leys (1965), and Huntington (1968) are the pioneers for this hypothesis. According to them, corruption may be beneficial in a second-best world because of the distortions caused by ill-functioning institutions. To overcome inefficiency in the bureaucracy, investment is needed to 'speed' or 'grease' things.

According to Leff (1964), a bribe is an incentive for better performance for the officials and hence can promote economic growth by speeding up bureaucratic processes. He also observed, in circumstances where government spending is not efficient, corruption may improve the quality of investment. Through bribes, firms can evade taxes. Such evasion will reduce public revenue, but overall efficiency of the economy can be improved when compared to the government, firms or private entrepreneurs can invest efficiently.

Bardhan (1997) observed that corruption may help in overcoming bureaucratic rigidities when there is competition between bribers. Lui (1985) showed that a system built on bribery will lead to an efficient process for allocating licenses and government contracts, since the most efficient firms will be able to afford the highest bribes. Beck and Maher (1986) and Lien (1986) argued for corruption to play efficiency enhancing role. According to them, corruption may help officials make right choices, especially when the officials do not have enough information or are not competent in some decisions. As the most efficient company can pay the highest amount of bribe, selection of companies based on bribes can replicate the outcome of a competitive auction.

Through bribes, private agents can minimize the consequences of some unfavorable policies (Bailey, 1966). Bribe may simply work as a hedge against bad public policies (Leff, 1964). This is particularly true if due to some reasons, government policies or institutions are biased against entrepreneurship. By paying bribe, companies can evade or limit the adverse effects of these unfavorable policies.

Though the available literature offer some important insights about impact of corruption, they also have some limitations. The dominant trend here is to use different indices to measure corruption in a country. Unavailability of data regarding corruption experiences at micro or individual levels versus the easy availability of aggregate level data is perhaps the major factor for this trend (Mocan, 2008). In some literature bribery and corruption are used as synonyms, or they do not distinguish between these two, i.e. Rose-Ackerman, (1999); Wei, (1999). A common tendency in the literature is to begin with corruption in the title and then to focus only on bribery, i.e. Swamy et al. (2001); Torgler and Valev (2006); Torgler and Dong (2008); Shaw (2009) etc. Johnston (2000) observed that different corruption indices were biased to measuring bribery. Furthermore, in the existing literature, the implicit cost of bribery (i.e. the cost of negotiating for bribery, time wastage, etc) is not considered. For bribes, the literature incorporates only the amount of bribe.

Svensson (2003) identified three common features of the available corruption literature. These are (1) cross-country analyses; (2) analyses based on perception indices; and (3) foreign experts' assessments on overall corruption in a country (i.e. among different data sources used for constructing Transparency International's Corruption Perception Index and World Bank's Governance Indicators database some are foreign experts survey). Corruption is identified as an outcome of countries' policy-institutional environment in the literature. He also mentioned some that due to the aggregated nature of the data, cross country analyses can hardly tell anything about variations within country. Moreover, serious questions can be raised about acceptability of these studies due to perception biases.

One of the most challenging parts in corruption research is to conceptualize and identify corruption. Johnston (2000) pointed out several difficulties in measuring corruption.

Due to the secretive nature of corruption, it is often difficult to find direct witnesses of it. Especially when there is a win-win situation, neither the bribe payer nor the receiver is willing to report the corruption. Lack of a common definition of corruption makes measurement more troublesome. This happens as corruption depends on the social, cultural, and legal context, and all these can vary over time and place. The complex relationship between corruption, scandal, and crime adds more difficulties in distinguishing these while measuring corruption.

Keeping in mind the learning from the available literature and severity of corruption in Bangladesh, we design this study to know the impact of corruption on farm production and profit. While doing the contribution of this article is mainly twofold. Firstly: this article is not only confined with bribery, rather implicit cost of corruption is also included. Secondly: to our best knowledge this is the first article in the thin body of micro-level corruption literature where impact of corruption on farm production and profit is estimated.

