

**HIGHER BORO PRODUCTION FOR FOOD SECURITY:  
AN INTEGRATED STRATEGY**

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The present paper titled **Higher Boro Production for Food Security: an Integrated Strategy** has been prepared under the CPD IRBD programme. The paper was presented at the CPD Dialogue on **Boro Production: Immediate Tasks for the Newly Elected Government** on 19 January 2009, at CIRDAP Auditorium, Dhaka by *Uttam Deb* Head, Research Division, CPD.

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## Acronyms

AWD	Alternate Wet and Dry
BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BPC	Bangladesh Petroleum Corporation
CHT	Chittagong Hill Tracts
CPD	Centre for Policy Dialogue
CSD	Central Storage Depot
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
DAP	Diammonium Phosphate
EIA	Energy Information Administration
FFW	Food for Work
FPC	Fair Price Campaign
FPMU	Food Planning and Monitoring Unit
GDP	Gross Domestic Product
GR	Gratuitous Relief
HYV	High-yielding Variety
ha	Hectare
IRBD	Independent Review of Bangladesh's Development
LSD	Local Storage Depot
MEP	Minimum Export Price
MSP	Minimum Support Price
MT	Metric Ton
MoA	Ministry of Agriculture
MoP	Muriate of Potash
NGO	Non-government Organisation
OMS	Open Market Sale
PFDS	Public Foodgrain Distribution System
PPP	Public-Private Partnership
SMS	Short Message Service
SPARRSO	Space Research and Remote Sensing Organization
SRI	System of Rice Intensification
SSP	Single Super Phosphate
TE	Triennium Ending
TR	Test Relief
TSP	Triple Super Phosphate
USD	United States Dollar
VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding

# HIGHER BORO PRODUCTION FOR FOOD SECURITY: AN INTEGRATED STRATEGY

## 1. INTRODUCTION

Achieving self-sufficiency in foodgrain production by 2012, reduction of prices of essential commodities, and poverty reduction were amongst the most important election pledges of the new government. These commitments are of complementary nature. Attainment of food security at the national and household level can contribute towards fulfilling the above mentioned three commitments. Attaining food security at the national level depends on the availability of food from domestic production and imports from the international markets, whereas food security at the household level depends not only on availability of food, but also on the ability to purchase food by the household. Households with adequate income can buy food from the market if it is available, but low-income households face problems to buy food when food prices are high. For such low-income groups, government distributes food through priced channels such as Open Market Sale (OMS), and non-priced channels like Vulnerable Group Development (VGD), Vulnerable Group Feeding (VGF), Food for Works (FFW), etc. Therefore, a major challenge of the government is to balance the interest of producers and consumers through government procurement and Public Food Distribution System (PFDS).

Bangladesh has made remarkable progress in achieving its food security. Since independence in 1971, production and consumption of foodgrains grew over time. Even though, there were ups and downs, production of foodgrains generally experienced an upward trend. However, price hike for agricultural commodities, particularly rice and wheat in 2007 and 2008, has posed a major challenge to food security in Bangladesh. Imports from international market was a very difficult task in these years due to restrictions on rice exports by major rice exporting countries such as India, Vietnam, Cambodia and Egypt. An all time high production of Boro rice in FY2007-08 (to the tune of 17.76 million tonnes) was very helpful to meet the challenge.

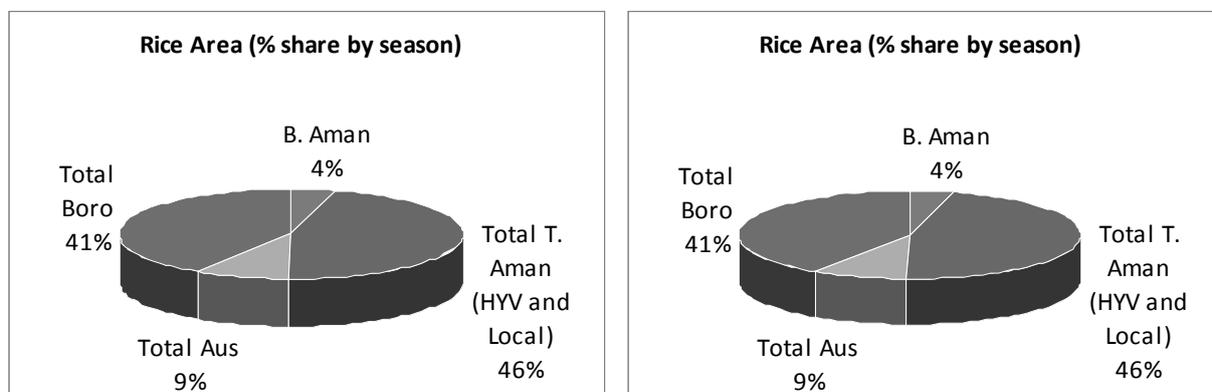
During the time of independence, Aman was the major food crop, which was the dominant source of total rice production. Structure of rice production in Bangladesh has remarkably changed over time. With the development of rice cultivars for Boro season and expansion of irrigation system, both area and production of Boro rice increased over time. Since 1999-00, Boro contributes more than half of the total rice production in Bangladesh. Average area under Boro rice in TE 2007-08<sup>1</sup> was 4.31 million hectare (ha) which produced about 15.56 million metric tonnes (MT) of rice. Currently Boro occupies about 41 per cent of total rice area and contributes 56 per cent of total rice production in Bangladesh (Figure 1). On the other hand, Aman rice occupies 50 per cent of total rice area and contributes 38 per cent of total production. Aus rice contributes about 9 per cent of total rice area and 6 per cent of rice production. Structural change in rice production in Bangladesh and more dependence on Boro crop has made rice production a function of input supply, policies and prices rather than vagaries of nature. This structural change has made attainment and sustenance of food

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<sup>1</sup> TE stands for “triennium ending.” Thus, the data for TE2007-08 represents the average for the three years: 2005-06, 2006-07 and 2007-08.

security more of a matter of governance and management. It has also posed serious challenges for the government and development agencies, particularly for ensuring availability of inputs at a reasonable price, and also to find an appropriate balance between the interest of the producers and the consumers.

