

Public Procurement of Paddy in Bangladesh: Implications for Policy

AKHTER U. AHMED*

M. MEHRAB BAKHTIAR*

SADAT ANOWAR*

MOHAMMAD MOSHIUR RAHMAN**

Public procurement of foodgrains in Bangladesh has significant implications for production and public foodgrain stock. Boro is the main rice crop cultivated in Bangladesh. During the 2019 boro harvest season, farmers in Bangladesh, particularly smallholder farmers, were adversely affected by low paddy prices. This paper assesses to what extent boro farmers could sell their paddy to the government, evaluates the efficacy of direct paddy procurement from farmers and examines options for improving Bangladesh's foodgrain procurement system. Relevant actors in the boro paddy procurement system were interviewed, including boro-growing farm households, rice millers, traders, and government officials. We have also conducted a study in West Bengal, India, to explore alternative paddy procurement systems. Using evidence from Bangladesh and West Bengal, we propose two policy options for rice procurement in Bangladesh. First, when the paddy price is low and does not cover farmers' production cost per unit, the government can purchase paddy directly from farmers to provide necessary price support. Second, when the paddy price is high, the government can purchase rice from the market through open tender to build or replenish public foodgrain stocks.

Keywords: Bangladesh, West Bengal, Public Procurement, Grain, Production Costs, Demand-supply, Minimum Price Support, Policy Options

JEL Classification: H57, Q11, E64

* IFPRI Bangladesh; ** Agriculture Policy Support Unit (APSU), Ministry of Agriculture, Government of Bangladesh.

This study was funded by the United States Agency for International Development (USAID) through the Policy Research and Strategy Support Program (PRSSP) in Bangladesh under USAID Grant Number EEM-G-00-04-00013-00. We are indebted to A.M.M. Shawkat Ali and Md. Tofazzal Hossain for their insightful feedback. Naveen Abedin, Wahid Quabili and Julie Ghostlaw provided excellent research assistance. Data Analysis and Technical Assistance (DATA) and in particular, Zahidul Hassan and Imrul Hassan provided invaluable insights during the design of the questionnaire and for the overall support for this project. Any opinions stated herein are those of the authors and are not necessarily representative of or endorsed by the Ministry of Agriculture, Government of the People's Republic of Bangladesh or the U.S. Agency for International Development (USAID).

I. INTRODUCTION

In many developing countries, public procurement of agricultural commodities from farmers is a widely used policy tool, which has important implications for the myriad actors in country-level food and agricultural systems. Objectives of public food procurement programmes include providing price support for farmers, market price stabilisation, and replenishing public stocks and distributional considerations involving social safety net programmes through food-based assistance (Ahmed, Chowdhury & Ahmed, 1993; Ruel & Alderman, 2013). Public food procurement underpins various interactions between agriculture and social protection and has significant potential to reduce risks and enhance agricultural production.

In Bangladesh, rice procurement from local producers and the market started with the initiation of the public food marketing system¹ and remains intact to this day. The procurement price of rice or paddy is the price at which the government purchases these grains domestically from millers and farmers. Formulating an optimum foodgrain procurement policy that benefits producers and consumers, and safeguards the most vulnerable agricultural value chain actors from unforeseen shocks, presents considerable challenges.

In 2019, paddy prices (received by farmers) in Bangladesh went down due to a bumper harvest of the *boro* rice crop.² The average paddy price was Tk 17.42 per kilogram (kg)³ in January 2019 after the *aman* harvest but declined by 22 per cent to Tk 13.56 per kg in May 2019 (DAM, 2020). Farmers complained that they did not receive price support from the government when paddy prices in the market did not cover their production costs.

¹During the 1960s, government procurement of foodgrains involved an involuntary contribution of rice by large farmers at a fixed price. During the 1970s, this system was replaced by voluntary sales to the government at fixed prices (Ahmed, 1979; Ahmed et al., 1993).

²Boro is the rice crop irrigated during the dry season in Bangladesh, which is planted from December to early February and harvested between April and June. In 2018/2019, the total production of rice in Bangladesh was 36,391,000 (36.4 million) metric tons, of which boro rice accounted for 53.8 per cent; aman rice, 38.6 per cent; and aus rice, 7.6 per cent (BBS, 2019).

³The exchange rate used is 1 US dollar (USD) to 84.40 Bangladeshi Taka (Tk), which represents the average exchange rate in 2019. The average annual exchange rate was used because prices are presented from various months in 2019, and there was minimal variation in the USD-Tk exchange rate in 2019.

In response to depressed paddy prices in 2019, the Bangladesh Policy Research and Strategy Support Program (PRSSP), implemented by the International Food Policy Research Institute (IFPRI), was closely engaged in policy dialogues with multiple stakeholders in the government. In June 2019, the Ministry of Agriculture requested IFPRI to conduct this study in collaboration with the Agricultural Policy Support Unit (APSU) of the ministry in order to assess to what extent *boro* farmers were able to sell their paddy to the government at the announced procurement price in 2019, evaluate the efficacy of the direct paddy procurement from farmers by the government to help farmers overcome low paddy prices in the future, and finally, examine ways to improve the foodgrain procurement system in Bangladesh. In April 2021, the Cabinet Division recommended the Ministry of Food to reconfigure the paddy procurement system based on IFPRI's study recommendations (Karim and Wardad 2021).

In this study, we present findings and identify policy options which consider the agricultural, economic, and social consequences of alternative methods of *boro* paddy procurement. The paper is structured as follows. Section I presents the introduction, and the remainder of this section provides a review of the literature. Section II describes the paddy and rice procurement system of the Bangladesh Government. Section III lays out sampling and survey design. Section IV presents and interprets descriptive statistics of paddy production, marketing, and procurement, and presents results. Mathematical modelling was used to estimate the effects of procurement on the market price in different scenarios. Section V discusses the paddy procurement system in West Bengal, India, to glean practical insights for improving Bangladesh's paddy procurement system. Section VI summarises the research findings to inform the Bangladesh Government's policy decisions toward providing incentives to farmers for enhancing agricultural productivity and maintaining optimum public food grain stocks to provide food support to the needy population.

1.1 Literature Review

The effect of public food procurement on producers' and consumers' welfare can depend on various factors. One of the more important factors is the design of the procurement system—the rules, procedures, and contracts that guide food purchases from farmers to the government (Brooks, Commandeur, & Vera 2019; FAO, 2015; Nehring, Miranda, & Howe, 2017). Most farmers sell their produce in the market, and an effective procurement system can incentivize producers through its impact on market prices, potentially by reducing price risks and uncertainty for farmers (FAO, 2018).

In their seminal research on the government rice procurement system in Bangladesh, Ahmed et al. (1993) observe that the design of the procurement system is critically important in producing an impact on market prices. Shemu, Sabur, Alam and Kausar (2013) show that many Bangladeshi farmers are unaware of the existence of the public procurement system. Farmers who are aware express their discontent towards the system due to unnecessary and complex formalities of the procurement centre, a long distance to the central storage depot from farm households, ineffective communication system, and corruption of the procurement officials.

Several governments have implemented public food procurement systems as a tool to support the livelihoods of farmers, and in particular, smallholder farmers. In addition to supporting farmers' livelihoods, public food procurement can also promote positive nutrition outcomes on dietary diversity when food purchases also target more diverse and healthier foods. These foods can be procured from smallholder farmers, improving household availability and access to food from their own production and distributed through different food assistance strategies (Ruel & Alderman, 2013).

In Brazil, the Food Purchase Programme was introduced to ensure a market and reasonable price for products from smallholder farmers. This programme involved a range of measures, including direct procurement of products at harvest for maintaining local food security stocks; advanced procurement of products at planting time; local procurement by local governments to be used in school feeding programs; and a program supporting milk production and consumption, benefiting producers with limited production and bargaining power (FAO, 2018; Nehring & McKay, 2013). In India, the Public Distribution System (PDS) was set up to safeguard consumers from food shortages and protect producers from price fluctuations (Nehring & McKay, 2013). PDS sought to improve food security by procuring food grains and distributing them to poor households through food subsidies and in-kind transfers (Bhattacharya, Falcao, & Puri, 2017). India employs two channels for the public procurement of rice: custom-milling of rice and levy. In the case of the former, the government buys paddy directly from farmers at the minimum support price (MSP) and gets it milled from private millers. In the case of the latter, it purchases rice from private millers at a pre-announced levy price, thus providing indirect price support to farmers (Gupta, 2013).

Like India, the public distribution system of Bangladesh sets a guaranteed price for producers of wheat and paddy rice. Wheat and paddy are distributed

through targeted social safety net programmes. Ahmed et al. (1993), in their evaluation of the food procurement system in Bangladesh, developed an approach to determine the government procurement price of rice and improve the operational effectiveness of the procurement systems to support farm-level prices for rice during harvest seasons. The authors argue that the principal objective of the government's agricultural procurement system should be to support the prices for farm-level incentives. They assert that it is counterproductive to include other objectives such as public stocks and distributional considerations and that such diffusion of purposes serves no objectives adequately. They also argue that the market price should be the main criterion for determining the procurement price, with the other two criteria of cost of production and world prices serving only as bases for marginal adjustment when emerging changes warrant such adjustments.