METHODOLOGY

Sampling design and collection of data. The primary data needed for the study were collected through a farm household survey. Multi-stage sampling technique was employed to identify the sample households. In the first the above median rice producing districts in 2008-09 were selected purposively. Then these 32 districts were ranked based upon the proportion of households in each district who had experienced corruption. Ranking here was done using Transparency International Bangladesh's (TIB) database 'National Household Survey 2007 on Corruption.' The top and bottom three districts from this ranking (i.e. the districts where the incidence of corruption was highest and lowest) were selected. The six districts selected were: Lalmonirhat, Nilphamary, Comilla, Sirajgong, Naogaon and Narsingdi. From each district, the sub-district that produced the most rice in 2008-09, was selected. Then from each of these sub-districts, one agricultural block and then one village were selected, again using the same criteria used for selecting sub-districts. Thus there were six districts: Enayetpur (Naogaon), South Sordubi (Lalmonirhat), Masjidpara (Nilphamary), Mukimpur (Sirajgong), Rajapara (Comilla), and Char Belabo (Narsingdi). In the final stage, 35 rice-growing farm households from each village were randomly selected from the lists of farmers made available by the local agricultural extension office. These lists classify farmers into different groups based on their land holding status. Our sampling frame used four categories of farmers: marginal, small, medium, and large. Landless farmers and those not growing rice were excluded. To avoid over or under-representation from a specific category of farmers within a village, we calculated the proportion of each category of farmers within each village. This figure was then used to determine the number of different categories of farmers interviewed in each village. Thus the survey interviewed 210 farmers from six villages in six different districts of the country.

For collecting necessary quantitative data a semi-structured interview schedule was designed to collect detailed information about rice farming in two seasons during the period 2008-09. The seasons are namely: *Aman* and *Boro*. *Aman* is grown during the rainy season whereas *Boro* rice is cultivated during the winter (dry season). In *Aman* season farmers cultivate mostly traditional varieties using natural rainfall, whereas during *Boro* farmers grow high yielding varieties using irrigation water. Requirement of different inputs and hence the associated costs are much higher in *Boro* season compared to that of *Aman* season. There are another rice growing season namely *Aus*. As compared to other season production here is much less and very few farmers do rice farming, we concentrate on *Aman* and *Boro* in our analysis. Furthermore one Focus Group Discussion (FGD) in each village was conducted with the farmers to know nature of corruption that experience.

Measuring the cost of corruption in the agricultural sector. In our work we use the definition of Tanzi (1995) which Begovic (2005) described as the 'most promising' from an analytical view point. Tanzi (1995) used the concept of 'arm's-length principle' while defining corruption. The arm's-length principle ensures that all individuals are treated equally and allows no space for showing favoritism to anyone. This principle ignores the existence of any

kind of relationship except an official relationship. By using this principle, Tanzi (1995) defined corruption as “the intentional noncompliance with the arm’s-length principle aimed at deriving some advantage for oneself or for related individuals from this behavior.” Three basic elements of corruption can be identified from this definition. The first condition describes corruption as a violation of the arm’s-length principle. The second and third criteria describe that such violations are intentional and for personal benefit. A unique feature of this definition is that its scope is not confined to only the public or private sector.

Corruption may burden the farmers with costs. Some of these are explicit in nature. Higher prices compared to government fixed prices in the input market and bribes while collecting irrigation subsidies are examples of explicit costs of corruption. Similarly, the monetary value of inputs that have been ‘stolen’ by extension agents is another example.

Along with these explicit costs, corruption can also impose some implicit costs. For example, when a farmer has to make several visits to negotiate a bribe amount for collecting irrigation subsidies, along with bribery he experiences excess transportation costs and wastes time. If a farmer encounters a high price in the input market due to corruption, he may not purchase the entire quantity needed and may wait for reduced corruption so that he can purchase at lower price. This ultimately results in several visits, and hence transportation and labor costs increase. In order to create an impression among the farmers that there is actually a supply shortage in the input market, the dealers often refuse to sell farmers their total required quantity, even if the farmer agrees to pay a higher price. Eventually farmers’ time is wasted, and they have to bear excess transportation costs. Cost of time wasted has implications on farmers’ liquidity constraints. If a farmer had to spend more time collecting inputs, he may have to hire more labor to work in the fields. Even if the farmers do not need to hire labor during that time, they might lose some income if they have opportunity costs for their own labor.