**Figure 1: Distribution of Rice Area and Production across Rice Growing Seasons**

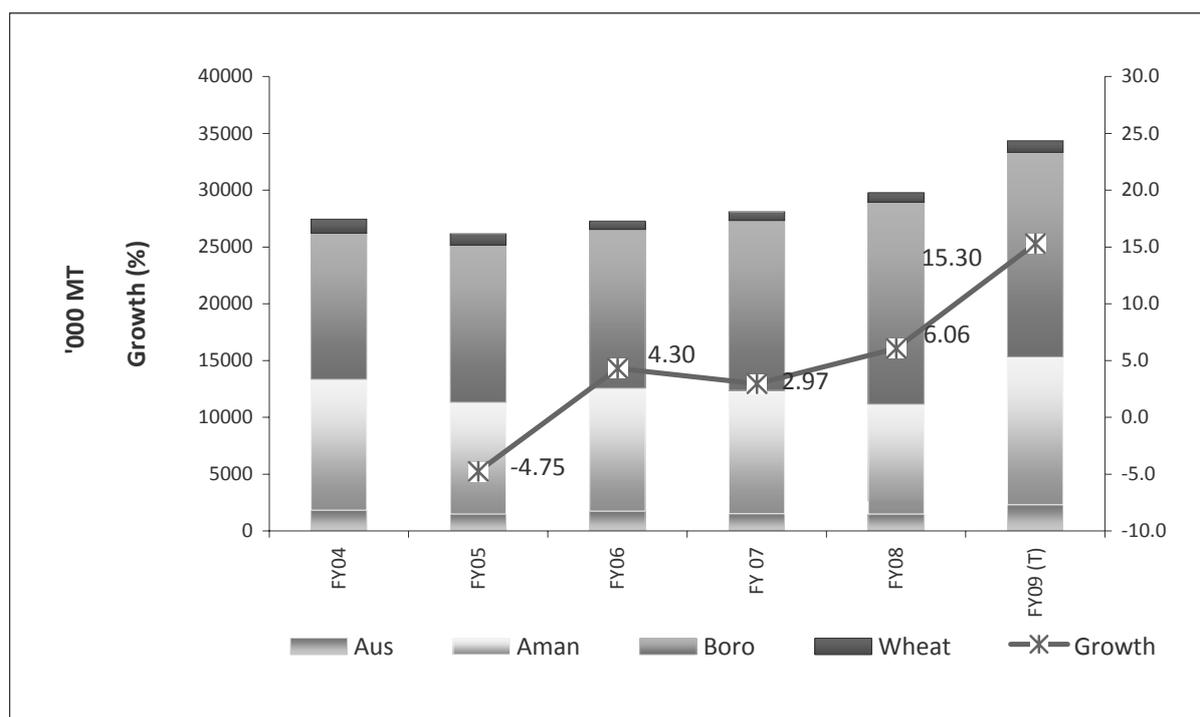


**Source:** Authors' calculation, based on the data from Bangladesh Bureau of Statistic (BBS).

This paper attempts to arouse interest for an integrated strategy for food security through higher Boro production. It discusses input delivery strategy needed for higher Boro production as well as a mechanism for public procurement and distribution of foodgrains to ensure social protection and social safety net.

## 2. BORO PRODUCTION TARGET: IS IT REALISTIC?

The Department of Agricultural Extension (DAE) has set the operational target (revised) for foodgrains production in FY2008-09 at 34.33 million MT; if achieved, this will register a 15.30 per cent annual growth over FY2007-08 (Figure 2). Preliminary estimates of Aus production reveal a 25.7 per cent annual growth in FY2008-09, though 1.90 million MT shortage of production failed to achieve the production target by 18.0 per cent (BBS 2008). Farmers have already harvested Aman rice; however, Bangladesh Bureau of Statistics (BBS) and the DAE are yet to come up with any estimation of Aman production. Despite the fact that some of the Aman areas were affected by flood in 2008, and there were reports of insect attacks in some pockets of production, field level information is indicative of an overall satisfactory Aman production in FY2008-09.

**Figure 2: Foodgrain Production Target in FY2008-09**

Source: BBS and DAE.

Ministry of Agriculture (MoA) has set a target of the current Boro season, cultivating Boro rice in 46.75 lakh ha of land comprising of 10.00 lakh ha Hybrid rice, 35.50 lakh ha of high yield variety (HYV) rice and 1.25 lakh ha of local Boro rice. According to the BBS, total area under Boro rice in FY2007-08 was 46.08 lakh ha which was comprised of 7.91 lakh ha of hybrid rice, 36.96 lakh ha of HYV rice and 1.26 lakh ha of local Boro rice. In other words, targeted total Boro area is 1.5 per cent higher than actual Boro area in the last year (FY2007-08). In case of hybrid rice, this year's target is 26.37 per cent higher than last year while it is 3.8 per cent lower for HYV Boro rice. In case of production of Boro rice, target is set at 1.80 crore MT which is 1.40 per cent higher than actual production in FY2007-08. Is this a realistic and achievable target? If so, what interventions are required?

### 2.1 Reality Check for Target in Boro

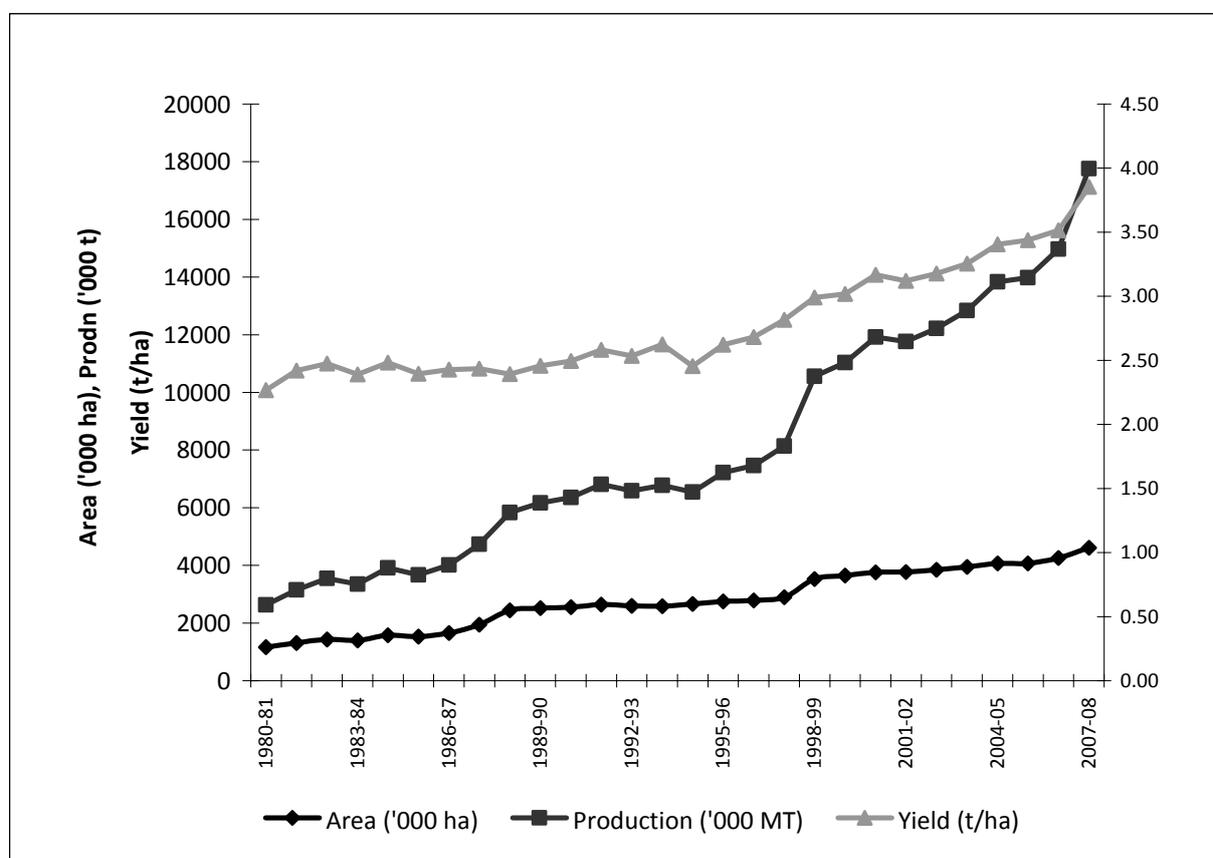
An analysis of area and production of Boro rice during 1980-81 to 2007-08 revealed that both area and production of Boro rice has increased (Figure 3). Area under Boro rice has increased from 11.6 lakh ha in 1980-81 to 46 lakh ha in 2007-08. On the other hand, production of Boro rice increased from 26.3 lakh tonnes to 1 crore 77.6 lakh tonnes, while per hectare yield of Boro rice increased from 2.27 ton/ha to 3.86 ton/ha. During this period, annual compound rate of growth in area, production and yield of Boro rice was 4.82, 6.49 and 1.68 per cent, respectively. Thus, increase in yield was the major determinant for increased Boro production in Bangladesh. Increase in Boro yield was the ultimate outcome of research, extension and overall development efforts. Investment for irrigation and water resources development also played an important role.