II. BORO PADDY AND RICE PROCUREMENT IN 2019

2.1 The Procurement System

Public interventions in the foodgrain market have been quite substantial in Bangladesh. The government procures food grains (rice and wheat) from domestic and international markets, stores the procured foodgrains in public *godowns* (warehouses), and distributes them through different channels of the Public Food Distribution System (PFDS).

There are several steps in place for purchasing paddy (unhusked rice) from farmers in Bangladesh. First, field-level officials under the Department of Agricultural Extension (DAE) of the Ministry of Agriculture prepare the lists of farmers who are eligible to sell paddy to the Directorate General of Food (DGF). Eligible farmers are those who have a "*Krishi* card" (agricultural input support card) and meet other selection criteria, such as the minimum and the maximum allowable quantity of paddy. These farmers are often selected via lottery because the number of farmers interested in selling paddy to the government typically exceeds the target number of farmers who can participate in the procurement process. Next, these listed farmers bring their paddy and agricultural input support card or national identification (NID) to the DGF's local supply depots (LSDs) to sell their paddy. Then, DGF purchasing officers verify farmers' identification and that the paddy meets the necessary specifications for procurement (for example, percentage of moisture content, dead or damaged grains, foreign materials, etc.). Thereafter, the paying officers issue payment orders based on weight, quality, and stock certificates (WQSCs). Payments are sent to farmers' accounts in designated banks.

The DGF's method for purchasing rice from rice millers slightly differs from the procurement process for farmers. The DGF purchases rice from enlisted rice millers nationwide. Rice procurement allotment in districts and *upazilas* (sub-districts) is based on paddy production, rice mill capacity, and the total rice procurement target. The DGF's district and upazila controllers, and rice millers establish an agreement for supplying rice to LSDs or central storage depots (CSDs), with terms and conditions stipulated in the agreement. The LSD or CSD officer-in-charge receives the rice as per DGF specifications. If the rice is of fair average quality (FAQ), the purchasing officer issues a WQSC to the paying officer, stating the rice quantity and total payment amount.

The DGF paying officer verifies the rice stock in the respective LSDs/CSDs, signs the WQSCs, and issues the WQSCs to millers who supplied the rice. The millers receive payments in their designated banks.

2.2 Amounts of Boro Paddy and Rice Procured in 2019

On 25 April 2019, the DGF instructed the District Controllers of Food (DC Food) to procure 150,000 metric tons of paddy from farmers, 1 million metric tons of parboiled rice and 150,000 metric tons of atap rice from rice millers before 31 August 2019. The government set the procurement prices at Tk 26 per kg for paddy, Tk 36 per kg for parboiled rice, and Tk 35 per kg for atap rice.

On 13 June 2019, the DGF instructed DC Food to procure an additional 250,000 metric tons of paddy from farmers. The total rice-equivalent⁴ target procurement quantity was 1,418,000 (1.42 million) metric tons. The total actual rice-equivalent procurement was 1,417,885 (1.42 million) metric tons, of which rice procurement accounted for 81.1 per cent, and rice-equivalent paddy procurement accounted for 18.9 per cent. Table I shows the targeted and actual amounts of boro paddy and rice procurement in 2019. The achieved procurements virtually fully met the targets.

⁴ The conversion factor from paddy to rice is 0.67 (67 per cent).

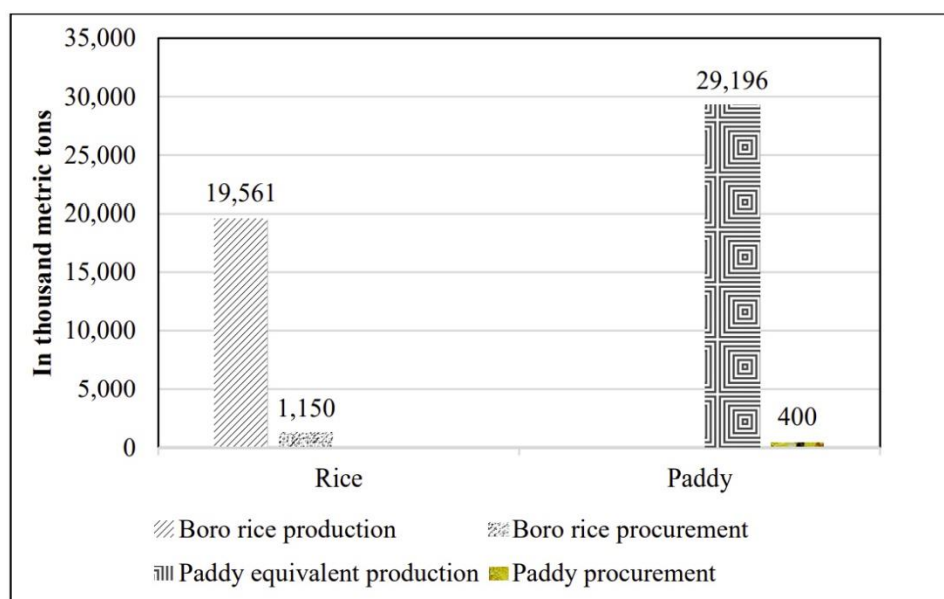
TABLE I
**BORO PADDY AND RICE PROCUREMENT TARGET
 AND ACHIEVEMENT IN 2019 (in metric tons)**

Commodity	Target	Achievement
Paddy	400,000	399,862
Rice (parboiled)	1,000,000	999,987
Rice (<i>atap</i>)	150,000	149,990
Total rice-equivalent amount	1,418,000	1,417,885

Source: Management Information System (MIS), Directorate General of Food, Ministry of Food.

Figure 1 shows that, in 2019, rice procurement was 5.9 per cent of total boro rice production, and paddy procurement was 1.37 per cent of total paddy-equivalent boro rice production.

**FIGURE 1: Boro Rice and Paddy Procurement and
 Corresponding Production in 2019**



Source: Bangladesh Bureau of Statistics (BBS) for production data; Directorate General of Food (DGF) for procurement data.

III. DATA AND METHODS

Data for this study came from surveys of boro paddy farmers, rice millers, traders, and relevant government officials. Integrating these data provides a nuanced analysis of the boro paddy and rice market and the government procurement system in Bangladesh. In addition to primary data, IFPRI collected data from secondary sources, including the DGF, Bangladesh Bureau of Statistics (BBS) of the Ministry of Planning, and the Department of Agricultural Marketing (DAM) of the Ministry of Agriculture. We also conducted a study in West Bengal, India, in late 2019 to examine its paddy and rice procurement system and identify alternative models of paddy procurement.

3.1 Sampling

The survey sample for this study was drawn from IFPRI's Bangladesh Integrated Household Survey (BIHS) conducted in 2019, a national-level rural survey of Bangladesh. The study sample includes all boro-producing households from the BIHS sample located in the 43 top-producing districts, which accounted for around 90 per cent of the total boro rice and paddy procurement by the government in 2019. A representative sample of 1,369 boro-producing farm households was interviewed.

We used IFPRI's Integrated Food Policy Research Program's (IFPRP) 2018 database of rice millers and traders to sample from and interview 48 rice millers and 92 traders from 40 upazilas (sub-districts) of Bogura, Dinajpur, Mymensingh, and Naogaon districts. We also interviewed 40 upazila agriculture officers (UAOs) and 40 upazila food controllers (UFCs) from the 40 upazilas.

3.2 Survey Design and Administration

In July 2019, IFPRI and the APSU of the Ministry of Agriculture jointly consulted farmers, rice millers, traders, and government officials in Bogura and Naogaon districts about farming, marketing, and milling of boro paddy and the procurement system. This field visit informed the conceptualisation of the study.

IFPRI and APSU jointly designed the survey questionnaires to interview farmers, rice millers, traders, and government officials. The farmers' questionnaire covered the production and sale of boro paddy, its marketing through different channels, and knowledge of and access to the government procurement system. The traders and millers' questionnaires focused on the procurement and sales of paddy and rice by various types of traders and rice millers. The government

officials' questionnaires focused on the government procurement system. Farmers, traders, rice millers, and government officials were surveyed in October 2019. A follow-up telephone survey of farmers was carried out in January 2020.

3.3 An Analytical Model for Estimating the Effects of a Demand Shift on Boro Paddy Price

The model is used within the Marshallian framework of partial equilibrium analysis and is based on an analytical framework that considers the fact that a share of the total *boro* rice production in Bangladesh is consumed by producers themselves (Ahmed & Sampath, 1992). The model is based on the assumption that the market for food crops grown by numerous small growers and sold to a mass of consumers is competitive, which implies that the crop prices are set by demand and supply in the domestic market. The analytical model is graphically illustrated in Figure 2, and the mathematical formulation of the model is below.