By incorporating different explicit and implicit cost items, which were possible to collect reliably, the total cost of corruption (CoC) is calculated. The cost of corruption that farmers experience from the input market can be divided into several components. These are excess payments and/or bribes in input market, the cost of time wasted, and excess transportation costs. Along with these, the monetary value of a lower quantity of inputs received by the farmers from the extension office while organizing demonstration plots is also included as a component of the cost of corruption.

Hence, the cost of corruption (CoC) = excess payment in the input market + bribes while collecting irrigation subsidies + time wasted while collecting inputs expressed in monetary value + excess transportation costs + the monetary value of a lower quantity of inputs received from the extension office.

These cost components are defined as follows:

Excess payment in the input market (BDT): The difference between the governmentally fixed retail price and the actual price paid by the farmers. Only inputs subsidized by the government are considered here.

Bribes while collecting irrigation subsidies (BDT): Amount of bribes paid by irrigation pump owners while collecting irrigation subsidies.

Monetary value of time wasted (BDT): A farmer may have his time wasted due to repeated visits to dealers and while waiting in queue. A farmer’s time wasted is incorporated into the CoC only when the following two conditions were satisfied:

- Farmer’s were asked, and it was made sure, that the repeated visit was not due to a lack of capital or willingness to purchase.
- Secondary data about fertilizer supply in the local market were checked in order to determine whether there was any shortage of supply. Only when there was no real supply shortage a farmer’s time wasted was considered.

Time wasted is measured in man-days and then multiplied by the wage rate in order to generate the monetary value of wasted time. Here we have used farm-specific wage rates that are available at the time of collecting that specific input.

Excess transportation costs (BDT): A farmer may have to bear excess transportation costs for repeated visits and separate transportation of small quantities instead of one large

transport load. We have incorporated excess transportation costs as a part of the total cost of corruption only when there was no supply shortage and when farmers had enough capital and were willing to purchase input. Here excess transportation costs include the cost of the vehicle that is obtained from the respondents during interview.

Cost of corruption in government extension services (BDT): Some of the demonstration plot organizers reported not receiving the proper quantity of inputs from the extension office for their demonstration plots. The monetary value of these inputs that the extension office was supposed to but did not supply constituted the final part of the cost of corruption.

Measuring the impact of corruption on farm production and profit. Corruption adds additional cost to farmers, and hence the shadow price of inputs (i.e. marginal costs of input purchase) increases. Higher prices or costs restrict farmers from using more inputs. Ultimately production is at lower level. Here we try to estimate relative changes in production for an input in corrupt and non-corrupt world. This will enable us to know the effect of one additional unit of input on production.

A farm is said to be at its optimal input use level when the input's marginal benefit to the farm equals the marginal cost to the farm of purchasing the input. At this level, the marginal value product (MVP) of an input should equal the marginal cost (MC) of that input. But in the real world, there might be deviations from such assumption. There are uncertainties regarding production and price. Sudden increase in input price may not allow farmers to obtain their optimal level of input bundles. Natural disaster or pest attacks may destroy the production.

By assuming that our sample farmers are at optimal level of using fertilizer, we can say:

$$MVP_f = MC_f \quad (1)$$

here, MVP_f and MC_f are marginal value product and marginal cost of fertilizer; MC_f is the price of using the last unit of fertilizer. MVP_f can be obtained by multiplying the output price (P_y) with the marginal physical product (MPP_f) of the paddy.

$$MVP_f = MPP_f \times P_y \quad (2)$$

MPP_f is the additional output that can be produced by employing one more unit of fertilizer while holding all other inputs constant. Hence,

$$MPP_f = \frac{\partial y}{\partial f} \quad (3)$$

By replacing MVP_f we can rewrite Equation 1 as follows:

$$\begin{aligned} MPP_f \times P_y &= P_f \\ MPP_f &= \frac{\partial y}{\partial f} = \frac{P_f}{P_y} \end{aligned} \quad (4)$$