**Table 1: Targeted Boro Area and Production in FY2008-09 against Actual Area and Production in FY2007-08**

Description	Hybrid	HYV	Local	Total
<b>Area</b>				
Targeted area in FY2008-09 (lakh ha)	10.00	35.50	1.25	46.75
Actual Boro area in FY2007-08 (lakh ha)	7.91	36.90	1.26	46.07
Target of FY2008-09 as % of Actual Boro Area in FY2007-08	126.40	96.20	99.20	101.50
<b>Production</b>				
Targeted production in FY2008-09 (lakh MT)	47.00	131.00	2.12	180.12
Actual production in FY2007-08 (lakh MT)	35.52	139.84	2.26	177.62
Target production in FY2008-09 as % of actual production in FY2007-08	132.30	93.70	94.20	101.40

Source: BBS and DAE.

**Figure 3: Trends in Area, Production and Yield of Boro Rice: 1980-81 – 2007-08**



Source: BBS.

Boro is a produced in the dry season. Therefore, availability of irrigation is a necessary pre-condition for growing Boro rice. According to the Minor Irrigation Survey Report 2007-08, irrigated area in the Rabi season was 62.95 lakh ha which includes Boro rice, potato and other Rabi season crops. Available information also revealed that there is adequate number of irrigation equipments in good operating conditions. As is known, currently a total of 14 lakh 75 thousand irrigation equipments comprising 31,302 deep tubewells (electricity-operated: 28,288, diesel-driven: 3,014); 13 lakh 5 thousand shallow tubewells (electricity-operated: 181,454, diesel-driven: 1,123,519); and 138.6 thousand low lift pumps are in operation. This

information indicates that the necessary infrastructure or the hardware aspect of irrigation supports to achieve the Boro production target is available.

Aggregate level situation may not be prevailing at the district and upazila level. Therefore, an analysis of the upazila level irrigated area under modern irrigation in FY2007-08 was carried out. Data available in the Minor Irrigation Survey Report 2007-08 was used for this purpose. In FY2007-08, out of the 464 upazilas, coverage of modern irrigation was very high (more than 25,000 ha) in 70 upazilas; high (10,001 to 25,000 ha) in 181 upazilas, medium (2,001 to 10,000 ha) in 135 upazilas; low (501 to 2,000 ha) in 39 upazilas; and negligible (up to 500 ha) in another 36 upazilas (Figure 8 and Annex Table 1). Modern irrigation system was not used for irrigation in three upazilas (Hatia, Manpura and Mongla). Upazila level analysis also pointed out that the necessary infrastructure for irrigation is available to achieve the targeted Boro area.

Production of Boro rice also depends on other inputs like seed, fertiliser, pesticide and availability of agricultural credit. But these inputs are not binding constraints like irrigation infrastructure. Since the existing irrigation infrastructure is capable of supporting the target, therefore, it is justified to state that the target set for Boro area and production is a realistic one.

## **2.2 Targets at the District Level**

In FY2008-09, target area for total Boro rice cultivation is very high (more than 150 thousand ha) in nine districts (Dinajpur, Naogaon, Bogra, Tangail, Mymensingh, Netrokona, Sunamganj, Comilla and Jessore); high (100 thousand to 150 thousand ha) in seven districts (Rangpur, Gaibandha, Jamalpur, Kishoreganj, Sirajganj, Brahmanbaria and Habiganj); medium (50 to 100 thousand ha) in 24 districts (Thakurgaon, Nilphamari, Lalmonirhat, Kurigram, Joypurhat, Sherpur, Natore, Pabna, Rajshahi, Jhenaidaha, Satkhira, Barisal, Gopalganj, Chandpur, Dhaka, Narsingdi, Manikganj, Gazipur, Sylhet, Chittagong, Panchagarh, Nawabganj, Feni and Noakhali); low (10 to 50 thousand ha) in 19 districts (Kushtia, Khagrachhari, Meherpur, Chuadanga, Rajbari, Magura, Faridpur, Narail, Khulna, Bagerhat, Bhola, Pirojpur, Lakshmipur, Cox's Bazar, Madaripur, Shariatpur, Munshiganj, Narayanganj and Moulovibazar); and negligible (up to 10 thousand ha) in another five districts (Barguna, Bandarban, Rangamati, Jhalokathi and Patuakhali) (Figure 4).

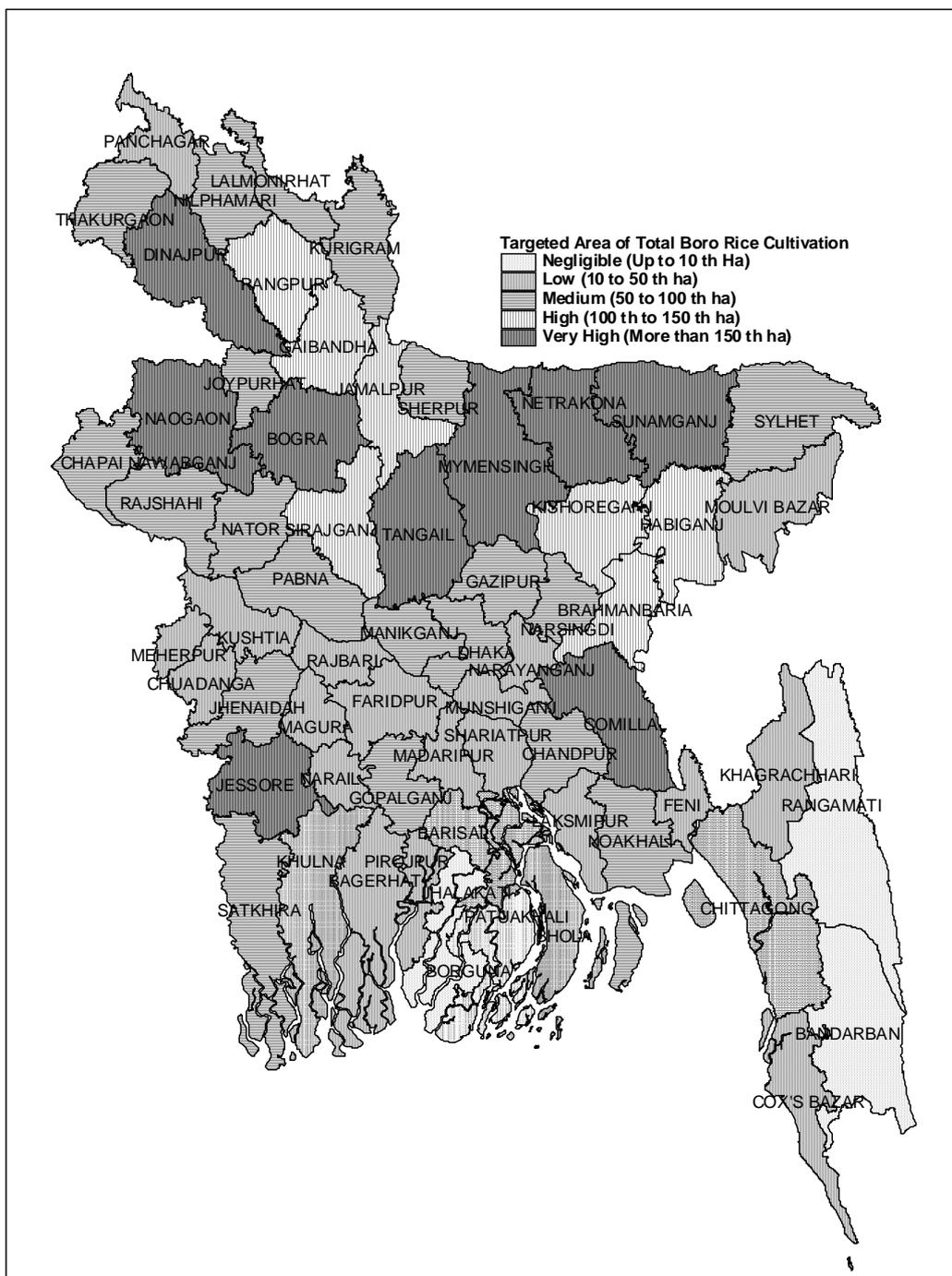
Targeted Boro area in FY2008-09, is substantially higher compared to Boro area in FY2007-08 (more than 5,000 ha) in seven districts (Kurigram, Gaibandha, Naogaon, Netrokona, Moulovibazar, Madaripur and Satkhira); higher (0 to 5,000 ha) in 37 districts (Bogra, Tangail, Comilla, Jessore, Jamalpur, Habiganj, Thakurgaon, Nilphamari, Lalmonirhat, Sherpur, Natore, Rajshahi, Jhenaidaha, Barisal, Gopalganj, Chandpur, Narsingdi, Manikganj, Gazipur, Sylhet, Panchagarh, Kushtia, Khagrachhari, Meherpur, Rajbari, Magura, Faridpur, Narail, Khulna, Bagerhat, Lakshmipur, Shariatpur, Narayanganj, Barguna, Bandarban, Rangamati and Patuakhali) (Figure 5). On the other hand, targeted Boro area is lower (0 to -5,000 ha) in 16 districts (Rangpur, Joypurhat, Nawabganj, Sirajganj, Pabna, Chuadanga, Dhaka, Munshiganj, Brahmanbaria, Sunamganj, Pirojpur, Jhalokathi, Bhola, Feni, Chittagong and Noakhali); and substantially lower (up to -5,000 ha) in another four districts (Cox's Bazar, Mymensingh, Kishoreganj and Dinajpur) (Figure 5).