We undertake this analysis for the boro paddy market. In Figure 2, the vertical line D_hH represents the paddy demand curve of producers for home consumption, which is insensitive to changes in paddy price. The vertical demand curve for producers' home consumption represents the amount of rice consumed by the surplus farmers and the total quantity produced by the deficit farmers. The horizontal distance between the demand curve for farmers' home consumption (D_hH) and the market demand curve (D_mD_0) measures the quantity of the "gross marketed surplus" supplied by the surplus boro paddy producers.

The DGF is a potential large buyer of boro paddy and rice through its procurement system. The demand curve for boro paddy D_mD_0 represents the aggregate demand for boro paddy from domestic production. While the market equilibrium before the demand shift of paddy is at A , the market equilibrium is established at B after the rightward shift in the aggregate demand curve from D_mD_0 to D_mD_1 .

To quantify the impact of the demand shift for paddy, a mathematical treatment of the above relationship is developed. Assuming a constant price elasticity of demand, we can represent the market demand function as

$$q = ap^{-\varepsilon}, \quad (1)$$

where p and q are the price and quantity demanded of paddy, respectively. The constant a includes demand shifters and ε is the price elasticity of demand.

A constant elasticity supply function for paddy can be expressed as

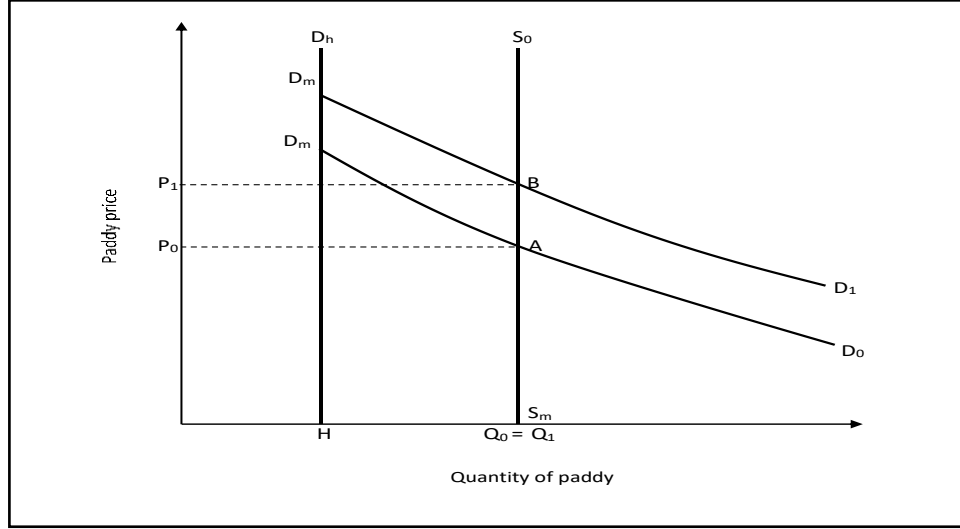
$$q = bp^\beta, \quad (2)$$

where p and q are the price and the quantity supplied, b includes supply shifters, and β is the price elasticity of supply.

Assuming an m shift in demand schedule, the new demand function can be expressed as

$$q = a(1 + m)p^{-\varepsilon}. \quad (3)$$

FIGURE 2: Effects of a Shift in Paddy Demand on Market Price of Boro Paddy



If the supply of paddy results in a k shift in paddy supply schedule, then the new supply function can be expressed as

$$q = b(1 + k)p^\beta \quad (4)$$

The two equilibrium prices of paddy (P_0 and P_1), without the demand shift and with the demand shift, respectively, can be derived by equating equations (1) and (2) and (3) and (4) and solving them for P_0 and P_1 . Thus,

$$P_0 = \left(\frac{a}{b}\right)^{1/(\beta+\varepsilon)}, \text{ and} \quad (5)$$

$$P_1 = P_0 \left(\frac{1+m}{1+k}\right)^{1/(\beta+\varepsilon)}. \quad (6)$$

Similarly, we can obtain the equilibrium quantities of paddy (Q_0 and Q_1) with the supply shift as

$$Q_0 = a^{\beta/(\beta+\varepsilon)} b^{\varepsilon/(\beta+\varepsilon)}, \text{ and} \quad (7)$$

$$Q_1 = Q_0(1+m)^{\beta/(\beta+\varepsilon)}(1+k)^{\varepsilon/(\beta+\varepsilon)}. \quad (8)$$

with subscripts 0 and 1 indicating the situations without and with the demand and supply shifts, respectively.

Assumptions and parameters used for the present exercise:

- In estimating the value of the demand shift parameter (m), we used the actual paddy procurement quantity of 399,862 metric tons of paddy by the DGF under the Ministry of Food.
- For estimating the impact of paddy procurement on the market price of paddy, we assume no shift in the supply of paddy; therefore, we set the value for k at 0.
- We used the 2019 marketed surplus of 16,350,000 (16.35 million) metric tons of paddy equivalent rice as the baseline quantity (Q_0).
- We used the paddy price of Tk 15.41 per kg prevailing in April 2019 as the base price.
- We used -0.327 as the value of price elasticity of demand for rice. We estimated the demand price elasticity from the 2011-2012 and 2015 rounds of BIHS panel data using the Quadratic Almost Ideal Demand System (QAIDS) model.⁵
- Since domestic production of paddy will not change in response to the procurement price before the following year, we set the value of zero for the price elasticity of supply. Therefore, in Figure 2, the supply curve of paddy, $S_m S_0$, is constructed as a vertical supply curve, where the quantity of paddy supply remains constant ($Q_0 = Q_1$).
- The change in the equilibrium price of paddy from P_0 to P_1 is only due to the shift in demand, as shown in Figure 2.

⁵This QAIDS model is the only demand system analysis in Bangladesh that used panel data, following the same households who faced changes in price from 2011/2012 to 2015. Other demand system analyses in Bangladesh used cross-section data, where the variation in commodity prices reflects only spatial price variation.

The estimates suggest that for raising the market price of paddy to Tk 26.00 per kg, the procurement quantity needs to be 3,074,000 (3.07 million). This amount accounts for 18.7 per cent of the market supply of paddy (i.e. farmers' marketed surplus) or 10.5 per cent of total paddy-equivalent boro production in 2019.

IV. RESULTS AND DISCUSSION

4.1 Salient Characteristics of Boro Farmers

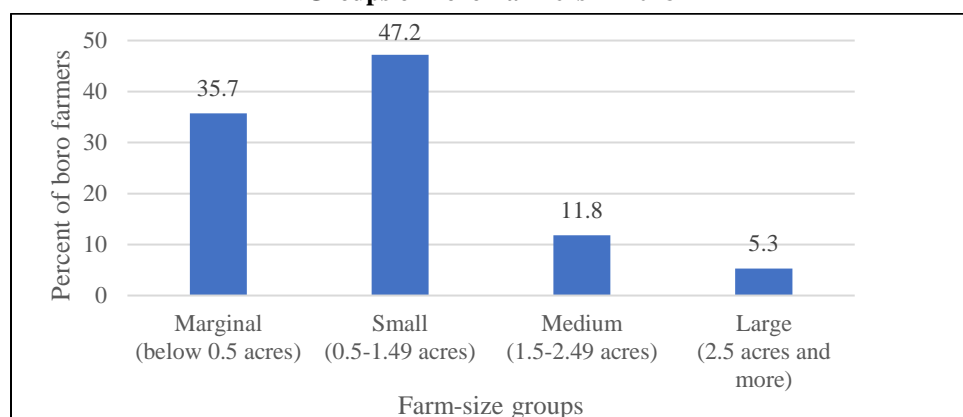
Using national-level data from IFPRI's 2019 BIHS, this section presents broader contextual factors that shape the implications of boro paddy and rice procurement for farmers. These factors include farm-size classification, land tenure patterns, boro paddy varieties grown by farmers, and the cost of production of boro paddy.

Since the BIHS is statistically representative of all rural households in Bangladesh, we can estimate the total number of farmers who cultivated boro paddy. Using population projection data from the World Bank, we estimated a total of 25.61 million rural households in Bangladesh in 2019. From the BIHS dataset, we calculated that 36.3 per cent of all households cultivated boro rice. Therefore, the total number of boro rice farmers was around 9,287,000 (9.29 million) in 2019.

The analysis disaggregates all boro farmers into four operated farm-size groups. There are marginal farmers (operating less than 0.5 acres of land), small farmers (0.5 to 1.49 acres of land), medium farmers (1.5 to 2.49 acres of land), and large farmers (operating 2.5 acres or more land). The four farm-size groups match the cut-off points of the six operated farm-size groups reported in the 2010 Household Income and Expenditure Survey (HIES) report (BBS, 2011) by aggregating the smallest two HIES farm-size groups under the marginal farm category and the largest two groups under the large farm category.

Figure 3 presents the distribution of operated land by each of the four farm-size groups of boro farmers in Bangladesh. Marginal and small farmers account for 82.9 per cent of all boro farmers.