Thus the ratio of fertilizer price (P_f) to paddy price (P_y) gives the marginal physical product for the fertilizer. Here we have used weighted average price for both paddy and fertilizer. Weighted average price of fertilizer (P_f) is calculated by the following formula:

$$P_f = \frac{Q_u \times P_u + Q_{TSP} \times P_{TSP} + Q_{MP} \times P_{MP} + Q_{DAP} \times P_{DAP}}{Q_u + Q_{TSP} + Q_{MP} + Q_{DAP}} \quad (5)$$

here, Q_u , Q_{TSP} , Q_{MP} and Q_{DAP} indicate quantity of urea, TSP, MP, and DAP purchased; and P_u , P_{TSP} , P_{MP} and P_{DAP} indicate the price of urea, TSP, MP, and DAP. To obtain weighted average prices in the corrupt world, we used actual fertilizer prices paid by the farmers. In the corruption-free world, we used government fixed price.

By the following formula weighted average price of a paddy (P_y) is calculated:

$$P_y = \frac{Q_1 \times P_1 + Q_2 \times P_2 + \dots + Q_n \times P_n}{Q_1 + Q_2 + \dots + Q_n} \quad (6)$$

here, Q_1, Q_2, \dots, Q_n indicates quantities of paddy sold in different installments, and P_1, P_2, \dots, P_n are the associated prices with different installments.

Impact of corruption on farm return is calculated through undiscounted benefit cost ratio (BCR). BCR is calculated as the ratio of a farm's gross income to total costs. The value of straw was included along with value of paddy while calculating gross income. BCR is calculated based on both variable cost and total cost. The list of variable inputs include: rented in land, seed, fertilizer, organic manure, hired labor, pesticides, irrigation, hired equipments and marketing. The components of fixed cost are own land, own labor, own equipments and interest on operating capital.

RESULTS AND DISCUSSION

Sources and forms of corruption in the agricultural sector. Corruption in the agricultural input market. As paying subsidies directly to the farmers would surely result in higher administrative and monitoring costs, the government in Bangladesh pays subsidy through importers, since the domestic production of mineral fertilizer is not enough to meet the demand. In 2008-09, domestic production of urea, gypsum and triple super phosphate (TSP) covered around 50%, 10% and 40% of the total demand, respectively. For diammonium phosphate (DAP) and muriate of potash (MOP), the country had to completely rely on imports (Kafiluddin and Islam, 2008). Unfortunately only a few farmers get benefit from the subsidy program, and the benefit is mostly enjoyed by the middlemen (MoA, 2006). In Bangladesh, four types of fertilizers, urea, DAP, TSP and MOP, are subsidized. By deciding on maximum selling prices at the local retail level, the government estimates the amount of subsidies that an importer has to receive. However in most of the cases, dealers sell fertilizer for more than the governmentally fixed price. Lack of monitoring and supervision on the part of responsible government authorities allows dealers to continue their corrupt practices. There might be confusion when considering such practices to be corruption, because one may prefer to identify them as result of market failure. However, all the elements considered essential by Tanzi (1995) when identifying an act or behavior as corrupt – violation of the arm's-length principle, intentional in nature, and for personal benefit – are present in the practices of dealers. We therefore consider these to be corruption.

A common practice of the dealers is not to sell inputs by giving the excuse of a supply shortage, even though there is enough in stock (MoA, 2006; TIB, 2010). Such an artificial crisis is necessary for the dealers in order to create unrest and panic in the market so that they can force the farmers to purchase at higher prices. Due to this, farmers have to wait in long queues and make repeated visits to the dealers. At the local or village level, only government-appointed dealers can operate in the subsidized fertilizer market. The market is not open for everyone. To become a dealer or importer one has to get prior approval from

different government authorities. Hence the number of dealers is limited or fixed, and it is not possible for somebody to enter the market as a response to marketing failure. Moreover, supplying subsidized fertilizers from one district to another is also prohibited. These conditions were created with some good intentions, such as ensuring a smooth supply channel to the end user through proper monitoring, proper distribution of the subsidy, etc. However, these also ensure the retailers or middlemen to have market power that they use for their own benefit.