In case of production target for Boro rice in FY2008-09, it is very high (more than 500 thousand MT) in 10 districts (Dinajpur, Naogaon, Bogra, Tangail, Mymensingh, Netrokona, Kishoreganj, Sunamganj, Comilla and Jessore); high (200 to 500 thousand MT) in 27 districts

(Thakurgaon, Nilphamari, Lalmonirhat, Rangpur, Kurigram, Gaibandha, Joypurhat, Sherpur, Jamalpur, Sirajganj, Natore, Pabna, Rajshahi, Jhenaidaha, Satkhira, Barisal, Gopalganj, Chandpur, Noakhali, Dhaka, Narsingdi, Manikganj, Gazipur, Brahmanbaria, Habiganj, Sylhet and Chittagong); medium (100 to 200 thousand MT) in 17 districts (Panchagarh, Nawabganj, Moulvibazar, Narayanganj, Kushtia, Chuadanga, Faridpur, Magura, Narail, Madaripur, Shariatpur, Khulna, Bagerhat, Bhola, Feni, Lakshmipur and Cox's Bazar); low (50 to 100 thousand MT) in four districts (Meherpur, Rajbari, Pirojpur and Munshiganj); and negligible (up to 50 thousand MT) in another six districts (Barguna, Khagrachhari, Bandarban, Rangamati, Jhalokathi and Patuakhali) (Figure 6).

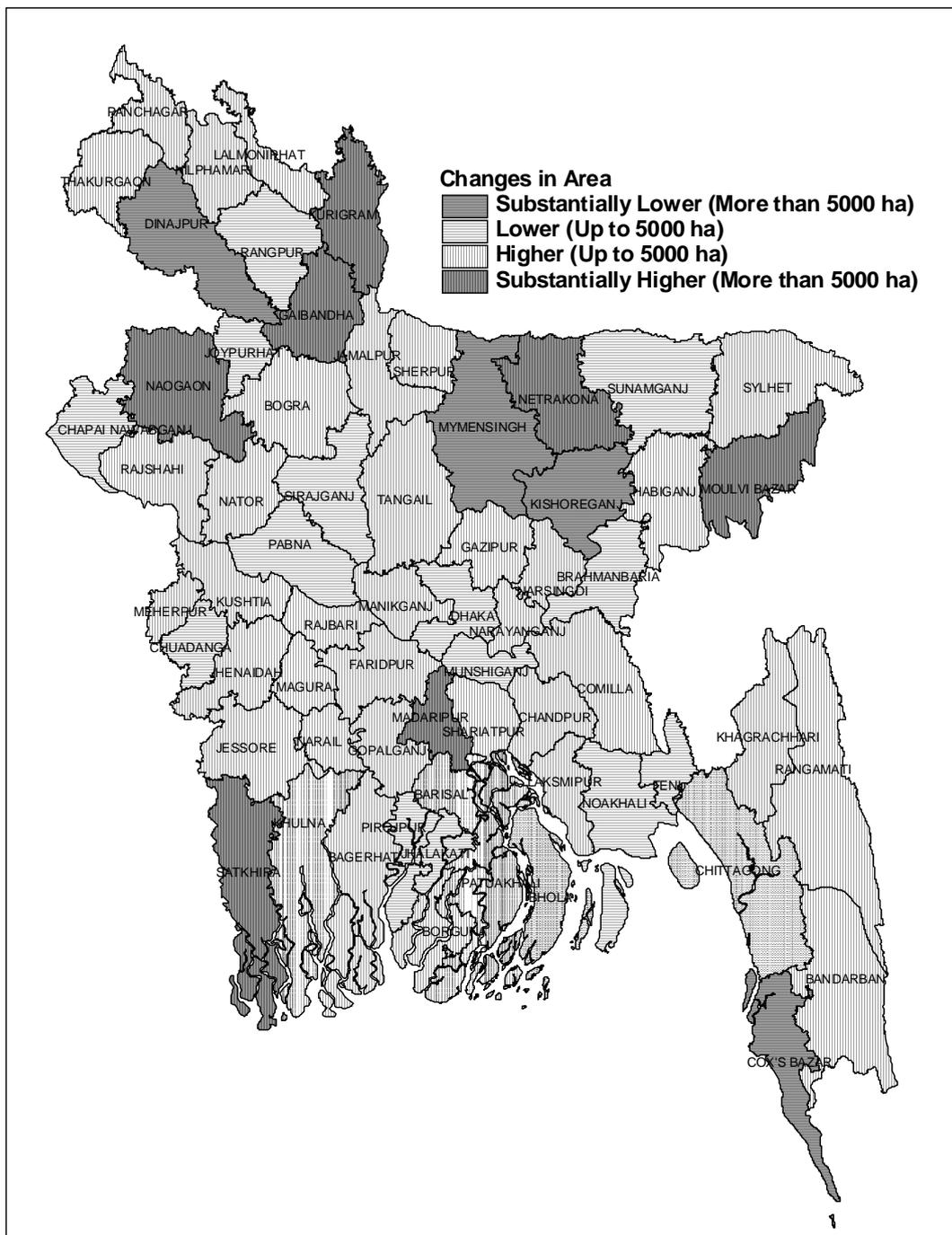
Compared to FY2007-08, targeted Boro production in FY2008-09 is substantially higher (more than 25,000 MT) in 11 districts (Kurigram, Mymensingh, Netrokona, Sunamganj, Sylhet, Moulvibazar, Jhenaidaha, Jessore, Magura, Satkhira and Bagerhat); higher (0 to 25,000 MT) in 26 districts (Comilla, Habiganj, Nilphamari, Lalmonirhat, Sherpur, Gaibandha, Madaripur, Chittagong, Pirojpur, Jhalokathi, Bhola, Barisal, Chandpur, Narsingdi, Gazipur, Rangpur, Panchagarh, Kushtia, Khagrachhari, Khulna, Lakshmipur, Shariatpur, Barguna, Bandarban, Rangamati and Patuakhali); lower (0 to -25,000 MT) in 16 districts (Joypurhat, Nawabganj, Jamalpur, Bogra, Meherpur, Chuadanga, Rajbari, Faridpur, Narail, Munshiganj, Manikganj, Brahmanbaria, Narayanganj, Feni, Noakhali and Cox's Bazar); and substantially lower (up to -25,000 MT) in 11 districts (Thakurgaon, Sirajganj, Pabna, Tangail, Natore, Naogaon, Dinajpur, Rajshahi, Dhaka, Gopalganj and Kishoreganj) (Figure 7).