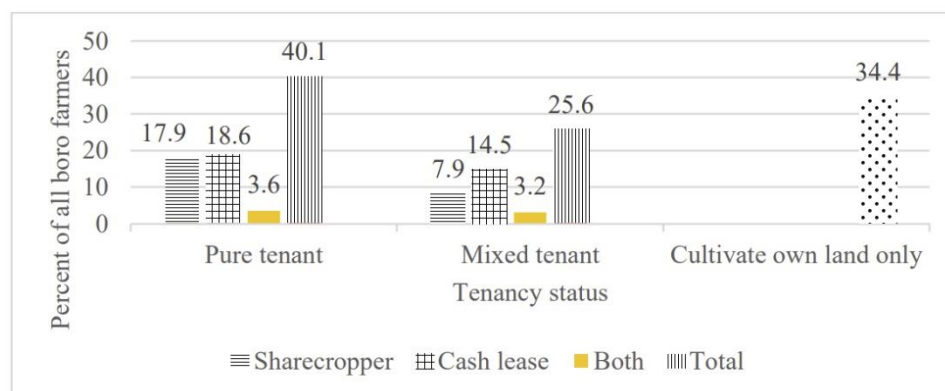
FIGURE 3: Distribution of Operated Land by Farm-Size Groups of Boro Farmers in 2018



Source: IFPRI Bangladesh Integrated Household Survey, 2019.

Figure 4 shows land tenure arrangements for boro farmers. In 2018, 40.1 per cent of all boro farmers were pure tenants—that is, they did not own the land they cultivated. The dominant tenurial arrangement during the boro season was cash-lease (33.1 per cent of farmers), who were either pure tenants (18.6 per cent) or cultivated their own land and cash-leased land (14.5 per cent). About one-quarter (25.8 per cent) of farmers were sharecroppers, meaning the produce is shared between the cultivator and the landowner in proportions agreed upon before cultivation. Approximately one-third (34.4 per cent) of the boro farmers did not have any land-lease arrangements; they cultivated only their own land.

FIGURE 4: Land Tenancy Status of Boro Farmers in 2018

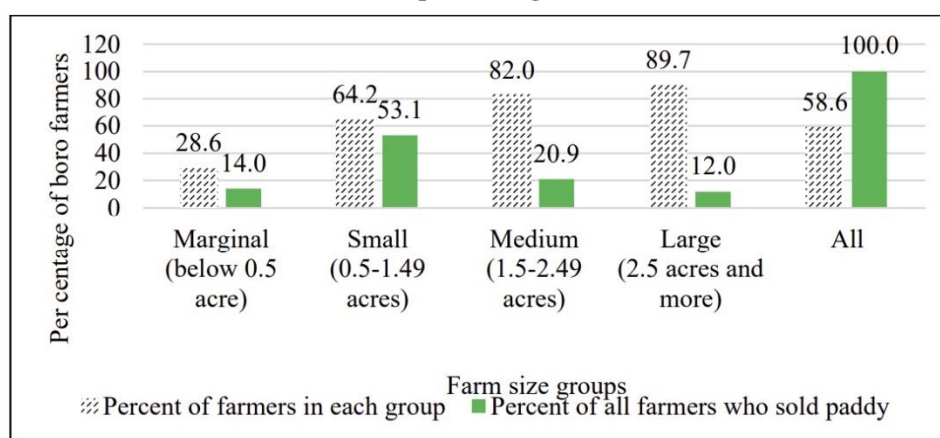


Source: IFPRI Bangladesh Integrated Household Survey, 2019.

4.2 Results from the Study Surveys

This sub-section presents the results from the primary data collected under this study. Figure 5 shows that, during the boro procurement season from April to August 2019, 58.6 per cent of all boro farmers (5.44 million out of 9.29 million boro farmers in 2019) sold boro paddy in the market. Marginal farmers made up 28.6 per cent of all boro farmers and 14 per cent of all farmers who sold paddy. Marginal farmers are mostly subsistence farmers who produce mainly for home consumption; their small size of operated land (less than half an acre) does not permit them to produce surplus paddy. By contrast, small farmers constituted about one-half (53.1 per cent) of all farmers who sold paddy during the 2019 boro procurement season.

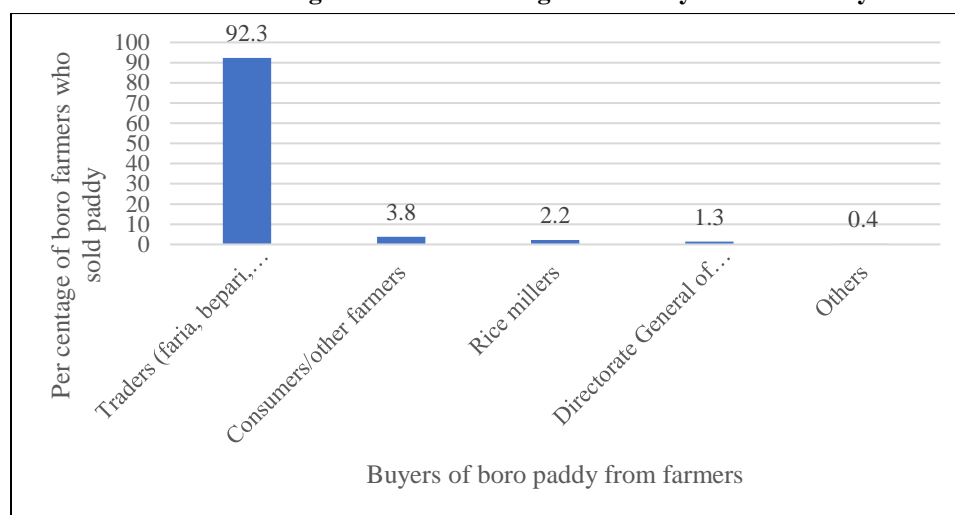
FIGURE 5: Percentage of Boro Farmers Who Sold Paddy
From April to August 2019



Source: IFPRI Survey for Boro Procurement Study, 2019.

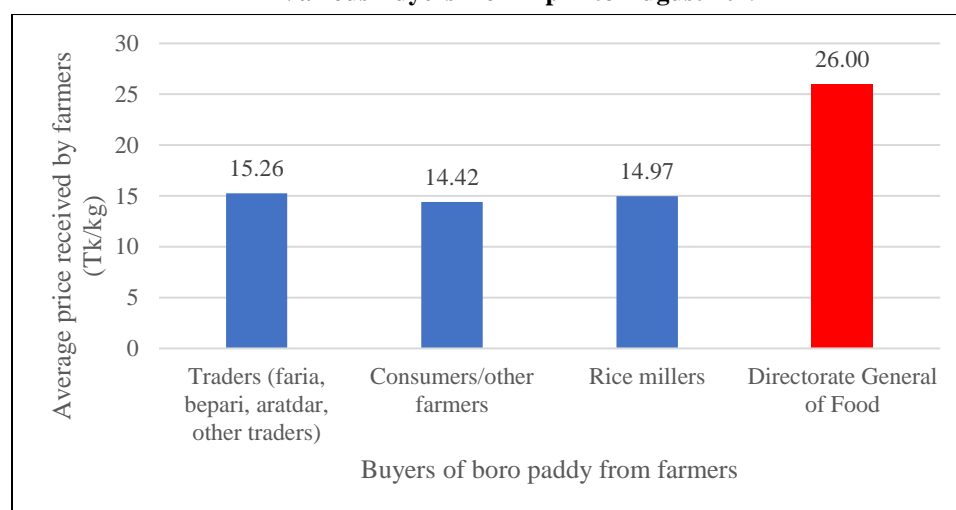
Among those who sold boro paddy from April to August 2019, 1.3 per cent of the farmers sold paddy to DGF purchasing officers. It means that about 73,000 farmers had sold paddy through the boro procurement system in 2019.

By contextualising this finding, according to official sources, rice procurement was 5.9 per cent of total boro rice production, and paddy procurement was 1.37 per cent of total paddy-equivalent boro rice production in the 2019 boro procurement season (see Figure 1). Most farmers (92.3 per cent) sold their boro paddy to various traders, including *faria*, *bepari*, *aratdar*, and other traders (Figure 6).

FIGURE 6: Percentage of Farmers Selling Boro Paddy to Various Buyers

Source: IFPRI Survey for Boro Procurement Study, 2019.