Subsidies are also provided for the electrically operated irrigation pumps. A certain portion of these pumps' electricity bill is refunded to the pump owner as a subsidy. However, while collecting the subsidy, the farmers are harassed by the officials, who make the procedure unnecessarily time-consuming and complicated (MoA, 2006; TIB, 2010). Bribes may end up being the only solution to overcoming all these official red tapes.

Corruption in agricultural extension services. The Department of Agricultural Extension (DAE) is the largest agricultural extension service provider in the country. For an effective transfer of new technologies at the grassroots level, the DAE organizes demonstration plots and exhibitions, provide training and advisory services to the farmers. During the FGDs, participants reported that the farmer selection process for organizing demonstration plots and training are biased and faulty due to nepotism and favoritism. Except for the extension agent's friends and relatives, only farmers who are influential in the locality due to their wealth and/or political connections, are selected for certain extension programs. They participants also reported that the extension office do not supply proper quantity of inputs while organizing demonstration plots. The corrupt extension agents 'steal' inputs that are supposed to be provided to the demonstration plot organizers. Information about other extension programs such as exhibitions of new technology and field visits to demonstration plots are mostly circulated among the farmers who have some relationship to the extension agents. The majority of the farmers in the locality remain unaware of these programs. Moreover, extension agents are often reluctant to do regular field visits, and hence farmers do not get extension services when needed. A study found that 75 percent of the developed modern technologies are not adopted by farmers because of the poor linkage between them and the extension agents (Karim, 2003). Very low levels of farmer contact and farmers' participation in on-farm demonstrations and field days are mentioned in different government reports (MoA, 2006).

Estimated cost of corruption for different categories of farmers. Table 1 shows the season-wise per hectare cost of corruption for different categories of farmers. In the *Aman* season 193 farmers reported experiencing corruption, and the average CoC for them is 3,165 BDT/ha. This cost is lower in the *Boro* season, estimated to be 1,935 BDT/ha. The cost of corruption is higher for small farmers in both seasons. However, analyses of variances fail to report statistically significant differences among the different categories of farmers in any of the two seasons. One would accept higher cost of corruption in the *Boro* season, as input particularly seed, fertilizer and irrigation requirement and hence cost is much higher in it.¹ Literature also observe higher probability of experiencing corruption for the rich as their demand for services and ability to pay bribe is high (Hunt, 2004; Torgler and Valev, 2006; Mocan, 2008). Our findings here can be explained through differences in fertilizer marketing system between the seasons.

Table 1. Cost of corruption (CoC) for different categories of farmers

Farm categories	<i>Aman</i>		<i>Boro</i>	
	Number	CoC (BDT ^a /ha)	Number	CoC (BDT/ha)
Marginal	27	2,797 (2,154)	18	1,491 (802)
Small	124	3,313 (2,025)	119	2,004 (1,681)
Medium & large	42	2,963 (1,783)	40	1,929 (1,478)
All	193	3,165 (1,994)	177	1,935 (1,570)

¹ The estimated average cost of seed/seedlings and irrigation are around 30 percent and 12 percent higher in *Boro* season compared to that of *Aman* season. The irrigation cost in *Boro* season is more than four times higher than that of *Aman* season.

Note: Figures in parentheses are standard deviation

^a1 US\$ is approximately 81.9 BDT (Source: Bangladesh Bank, 2012).