Figure 4: Targeted Area under Boro Rice Cultivation in Different Districts: FY2008-09



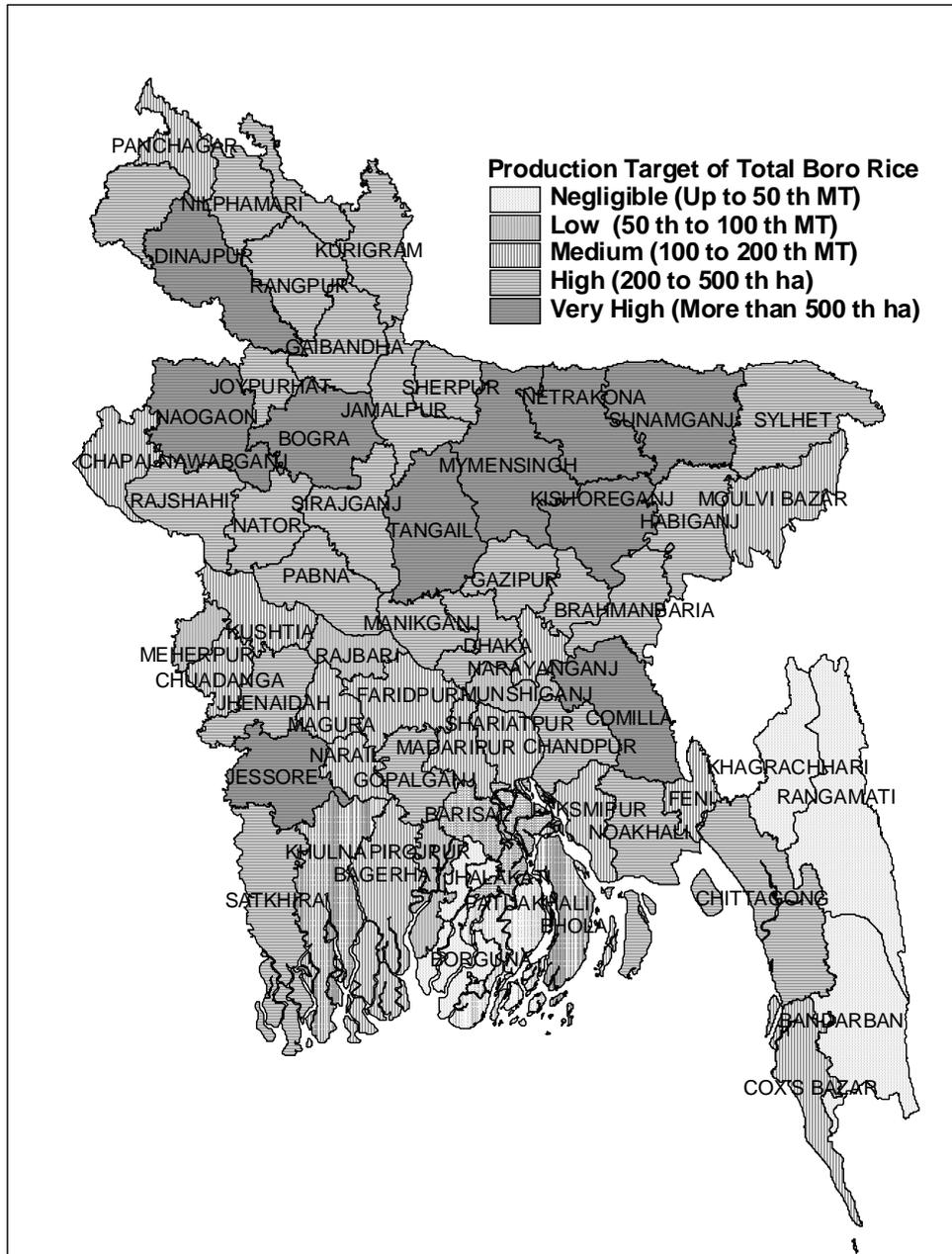
Source: Prepared by CPD, based on the data from DAE.

**Figure 5: Changes in Target Area in FY2008-09 Compared to Achieved Area in FY2007-08**



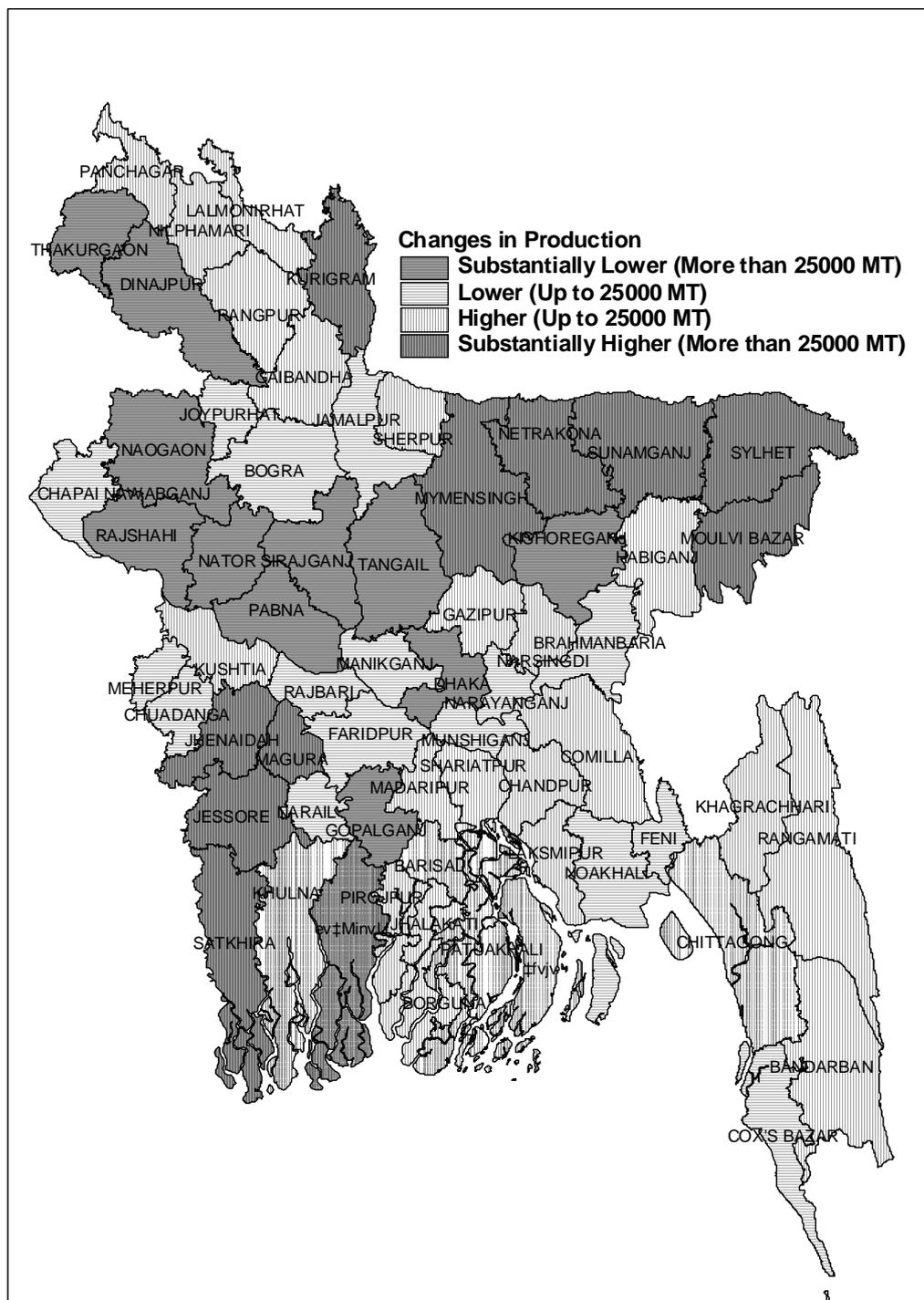
Source: Prepared by CPD, based on the data from DAE and BBS.