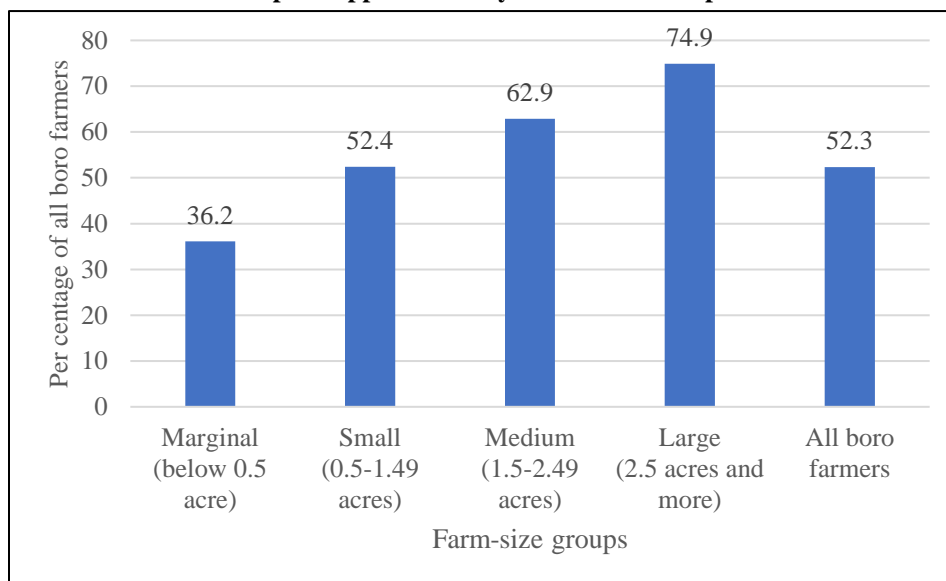
Figure 7 shows the average price of paddy (Tk per kg) received by farmers from various buyers during the 2019 boro procurement season. Farmers who sold their boro paddy to the DGF received Tk 26 per kg; however, farmers who did not sell their paddy to the government received between Tk 14 and Tk 15 per kg.

FIGURE 7: Average Price of Paddy Received by Farmers from Various Buyers from April to August 2019

Source: IFPRI Survey for Boro Procurement Study, 2019.

According to the DGF's guidelines, farmers who have an agricultural input support card (*Krishi* card) are eligible to sell paddy to the DGF at the procurement price of paddy (Tk 26 per kg). Figure 8 shows that 52.3 per cent of boro farmers in the survey sample had an agricultural input support card in 2019. The percentage distribution of the agricultural input support card appears regressive—36.2 per cent of the marginal farmers had agricultural input support cards compared with 74.9 per cent of large farmers.

FIGURE 8: Percentage of Boro Farmers Who Have an Agricultural Input Support Card by Farm-Size Groups

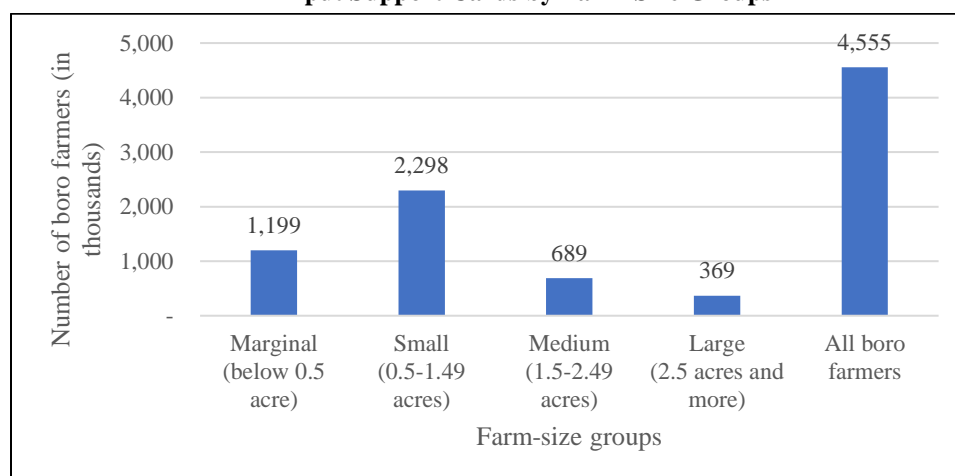


Source: IFPRI Survey for Boro Procurement Study, 2019.

However, when we examine the estimated number of farmers having agricultural input support cards, we see a progressive pattern of distribution across farm-size groups (Figure 9). In 2019, 4.56 million boro farmers were estimated to have an agricultural input support card.⁶ Among them, 26.3 per cent were marginal farmers, 50.5 per cent were small farmers, 15.1 per cent were medium farmers, and 8.1 per cent were large farmers.

⁶We multiply the estimated total number of boro farmers in 2019—9,287,000 (9.29 million)—by the proportions of boro farmers in each farm-size group, shown in Figure 3 to obtain the number of farmers by farm-size groups. Then, we use the proportions of farmers having agricultural input support cards to obtain the numbers.

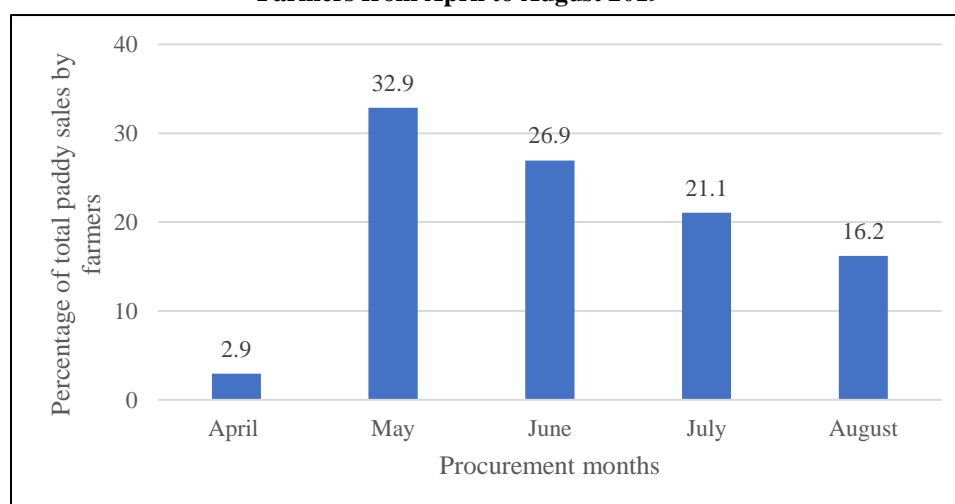
FIGURE 9: Number of Boro Farmers who have Agricultural Input Support Cards by Farm-Size Groups



Source: IFPRI Survey for Boro Procurement Study, 2019.

Figure 10 shows the pattern of monthly paddy sales as a share of total sales by farmers from April to August 2019, which was the procurement period. Sales peaked in May when farmers made one-third (32.9 per cent) of their total paddy sales for the 2019 boro procurement season.

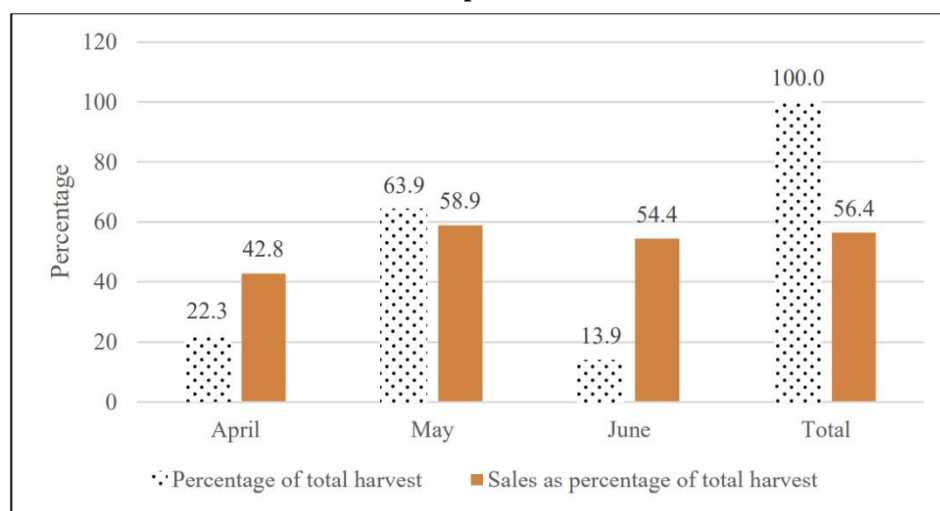
FIGURE 10: Monthly Paddy Sales as Percentage of Total Sales by Farmers from April to August 2019



Source: IFPRI Survey for Boro Procurement Study, 2019.

In 2019, the boro paddy harvest started in April and ended in June. Figure 11 shows that about 59 per cent of the total amount of boro paddy produced by farmers was harvested in May. The Figure also shows total monthly paddy sales by farmers as a percentage of their total monthly harvested amount, termed marketed surplus. The total marketed surplus of boro paddy was 56.4 per cent of the total harvest during the 2019 boro procurement season.

FIGURE 11: Monthly Paddy Harvest and Paddy Sales, as Percentage of Total Harvest from April to June 2019



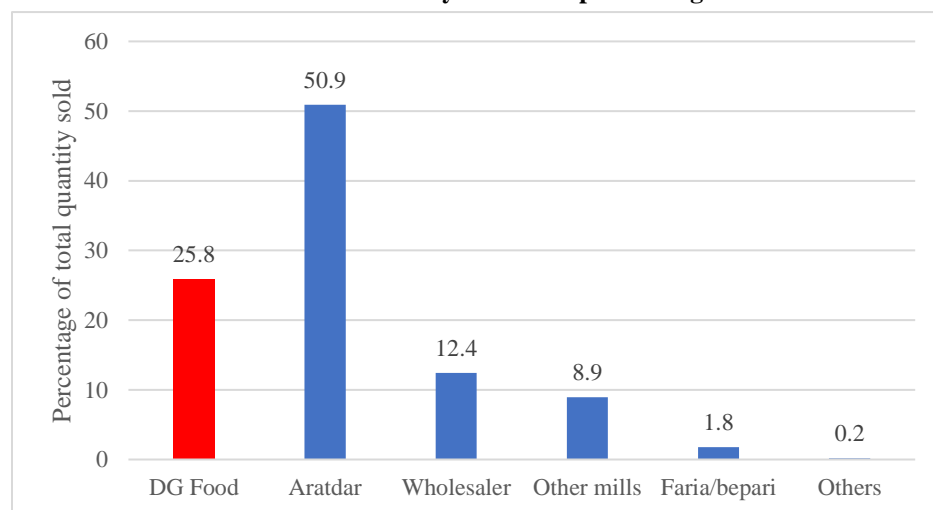
Source: IFPRI Survey for Boro Procurement Study, 2019.