Notable differences that existed in the fertilizer marketing channel between the *Aman* and *Boro* seasons can explain the reasons behind the differences in the cost of corruption between the seasons. In the *Aman* season, dealers were assigned at the union level (administrative unit over the village level), and each dealer was allowed to appoint two representatives to sell fertilizer in the respective villages. As dealers had freedom to select representatives, in many cases they appointed their relatives or friends who had little to no experience in fertilizer marketing. Furthermore, farmers had very little idea and information about the assigned representatives for their village. Considering the number of villages and farm households in a union, two representatives for one union can hardly be considered sufficient. During this season, dealers were bound to have storage capacity at the union level, thus ensuring the supply of fertilizer at that level; whereas in the earlier system prior to this, dealers were allowed to operate with warehouses at the district level. However, due to problems in appointing dealers and the limited number of representatives, the system did not work well below the union level. Also in the *Aman* season, farmers had to get written permission from extension agents in order to collect fertilizer. In the permission slip, the maximum quantity of fertilizer that a farmer was allowed to purchase was mentioned. Collecting this slip in many cases was not possible without paying a bribe. All these allowed the actors in the input market (dealers, representatives, extension agents) to have some discretionary power and control over it. Furthermore, in the *Aman* season fertilizer prices were notably high compared to the following *Boro* season. Except for urea, the prices of the other three fertilizers were almost double, which was quite unexpected and unpredicted, especially for the farmers and dealers (Table 2). The high price in the international market was the major driving force behind this. Hence there were several reasons in the *Aman* season for making the fertilizer market unstable, and there were opportunities for speculative activities. In order to address such an unpredictable market and the government-imposed restrictions, farmers had to pay bribes.

With these experiences, in the *Boro* season the government modified the existing marketing channel. Dealers were appointed at the district level. Dealers were allowed to have warehouse at district level. According to the size of the union, a maximum of nine retailers were appointed for each union. The slip system was abolished. Farmers had more exit options when they faced bribe situation. Prices in the local market went down with declining prices in international market.

Table 2. Retail price of government subsidized fertilizers (BDT/Kg)

Name of fertilizer	Price in <i>Aman</i>	Price in <i>Boro</i>
Urea	12	12
TSP	70 to 80	35 to 40
MOP	60 to 75	30 to 35
DAP	74 to 90	40 to 45

Note: As price variations is observed for TSP, MOP, and DAP, the price range (minimum to maximum) is noted in the respective fertilizer column.

Literature on corruption and competition also argue for relatively higher corruption in restricted markets. Ades and Di Tella (1999) argued that in a competitive market firms pay less bribes because they do not earn enough excess profits to afford them. The findings of Emerson (2006) also support the hypothesis that competition and corruption are inversely related. Competition among the officials might also reduce their bribe extraction (Rose-Ackerman, 1978; Shleifer and Vishny, 1993).

Impact of the cost of corruption on farm production and profit. The calculated marginal physical product of fertilizer using Equation 4 is presented in Table 3. While calculating the marginal physical product in the existing situation, the price that farmers paid is used. For calculating the marginal physical product in the corruption-free world, government fixed price is used. In the corrupt world, adding one more unit of fertilizer to the production process results in 1.88 unit average increase production for the *Aman* growers. In

the same season, if there is no corruption and farmers are able to purchase fertilizer at the government fixed price, each additional unit of fertilizer will increase paddy production by 1.18 units. For Boro growers, an additional unit of fertilizer in the corrupt and non-corrupt world will increase paddy production by 1.44 and 1.22 units, respectively. In both seasons, the effect of an additional quantity of input is relatively higher in the existing situation, than that of corruption free world, because farmers in the real world pay a higher price for fertilizer than the government fixed price (price in corruption-free world) though they receive same paddy price in both worlds.

Table 3. Marginal physical product (MPP) of fertilizer

Seasons	Situation	MPP
<i>Aman</i>	Existing situation	1.88
	No corruption	1.18
<i>Boro</i>	Existing situation	1.44
	No corruption	1.22

Impact of corruption on farm return. According to both BCR over variable cost and total cost, farmers have a higher ratio in the Aman season than in the Boro season. BCR (over variable cost) for the Aman and Boro seasons is 2.86 and 2.33, respectively. BCR over total cost for Aman and Boro is estimated to be 1.46 and 1.35, respectively. In both seasons, medium & large farmers have a higher BCR (over variable and total cost) than the marginal and small farmers (Table 4).

By increasing costs, corruption reduces farm profit. In order to estimate the magnitude of changes in farm return due to an increase or decrease in corruption, we have hypothesized different levels of corruption. If farmers have to bear a 25 percent higher cost of corruption for growing *Aman* rice, their BCR will be 2.73 (4.40 percent reduced) and 1.43 (1.67 percent reduced) over variable and total cost, respectively.