Figure 6: Targeted Boro Rice Production: FY2008-09



Source: Prepared by CPD, based on the data from DAE.

**Figure 7: Changes in Production Target in FY2008-09 Compared to Achieved Production in FY2007-08**



Source: Prepared by CPD, based on the data from DAE and BBS.

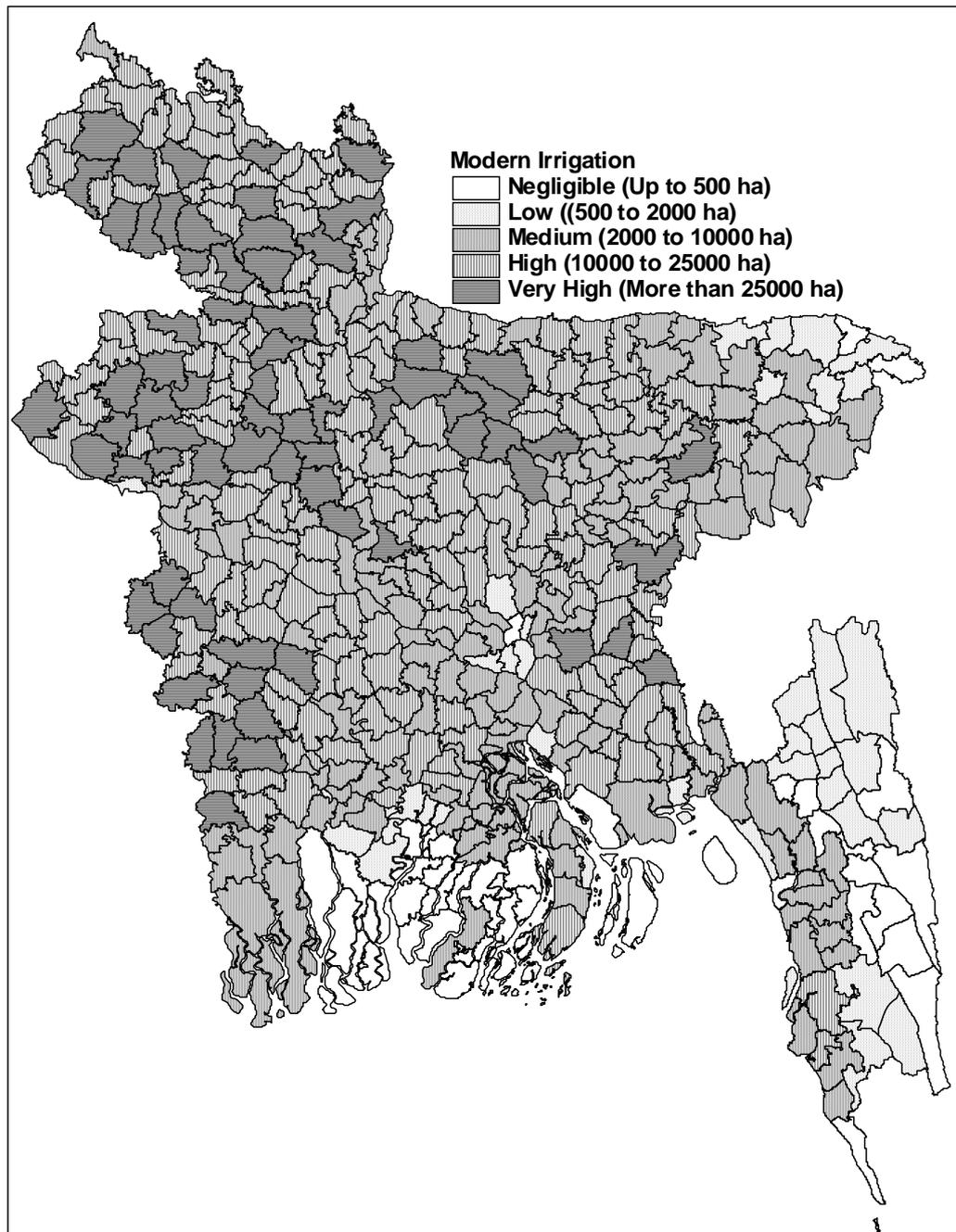
In 44 districts, targeted Boro rice area in FY2008-09 is more than actual Boro area in FY2007-08. On the other hand, targeted Boro areas in 20 districts are lower than actual area in previous year (Table 2).

**Table 2: District-wise Targeted Boro Rice Area (ha) in FY2008-09 as Percentage of Boro Rice Area in FY2007-08**

Name of the Districts	Total Target Area in FY2008-09	Achieved Area in FY2007-08	Target Area as % of Achieved Area	Name of the Districts	Total Target Area in FY2008-09	Achieved Area in FY2007-08	Target Area as % of Achieved Area
Bagerhat	37601	35559	105.74	Madaripur	46690	38489	121.31
Bandarban	5328	4107	129.72	Magura	40800	36118	112.96
Barguna	567	330	171.92	Manikganj	54627	52416	104.22
Barisal	63750	61976	102.86	Meherpur	25000	24724	101.12
Bhola	48540	49049	98.96	Moulvibazar	48900	39750	123.02
Bogra	190650	189869	100.41	Munshiganj	23316	25031	93.15
Brahmanbaria	104290	105208	99.13	Mymensingh	232500	240444	96.70
Chandpur	69040	68160	101.29	Narail	34275	33386	102.66
Chittagong	73010	76545	95.38	Narayanganj	33951	33600	101.04
Chuadanga	35230	35818	98.36	Narsingdi	57940	53606	108.09
Comilla	162280	160344	101.21	Natore	68800	66555	103.37
Cox's Bazar	45469	51900	87.61	Netrokona	167620	162389	103.22
Dhaka	52735	52764	99.95	Nilphamari	79163	74483	106.28
Dinajpur	161622	168882	95.70	Naogaon	190635	184920	103.09
Faridpur	36975	36166	102.24	Noakhali	53205	54486	97.65
Feni	31680	34564	91.66	Nawabganj	50940	51499	98.91
Gaibandha	112645	105390	106.88	Pabna	68700	69740	98.51
Gazipur	60555	58630	103.28	Panchagarh	43380	39715	109.23
Gopalganj	75075	74430	100.87	Patuakhali	5155	3407	151.29
Hobiganj	105836	102323	103.43	Pirojpur	16735	17035	98.24
Jamalpur	113130	112371	100.68	Rajbari	20900	20740	100.77
Jessore	153185	151378	101.19	Rajshahi	80500	78451	102.61
Jhalokati	8416	8634	97.48	Rangamati	7150	6635	107.77
Jhenaidaha	89514	86563	103.41	Rangpur	120640	121134	99.59
Joypurhat	67304	68662	98.02	Satkhira	71140	64042	111.08
Khagrachhari	10905	9370	116.38	Shariatpur	36935	32848	112.44
Khulna	43755	38782	112.82	Sherpur	79550	77929	102.08
Kishoreganj	149215	161758	92.25	Sirajganj	128180	130416	98.29
Kurigram	96420	87607	110.06	Sunamganj	181550	184066	98.63
Kushtia	34200	32779	104.34	Sylhet	66084	64020	103.22
Lakshmipur	27205	26079	104.32	Tangail	164197	162369	101.13
Lalmonirhat	52515	50815	103.34	Thakurgaon	57200	56376	101.46
				BANGLADESH	4675000	4607630.1	101.46

Source: DAE and BBS.