We gleaned several other insights from the farmer survey. The average length of time from paddy harvesting and threshing to the first sale was 32 days, mostly used for cleaning and drying paddy. The main reasons for selling paddy within 30 days after harvest include repayment of the loan (38.2 per cent), household expenses (27.9 per cent), emergency expenses (15.8 per cent), lack of storage (8.1 per cent), and paying off land rent (4.3 per cent). Nearly three-quarters (71.2 per cent) of farmers knew about the 2019 boro procurement announced by the government. Farmers' sources of information included the following: other farmers (57.3 per cent), newspaper/TV/radio (22.9 per cent), union council (8.6 per cent), Department of Agricultural Extension (5.0 per cent), Directorate General of Food (0.8 per cent), and other sources (5.4 per cent). Furthermore, slightly over half (55.8 per cent) of the boro farmers knew the announced price of paddy procurement.

The trader survey provided information on the type and variety of paddy and rice that traders purchased, to whom traders sold, and at what price during the 2019 boro procurement season. Among 92 traders interviewed, 59.7 per cent purchased paddy, 29.4 per cent purchased rice, and 10.9 per cent purchased both paddy and rice. Of the total purchased quantity of paddy, 76.3 per cent was HYV boro paddy, and 23.7 per cent was hybrid boro paddy on average. Among the traders, 80.4 per cent sold paddy to rice millers, 13.1 per cent sold to other *beparis* and *farias* (types of market intermediaries), 3.7 per cent sold to *aratdars* (brokers operating from fixed premises), and 2.8 per cent sold to others. Traders sold paddy at the average price of Tk 16.80 per kg to *aratdars* and other traders, and Tk 17.29 per kg to rice millers. On average, traders sold rice at Tk 36.07 per kg to *aratdars* and other traders and Tk 40.99 to consumers.

IFPRI's survey interviewed 48 enlisted rice millers, including automatic (58.3 per cent), semi-automatic (18.8 per cent), and husking (22.9 per cent) rice millers who sold boro rice to the DGF during the 2019 boro procurement season. Figure 12 shows the shares by buyers of the total amount of boro rice sales by rice millers from April to August 2019. They sold about one-quarter (25.8 per cent) of their total sales of milled rice to the DGF. *Aratdars* were the biggest buyer, purchasing one-half (50.9 per cent) of the total rice sold during the 2019 procurement season.

FIGURE 12: Percentage of Total Amount of Rice Sold to Various Buyers from April to August 2019

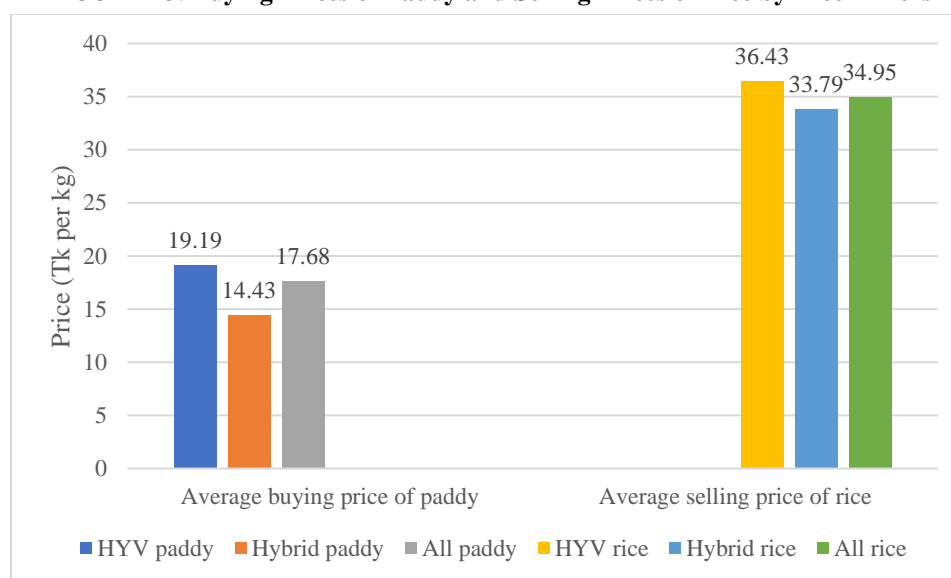


Source: IFPRI Survey for Boro Procurement Study, 2019.

On average, 94.3 per cent of all rice sold to the DGF by rice millers was hybrid rice. A key driver is the relatively lower cost of hybrid boro paddy compared with HYV boro paddy. The survey reveals that rice millers purchased HYV boro paddy for Tk 19.19 per kg and hybrid paddy for Tk 14.43 per kg (that is, the millers paid 24.8 per cent less for hybrid paddy), but they sold both types of rice to the DGF at the procurement price of Tk 36.00 per kg. Therefore, the millers had a large incentive to buy hybrid paddy for milling and sell hybrid rice to the DGF, which substantially increased their profit margin. A study on hybrid rice in Bangladesh and India suggests that the price of hybrid rice is lower due to its poor cooking quality, which makes it less attractive to consumers (Spielman, Ward, Kolady, & Ar-Rashid, 2017).

Figure 13 shows the average buying prices of paddy and selling prices of milled rice to aratdars, wholesalers, and others. The average selling price of hybrid rice was 7.2 per cent lower than HYV rice. In 2019, hybrid rice accounted for 17.7 per cent of the total boro production of 19.56 million metric tons (BBS, 2019).

FIGURE 13: Buying Prices of Paddy and Selling Prices of Rice by Rice Millers



Source: IFPRI Survey for Boro Procurement Study, 2019.

IFPRI's survey of 40 upazila agriculture officers (UAOs) found that most farmers have an agricultural input support card (85.6 per cent), varying between 32 per cent and 100 per cent across upazilas. UAOs reported that compiling the

farmers' list for procurement was primarily based on land area, production quantity, predicted sale quantity, and lottery. Moreover, there were reports of farmers being selected based on an influential person's recommendation. Half of the surveyed UAOs disagreed that farmers faced obstacles selling paddy, 37.5 per cent believed that farmers did face challenges, and 12.5 per cent were agnostic. About 18 per cent of UAOs reported that some farmers used another farmer's agricultural input support card to sell paddy to the DGF.

IFPRI's survey of 40 upazila food controllers (UFCs) revealed that, on average, 18.9 per cent of the total number of farmers enlisted by UAOs were selected for paddy procurement. The average of maximum amount of paddy that farmers sold to the government (as reported by UFCs) using an agricultural input support card was 1.85 metric tons. It varied widely, with 52.5 per cent of UFCs reporting that farmers sold up to 1 metric ton of paddy and 37.5 per cent of UFCs indicating that farmers sold up to 3 metric tons of paddy. The minimum amount of paddy that farmers could sell to the government differed across upazilas. Specifically, 40 per cent of UFCs stated that the minimum amount of paddy that could be procured was 0.120 metric tons in their upazilas, whereas 37.5 per cent of UFCs reported that the minimum amount of paddy that could be procured was 1 metric ton of paddy in their respective upazilas. The average minimum amount of paddy procured across the surveyed upazilas was 0.534 metric tons. All paddy sold to the government was verified as having 14 per cent moisture content using a moisture meter. On average, only 43.6 per cent of farmers brought paddy to be sold that met the required moisture content. The average upazila-level target amount for the first procurement announcement on April 25, 2019, was 546.65 metric tons. With the second procurement announcement, on June 13, 2019, the average target amount increased to 895.98 metric tons. About half (50.5 per cent) of the paddy procured was HYV, and 49.5 per cent was hybrid.

A key objective of the public foodgrain procurement program is to provide price support to farmers. However, our study reveals that among all farmers who sold paddy during the 2019 procurement season, only 1.3 per cent sold paddy to the government. There are two main reasons for such a low level of farmers' participation in paddy sales in the procurement program.

First, The government set the target for procuring paddy at a very low level. In 2019, the target for paddy procurement was 400,000 metric tons, and actual procurement virtually fully met the target (Table I). The procured amount of paddy was only 1.4 per cent of total paddy-equivalent boro rice production.