Table 4. Benefit cost ratio (BCR) for different categories of farmers

BCR	Farm categories	<i>Aman</i>	<i>Boro</i>
Variable cost basis	Marginal	2.50 (1.68)	2.18 (1.21)
	Small	2.88 (1.90)	2.32 (0.91)
	Medium & large	3.03 (1.10)	2.43 (0.88)
	All	2.86 (1.72)	2.33 (0.93)
Total cost basis	Marginal	1.42 (0.66)	1.32 (0.44)
	Small	1.43 (0.39)	1.33 (0.32)
	Medium & large	1.57 (0.34)	1.44 (0.33)
	All	1.46 (0.43)	1.35 (0.34)

Note: Figures in parentheses are standard deviation.

Such an increase in the cost of corruption in the *Boro* season will reduce the BCR to 2.31 (0.80 percent reduced) and 1.35 (0.41 percent reduced) over variable and total cost, respectively. But when the cost of corruption increases by 50 percent, 75 percent, and 100 percent; the BCR over total cost in the *Aman* season will reduce by 2.87 percent, 4.03 percent, and 5.16 percent, respectively. In the *Boro* season, the reductions in BCR over total cost will be 0.94 percent, 1.45 percent, and 1.94 percent for 50 percent, 75 percent, and 100 percent increases in the cost of corruption (Table 5).

Table 5. Changes in benefit cost ratio (BCR) due to increased corruption

Seasons	BCR	25%	50%	75%	100%
<i>Aman</i>	Variable cost basis	2.73 (-4.40)	2.67 (-6.74)	2.61 (-8.91)	2.55 (-10.95)
	Total cost basis	1.43 (-1.67)	1.42 (-2.87)	1.40 (-4.03)	1.38 (-5.16)
<i>Boro</i>	Variable cost basis	2.31 (-0.80)	2.29 (-1.72)	2.27 (-2.60)	2.25 (-3.47)
	Total cost basis	1.35 (-0.41)	1.34 (-0.94)	1.33 (-1.45)	1.33 (-1.94)

Note: Figures in parentheses are the percentage of BCR due to changes in corruption.

Table 6. Changes in benefit cost ratio (BCR) due to a decrease in corruption

Seasons	BCR	25%	50%	75%	100%
<i>Aman</i>	Variable cost basis	2.88 (0.81)	2.97 (3.76)	3.06 (6.97)	3.16 (10.51)
	Total cost basis	1.47 (0.86)	1.49 (2.20)	1.51 (3.57)	1.53 (5.01)
<i>Boro</i>	Variable cost basis	2.36 (1.11)	2.38 (2.10)	2.40 (3.12)	2.43 (4.18)
	Total cost basis	1.36 (0.64)	1.37 (1.18)	1.38 (1.74)	1.39 (2.30)

Note: Figures in parentheses are the percentage of BCR due to changes in corruption.

The estimated BCR due to reduced cost of corruption are presented in Table 6. In situations where there is no corruption, benefit cost ratio over total cost for the *Aman* and *Boro* farmers will be 1.53 (5.01 percent increase) and 1.39 (2.30 percent increase), respectively.

CONCLUSIONS AND POLICY RECOMEMNDATIONS

This article describes different forms of corruption that farmers in Bangladesh experience during their farming practices. A total of 210 rice growers' experiences about two consecutive rice growing seasons are analyzed here. The cost of corruption is calculated by incorporating both implicit and explicit forms of cost. Compared to existing literature, corruption in this article is used in broader way.

Cost of corruption is found to be higher in relatively restricted input market situation and observed to become lower when the market is relatively competitive. This might be outcome of competition among the sellers which ultimately enables the farmers to have more exit options. The findings here are inline with the existing literature about corruption and competition, where it is argued that competition reduces corruption. The works of Rose-Ackerman (1978), Shleifer and Vishny (1993), Ades and Di Tella (1999) and Emerson (2006) are worth mentioning here. Such findings argue for polices regarding competitive input market to reduce cost of corruption.

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