**Figure 8: Area under Modern Irrigation in the Rabi Season, by Upazila: FY2007-08**



**Source:** Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

### 3. INPUT DELIVERY STRATEGY

Achieving the targets in production requires smooth delivery of inputs such as seed, fertiliser, irrigation, pesticides, and agricultural credit to purchase the inputs. A brief review of the input requirement and supply situation is reported below.

#### 3.1 Seed

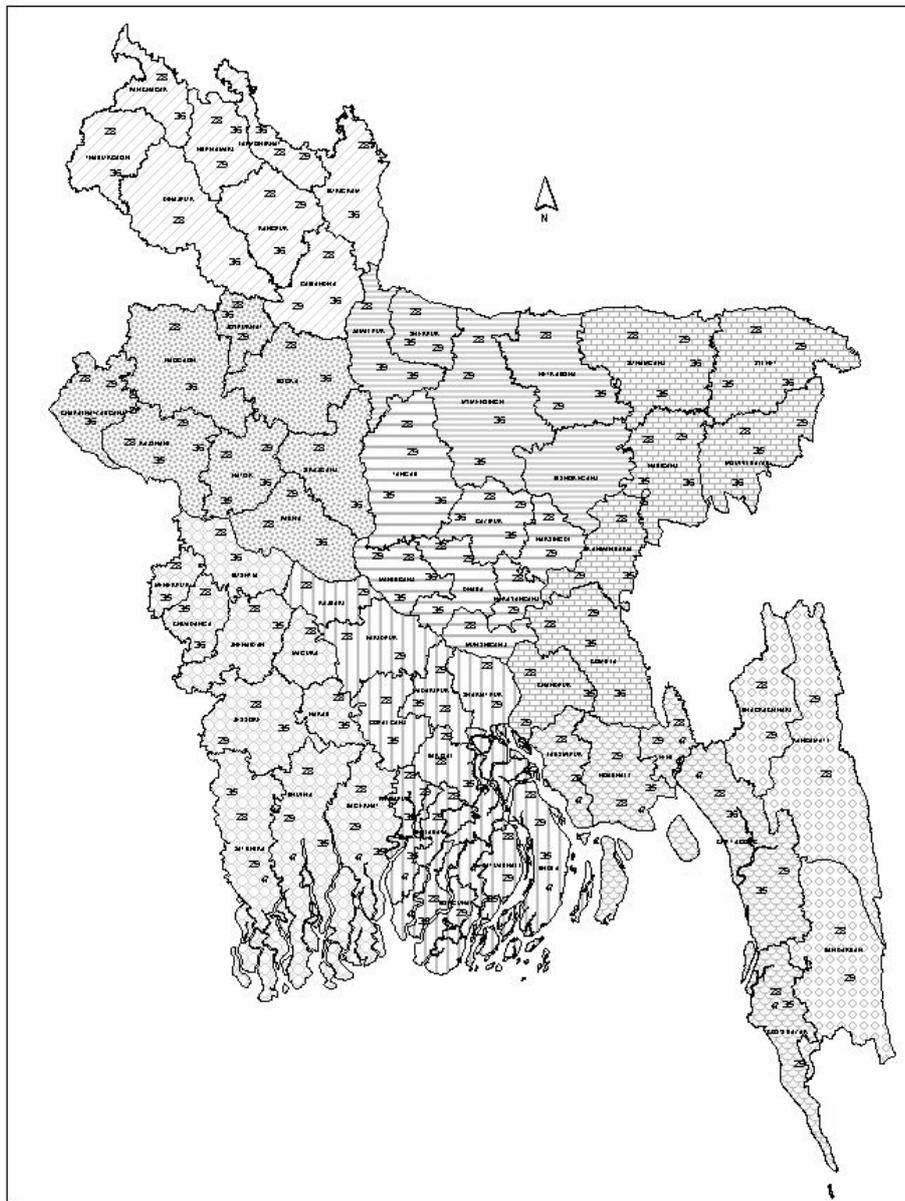
Supply of quality seed is very important to ensure rice production. Hossain *et al.* (2002) have shown that Bangladesh can increase its rice production to the tune of 20 lakh tonnes alone by ensuring supply of quality seeds of the same varieties to the farmers. Several modern rice varieties are available for cultivation in the Boro season. Farmers can grow BRRI Dhan 28, BRRI Dhan 29, BRRI Dhan 25, BRRI Dhan 36 and BRRI Dhan 47 in the Boro season. BRRI Dhan 47 has been developed for cultivation in the salinity affected southern-coastal region. A list of the districts, where these varieties are suitable for cultivation is given in Table 3 and Figure 9. Among the HYVs, BRRI Dhan 28 and BRRI Dhan 29 are the most popular. These two varieties cover approximately 60 per cent of the area under HYV.

**Table 3: HYVs Suitable for Cultivation in the Boro Season**

Boro Variety	Districts
BRRI Dhan 28	Bagerhat, Bandarban, Barguna, Barisal, Bhola, Bogra, Brahmanbaria, Chandpur, Chittagong, Chuadanga, Comilla, Cox's Bazar, Dhaka, Dinajpur, Faridpur, Feni, Gaibandha, Gazipur, Gopalganj, Habiganj, Jamalpur, Jessore, Jhalakathi, Jhenidaha, Joypurhat, Khagrachhari, Khulna, Kishoreganj, Kurigram, Kushtia, Lakshmipur, Lalmonirhat, Madaripur, Magura, Manikganj, Meherpur, Moulvibazar, Munshiganj, Mymensingh, Narail, Narayanganj, Narsingdi, Natore, Nawabganj, Netrokona, Nilphamari, Naogaon, Noakhali, Pabna, Panchagarh, Patuakhali, Pirojpur, Rajbari, Rajshahi, Rangamati, Rangpur, Satkhira, Shariatpur, Sherpur, Sirajganj, Sylhet, Tangail, Thakurgaon.
BRRI Dhan 29	Bagerhat, Bandarban, Barguna, Barisal, Bhola, Brahmanbaria, Chandpur, Chittagong, Comilla, Cox's Bazar, Dhaka, Faridpur, Feni, Gaibandha, Gazipur, Habiganj, Jamalpur, Jessore, Jhalakathi, Joypurhat, Khagrachhari, Khulna, Kishoreganj, Lakshmipur, Lalmonirhat, Madaripur, Manikganj, Moulvibazar, Mymensingh, Narayanganj, Narsingdi, Natore, Nawabganj, Netrokona, Nilphamari, Noakhali, Pabna, Patuakhali, Pirojpur, Rajbari, Rajshahi, Rangamati, Rangpur, Satkhira, Shariatpur, Sherpur, Sirajganj, Sylhet, Tangail.
BRRI Dhan 35	Bagerhat, Barguna, Barisal, Bhola, Brahmanbaria, Chandpur, Chittagong, Chuadanga, Comilla, Cox's Bazar, Dhaka, Gazipur, Gopalganj, Habiganj, Jamalpur, Jessore, Jhalakathi, Jhenidaha, Khulna, Kishoreganj, Madaripur, Manikganj, Meherpur, Moulvibazar, Mymensingh, Narail, Natore, Netrokona, Noakhali, Patuakhali, Pirojpur, Rajshahi, Satkhira, Sherpur, Sirajganj, Sylhet, Tangail.
BRRI Dhan 36	Bogra, Chittagong, Chuadanga, Comilla, Dinajpur, Gaibandha, Gazipur, Habiganj, Joypurhat, Kurigram, Kushtia, Lalmonirhat, Manikganj, Moulvibazar, Mymensingh, Natore, Nawabganj, Nilphamari, Naogaon, Pabna, Panchagarh, Rajshahi, Rangpur, Sirajganj, Sylhet, Tangail, Thakurgaon.
BRRI Dhan 47	Bagerhat, Barguna, Barisal, Bhola, Chittagong, Cox's Bazar, Jhalakathi, Khulna, Lakshmipur, Noakhali, Patuakhali, Pirojpur, Satkhira.