Second, because boro paddy is harvested during the rainy season, the paddy usually has high moisture content. However, it is difficult for farmers to dry paddy and then sell it to the government at the maximum allowable moisture content of 14 per cent. Therefore, the extremely low level of paddy procurement defeats the objective of providing price support to farmers through the procurement system.

4.3 Estimated Effects of Procurement on Market Price

We used a mathematical demand-supply model to estimate the impacts under different scenarios. Section 3.3 provides a description of the model and parameters used for the estimations.

The price of a commodity is determined by the interaction of its demand and supply in the market. We have estimated that the actual procurement of 399,862 metric tons of boro paddy in 2019 increased the market price of paddy by 7.6 per cent, from Tk 15.41 to Tk 16.56 per kg.

The total rice equivalent procurement in 2018/2019 was 1.42 million metric tons (equivalent to 2.12 million metric tons of paddy), equal to 7.3 per cent of total production for the year. If the government had procured the entire quantity in terms of paddy, then the market price of paddy would have been Tk 22.36 per kg (45 per cent higher than the actual average market price of Tk 15.41 per kg).

Our estimates suggest that the procurement quantity of 3.07 million metric tons of paddy would have been needed to increase the market price of paddy to Tk 26 per kg. This amount accounts for 18.7 per cent of the market supply of paddy (that is, farmers' marketed surplus), or 10.5 per cent of total paddy-equivalent boro production in 2018/2019.

V. PADDY PROCUREMENT IN WEST BENGAL, INDIA

In 2019, IFPRI-PRSSP commissioned a study in the Indian state of West Bengal to understand how paddy is procured directly from farmers. The study included farmer surveys and key informant interviews (KIIs) with government officials, self-help groups and cooperatives, and paddy/rice traders and transporters who procure paddy directly from farmers (Jana & Barun, 2019).

Since 2016/2017, the West Bengal State Government has implemented an electronic paddy procurement (e-procurement) system.⁷ Between 2017/2018 and 2019/2020, farmers' participation in the e-procurement system increased five-fold,

⁷West Bengal's e-paddy procurement system was first piloted in 2015/2016.

from 465,000 to 2.36 million.⁸ Overall, West Bengal's paddy procurement was 22 per cent and 24 per cent of total production in 2017/2018 and 2018/2019, respectively. Although the government purchases aman and boro paddy at the same announced price, the vast majority of paddy procured by the government is aman. In total, the amount of aman paddy procured by the government is more than double that of boro paddy (8,649 quintals versus 4,232.4 quintals, or 864.9 metric tons versus 423.2 metric tons).

Paddy is procured from farmers primarily through two approaches. Under the first approach, farmers bring paddy to *Kishan Mandis* (centralized procurement centres, or CPCs), and receive Rs. 20 per quintal transport allowance (Tk 226.30⁹ per metric ton). Here, the Food and Supplies Department assigns one purchase officer and one disbursement officer who purchase paddy from farmers and records these sales in the e-procurement system. Farmer payments are made via account payee checks under the *Dhan Din Cheque Nin* ('Give paddy, take your cheque') programme on the same day of receipt of paddy from farmers.

Under the second approach, registered farmers' cooperatives,¹⁰ self-help groups (SHGs), or producers' organisations, which have applied, been screened and are registered with the District Food and Civil Supply Department, announce the paddy procurement date in advance in the locality and procure paddy from registered farmers. The cooperatives then deliver the paddy to state government-designated custom milled rice (CMR) agencies, which have agreements with select rice mills. A designated government official (that is, block extension officer/cooperative inspector) certifies receipt of the paddy and sends the certificate of delivery to the CMR agency, and farmers receive an acknowledgement of sale on the back of the Farmers' Registration Certificate to be issued by the respective CMR agency. Rice millers are provided with a transport allowance of Rs. 18.38 per quintal (Tk 208.00 per metric ton) for delivering paddy from the CMR agency to the government-designated rice mill. Farmers' cooperatives update the sales information on the e-procurement system and notify

⁸The number of registered farmers in West Bengal's e-procurement system in 2019/2020 is reported as of December 14, 2019.

⁹ The exchange rate used is 1 Indian Rupee (Rs.) to 1.13 Bangladeshi Taka (Tk), effective April 30, 2020.

¹⁰Farmers' cooperatives and SHGs are crucial players in West Bengal's paddy procurement system. The West Bengal State Government promotes the formation of farmers' cooperatives and self-help groups but is otherwise not involved in their management and operation.

all registered members about sales via SMS. The state government pays farmers' cooperatives, SHGs, and producers' organisations Rs. 31.25 per quintal of paddy procured as a commission (Tk 353.70 per metric ton).

In 2019/2020, out of the state government's 5.2 million metric tons target for paddy procurement, the selected state government-designated custom milled rice (CMR) agencies procured the most paddy (46 per cent), followed by the state government-run CPCs (42 per cent) and the Food Corporation of India, that is, the central government (12 per cent).

IFPRI surveyed 205 farmers in Dakshin Dinajpur and Nadia districts to assess their satisfaction with participating in the e-procurement system. Of the surveyed farmers, 96 per cent were satisfied with the higher price received, and all farmers received the announced price of Rs. 1,750 per quintal in 2018/2019 (Tk 19,805.50 per metric ton). Since 2006/2007, the minimum support price (MSP) in West Bengal has gradually increased, with an announced price of Rs. 1,750 per quintal in 2018/2019 and Rs. 1,815 per quintal (Tk 20,541.10 per metric ton) in 2019/2020. Nevertheless, farmers who participated in the paddy procurement system also reported difficulties related to three key areas: (1) collection (weight rebate: 66 per cent; limited quantity: 33 per cent); (2) logistics (distance to centre: 24 per cent; long time waiting: 15 per cent), and (3) payment (paying extra charges: 30 per cent;¹¹ payment problems: 24 per cent; check cashing: 15 per cent).

Recently, the West Bengal Government has revised its paddy purchase limits per farmer. There were no upper limits on paddy purchases in 2015/2016 and 2016/2017. However, in 2017/2018, the yearly maximum purchase per farmer was restricted to 180 quintals (18 metric tons), which was halved to 90 quintals (9 metric tons) in 2018/2019, and further reduced in 2019/2020 to 45 quintals (4.5 metric tons). The purpose of reducing the maximum yearly limit per farmer is to enhance participation among smallholder farmers.

For every 100 metric tons of paddy received, rice millers supply 67 metric tons of milled rice to the state government. During the 2018/2019 kharif marketing season, the state government paid enlisted rice millers Rs. 2,877.72 per quintal for raw rice and Rs. 2,825.54 per quintal for parboiled rice (Tk 32,568.30 and Tk 31,977.80 per metric tons, respectively), which covers all incidental costs and

¹¹ The data show that farmers who participated in the Government's e-procurement system pay, on average, an extra Rs. 14-15 per quintal of paddy (Tk 158.40-169.80 per metric ton) related to loading, packing, storage, and illegal payoffs; farmers who sell to private traders pay, on average, Rs. 1-2 per quintal of paddy (Tk 11.30-22.60 per metric ton).

includes a paddy-drying allowance equivalent to 1 per cent of MSP, which has been implemented since 1998. Overall, West Bengal's paddy procurement model may provide options for Bangladesh's paddy procurement system.

VI. CONCLUSION AND POLICY IMPLICATIONS

In 2018/2019, the total rice production in Bangladesh was 36.4 million metric tons, of which boro rice accounted for 53.8 per cent. The total actual rice-equivalent procurement by the government was 1.42 million metric tons, equal to 7.25 per cent of production. Rice procurement from millers accounted for 81.1 per cent of total procurement, and the remaining 18.9 per cent from farmers in the form of paddy.

Farmers were adversely affected by low paddy prices during the 2019 boro harvest season. The results of this study indicate that some farmers were more affected than others. Smallholder farmers (47 per cent of boro farmers operating 0.5 to 1.49 acres of land) were relatively more affected by low paddy prices than other farmer groups because they sold about half of the total volume of boro paddy sold from April to August 2019. Cash-lease tenant farmers (33 per cent of all farmers) also suffered considerably when paddy prices dipped because they had to pay land rent in cash to landowners. Conversely, sharecroppers (26 per cent of all farmers) who paid rent as a share of their paddy production, and marginal farmers (36 per cent, operating less than 0.5 acres of land) who mostly cultivated boro paddy for home consumption, were more insulated from the impacts of low paddy prices.

The results show that rice millers benefited most from the procurement process. They made a large profit, primarily from purchasing hybrid paddy from traders—which was 24.8 per cent cheaper than HYV paddy—and then processing and selling hybrid rice to the government at the Tk 36 per kg procurement price. Even though hybrid rice accounted for 18 per cent of total boro production in 2018/2019 (BBS, 2019), it represented 94 per cent of rice millers' total volume of rice sales to the government.

Among all farmers who sold paddy in the 2019 procurement season, only 1.34 per cent sold their paddy to the government. This is expected, given that the total paddy procurement was 399,862 metric tons, which was 1.4 per cent of total paddy-equivalent boro rice production in the 2019 boro procurement season.

Since farmers sell paddy during the harvest season, the procurement price is expected to benefit farmers when the government purchases paddy directly from farmers. On the other hand, a large volume of rice procurement may increase the retail price of rice in the market, which can negatively impact consumers who must buy rice, particularly the urban poor. Therefore, the government's key challenge is how to provide price support to farmers and maintain a retail price that is affordable to low-income consumers.

Using a mathematical demand-supply model, we found that the procurement of 399,862 metric tons of boro paddy in 2019 likely increased the market price of paddy by 7.6 per cent compared with a scenario of zero procurement. The paddy-equivalent total procurement was 2.12 million metric tons in 2019. If the government procured the entire quantity as paddy instead of mainly rice, the market price of paddy might have been around 45 per cent higher compared with a zero-procurement scenario. To raise the market price of paddy to the level of the procurement price of Tk 26 per kg, the procured quantity of paddy would need to be 3.1 million metric tons of paddy, which accounts for 18.7 per cent of the market supply of paddy (that is, farmers' marketed surplus) or 10.5 per cent of total paddy-equivalent boro production in 2019.

6.1 Policy Implications

Two policy options arise from this study. We present these policy options and evaluate them based on their feasibility and limitations.

First, when the harvest price of paddy is low, due to bumper production, and does not cover farmers' production cost per unit, the government can purchase the entire targeted procurement quantity as paddy directly from farmers to benefit them through price support. If this were implemented during the 2019 boro harvest season, it would have raised the market price of paddy by around 45 per cent. Although this would still be below the procurement price of Tk 26 per kg, this would have been a significant improvement from the actual market price of paddy in 2019.

Under this system, farmers would bring their paddy to the local supply depot (LSD) to sell to the Directorate General of Food (DGF). Because the boro harvest is during the rainy season, farmers' paddy usually has high moisture content. However, it is difficult for farmers to dry paddy and then sell it to the government at the maximum allowable moisture content of 14 per cent. Therefore, the procurement price would be adjusted based on the moisture content of farmers'

paddy. Those who would supply paddy at 14 per cent moisture content could receive the announced procurement price, and those selling paddy with higher moisture content would receive a relatively lower price from the government, which would need to be determined using conversion factors.

The government could set a lower limit of 200 kg and an upper limit of 2 metric tons of paddy per farmer for procurement to increase the participation of smallholder farmers in the procurement system. Payment could be made to farmers using the existing paddy procurement system. The government-designated rice millers would transport the procured paddy from LSDs to rice mills. The millers should transport paddy with higher than 14 per cent moisture content within a day to avoid damage to paddy with excess moisture.

Paddy-to-rice crushing ratio with 14 per cent moisture should be 0.67 (that is, 67 MT of milled rice for every 100 MT of paddy) as per present rules. The crushing ratio for paddy with higher moisture content should be determined using conversion factors. Rice millers would receive payment to cover the carrying cost for moving paddy from the LSD to mills and a milling charge.

This policy option would benefit both farmers who participate and those who do not participate in the procurement system. Farmers who sell their paddy directly through the procurement system would get the procurement price; on the other hand, farmers who do not participate would benefit from the resulting higher market price of paddy during the harvest season. The critical factor for influencing paddy price is the volume of procurement. However, implementation of this option would require revamping the existing procurement system.

Raising the market price of paddy to the procurement price of Tk 26 per kg would require government procurement of 3.1 million metric tons of paddy. However, the government's current functional foodgrain storage capacity of around 2 million metric tons is insufficient to store this larger volume of rice-equivalent paddy (3.1 million metric tons of paddy, or 2.1 million metric tons rice equivalent). Although the Ministry of Food's Modern Food Storage Facilities Project is increasing the national storage capacity by 535,500 metric tons and is expected to increase the shelf life of rice stock from seven months to three years with the construction of modern steel silos, this expansion will still fall short of the storage required if this policy option is implemented.

In the second policy option, the government would purchase rice from the market through open tender when the paddy price is high during the harvest season. In such a situation, purchasing paddy directly from farmers may not be feasible for

the government to meet its procurement target. In this option, the sole objective of procurement would be to build or replenish the public foodgrain stock rather than the dual objective of providing price support to farmers and building public foodgrain stock. Farmers may not need price support if high paddy price prevails during the harvest season.

If appropriately designed, the second policy option would shift the responsibilities of milling, handling, and transportation from the Directorate General of Food to private traders. However, various factors must be incorporated into the design of open tender procurement to achieve the potential cost-effectiveness of this mechanism, including packaging, delivery points, pricing guidelines, quantity and quality control through inspection, time schedule, and mode of payment (Ahmed et al., 1993).

We have provided two policy options for modifying Bangladesh's paddy and rice procurement system. Choosing among these depends on the main objective of procurement, i.e., whether it is to provide price support to farmers or to replenish the PFDS stock. Although both issues are of utmost importance, achieving multiple objectives requires multiple instruments. The procurement program is a single policy instrument that cannot be used effectively to address both: providing price support to farmers during the harvest season *and* building up PFDS stock. Thus, if the primary objective is to support farmers, the government may consider policy option one; however, if the main objective is to maintain adequate public stock, then policy option two may be considered.

REFERENCES

- Ahmed, A. U., & Sampath, R. K. (1992). Effects of irrigation-induced technological change in Bangladesh rice production. *American Journal of Agricultural Economics*, 74(1), 144-157. <https://doi.org/10.2307/1242998>
- Ahmed, R. (1979). Foodgrain supply, distribution, and consumption policies within a dual pricing mechanism: A case study of Bangladesh (Vol. 8). International Food Policy Research Institute.
- Ahmed, R., Chowdhury, N., & Ahmed, A. U. (1993). Determination of procurement price of rice in Bangladesh. Working Paper No 6. Washington, DC: International Food Policy Research Institute.
- BBS (Bangladesh Bureau of Statistics). (2011). *Report of the household income and expenditure survey 2010*. Bangladesh Bureau of Statistics, Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.
- BBS (Bangladesh Bureau of Statistics). (2019). *Estimates of boro rice 2018-19*. http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/16d38ef2_2163_4252_a28b_e65f60dab8a9/2019-12-15-14-02-1f1f00d6a9a2c4e67bdb533ce054cb8.pdf. Accessed April 16, 2020
- Bhattacharya, S., Falcao, V. L., & Puri, R. (2017). The public distribution system in India. *The 1.5 billion people question*, 43. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-1087-9_ch2
- Brooks, J., Commandeur, D., & Vera, E. (2019). Inclusive procurement and transparency-connecting smallholder farmers to school feeding. *Gates Open Research*, 3(495), 495.
- DAM (Department of Agricultural Marketing). (2020). Wholesale and retail prices of agricultural commodities 2020. Ministry of Agriculture, Government of the People's Republic of Bangladesh, Dhaka.
- FAO (Food and Agriculture Organization of the United Nations). (2015). *The state of food and agriculture: Social protection and agriculture- Breaking the cycle of rural poverty*. FAO: Rome.
- FAO (Food and Agriculture Organization of the United Nations). (2018). Strengthening sector policies for better food security and nutrition results: Public food procurement. *Policy Guidance Note 11*. FAO: Rome. <http://www.fao.org/3/CA2281EN/ca2281en.pdf>
- Gupta, N. (2013). Government intervention in grain markets in India: rethinking the procurement policy. *Centre for Development Economics Working Paper*, 231. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.671.7754&rep=rep1&type=pdf>

- Jana, S., & Pal, B. (2019). Assessing the efficacy of and farmers' satisfaction with the government procurement system to procure paddy directly from farmers in West Bengal, India. Vidyasagar University.
- Karim, R., & Wardad, Y. (2021). Bangladesh government set to procure boro directly from farmers. *Financial Express*, Accessed April 11, 2021. <https://thefinancialexpress.com.bd/trade/bangladesh-government-set-to-procure-boro-directly-from-farmers-1618021400>
- Nehring, R., & McKay, B. (2013). *Scaling up local development initiatives: Brazil's food acquisition programme* (No. 106). Working Paper. International Policy Centre for Inclusive Growth (IPC-IG), Brasilia. <http://hdl.handle.net/10419/71802>
- Nehring, R., Miranda, A., & Howe, A. (2017). Making the case for institutional demand: Supporting smallholders through procurement and food assistance programmes. *Global Food Security*, 12, 96-102.
- Ruel, M., & Alderman, H. (2013). Nutrition-sensitive interventions and programmes: How can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*, Vol 382, No 9891, pp 536-551. [https://doi.org/10.1016/S0140-6736\(13\)60843-0](https://doi.org/10.1016/S0140-6736(13)60843-0)
- Shemu, S. A., Sabur, S. A., Alam, M. J., & Kausar, M. A. A. (2013). Public intervention and its effectiveness: the case of government boro paddy procurement program in Mymensingh district. *Bangladesh Journal of Crop Science*, 25, 21-30.
- Spielman, D. J., Ward, P. S., Kolady, D. E., & Ar-Rashid, H. (2017). Public incentives, private investment, and outlooks for hybrid rice in Bangladesh and India. *Applied Economic Perspectives and Policy*, 39(1), 154-176.