Source: Compiled from BRRI (2007) and AIS (2008).

**Figure 9: HYVs Suitable for Cultivation in Boro Season**



**Source:** Compiled from BIRRI (2007) and AIS (2008).

Farmers have registered about 40 hybrids with the National Seed Board for cultivation. However, only few hybrids are popular. Popular rice hybrids cultivated in Bangladesh include Heera, Aloron, Jagoron, Shakti, Sonar Bangla, Aftab, ACI Hybrid, Lal Teer, etc. A list of all hybrids approved for cultivation in Bangladesh in the Boro season is given in Table 4.

**Table 4: Rice Hybrids Registered for Cultivation by National Seed Board: 1998 – 2006-07**

Name of the Hybrid	Name of the Company	Year of Release	Released for Cultivation in the Following Area
AALOK-6201	ACI Ltd.	1998	All areas
Loknath-505	Macdonald	1998	All areas
Amarsri-1	Ganges D. Co.	1998	All areas
CNSGC-6	Mollika Seed Co.	1998	All areas
IAHS-100001	Aftab Multipurpose Farm Ltd.	2000	All areas
IR69690	BRRI	2001	Jessore, Barisal
ZF-31	Aftab Multipurpose Farm Ltd.	2001	Dhaka, Rajshahi, Rangpur
ZF-37	Aftab Multipurpose Farm Ltd.	2001	Mymensingh, Jessore
Hybrid Rice No. 99-5	Supreme Seed Company Ltd.	2001, 2003	Mymensingh, Jessore, Comilla, Rajshahi, Rangpur
RICER-101	Chense Crop Science Bangladesh Ltd.	2005	All areas
GB-4 (Jagoron)	BRAC	2003	All areas
LP-50	Aftab Multipurpose Farm Ltd.	2002, 2004, 2005	Mymensingh, Jessore, Comilla, Rajshahi, Rangpur
HS-273	Supreme Seed Company Ltd.	2003, 2005	Comilla, Rajshahi, Dhaka, Mymensingh
AALOK 93024	ACI Ltd.	2003	Comilla, Rajshahi
HB-8	BRAC	2005	All areas
TINPATA-40	Tinpata Quality Seed Bangladesh Ltd.	2005, 2006	Dhaka, Mymensingh, Comilla, Jessore, Rajshahi
TAJ-1 (GRA-2)	National Seed Company Ltd.	2006	Mymensingh, Comilla, Rangpur
TAJ-2 (GRA-3)	National Seed Company Ltd.	2006	Mymensingh, Comilla
HTM-4 (Sonar Bangla-6)	Mollika Seed Co.	2006	Dhaka, Mymensingh, Comilla, Jessore
HTM-606	North South Seed Ltd.	2006	Mymensingh, Comilla
HTM-707	North South Seed Ltd.	2006	Mymensingh, Comilla
HTM-202	East West Seed Bangladesh Ltd.	2006	Mymensingh, Comilla
HTM-303	East West Seed Bangladesh Ltd.	2006	Dhaka, Mymensingh, Comilla, Rajshahi
LP-108	Sea Trade Fertiliser Ltd.	2006	Mymensingh, Comilla, Rajshahi
LU You-2 (Surma-1)	Sinzenta Bangladesh Ltd.	2006	Dhaka, Mymensingh, Comilla
LU You-3 (Surma-2)	Sinzenta Bangladesh Ltd.	2006	Mymensingh, Comilla, Jessore, Rajshahi
TINPATA-10	Tinpata Quality Seed Bangladesh Ltd.	2006	Mymensingh, Comilla, Rajshahi
TINPATA SUPER	Tinpata Quality Seed Bangladesh Ltd.	2006	Mymensingh, Comilla
LP-70	Aftab Multipurpose Farm Ltd.	2006	Mymensingh, Comilla, Jessore
ACI-1	ACI Ltd.	2006	Mymensingh, Comilla, Jessore
ACI-2	ACI Ltd.	2006	Mymensingh, Comilla, Jessore, Rajshahi
BW001 (Jagoron-3)	BRAC	2006	Mymensingh, Comilla, Jessore
S-2B (Krishan-2)		2006	Mymensingh, Comilla, Rajshahi
HRM-01 (Agrani-7)		2006	Mymensingh, Comilla
HRM-02 (Sarothi-14)		2006	Mymensingh, Comilla

Name of the Hybrid	Name of the Company	Year of Release	Released for Cultivation in the Following Area
Rupasi Bangla-1		2006	Mymensingh, Comilla
HB-9 (Aloron-2)		2006	Mymensingh, Comilla, Rajshahi
Supreme Hybrid -5 (Hira-5)		2006	Mymensingh, Comilla
WBR-2 (Modhumati-2)		2006	Mymensingh, Comilla
WBR-5 (Modhumati-5)		2006	Mymensingh, Comilla, Jessore

Source: National Seed Board, Bangladesh.

According to an estimate of MoA (2008), total demand for rice seed in FY2008-09 is 107.5 thousand MT, which is 2.65 per cent higher than that of FY2007-08 (Table 5). Bangladesh Agricultural Development Corporation (BADC) is expected to supply one-third of total seed demand. About one-fifth of the demand for seed would be met up from farmers' own seeds. Private sector and non-government organisations (NGOs) are expected to supply 9.3 per cent of total seed demand. About 10.7 per cent of total seed demand would be met through import by private sector. Major seed importing companies of Bangladesh are BRAC, Supreme, ACI, Aftab, Mollika constituting about more than 90 per cent of total import in Bangladesh. Private sector companies will supply 2.6 per cent of total seed requirement from their own seed production.

**Table 5: Demand and Supply of Boro Seed in Bangladesh**

(in MT)

	FY2007-08 (Actual)				FY2008-09 (Target)			
	Local	HYV	Hybrid	Total	Local	HYV	Hybrid	Total
<b>Demand</b>	<b>3780</b>	<b>88450</b>	<b>12500</b>	<b>104730</b>	<b>3780</b>	<b>88725</b>	<b>15000</b>	<b>107505</b>
<b>Supply</b>								
BADC		32654 (36.92)		32654 (31.18)		36525 (41.17)		36525 (33.98)
DAE		22500 (25.44)		22500 (21.48)		22500 (25.36)		22500 (20.93)
Private and NGO		8000 (9.04)		8000 (7.64)		10000 (11.27)		10000 (9.30)
Private sector import			10500 (84.00)	10500 (10.03)			11500 (76.67)	11500 (10.70)
Private sector production			1200 (9.60)	1200 (1.15)			2800 (18.67)	2800 (2.60)
Unsold in the last year			800 (6.40)	800 (0.76)			700 (4.67)	700 (0.65)
Farmers	3780 (100.00)	25296 (28.60)		29076 (27.76)	3780 (100.00)	19700 (22.20)		23480 (21.84)
<b>Total</b>	<b>3780 (100.00)</b>	<b>88450 (100.00)</b>	<b>12500 (100.00)</b>	<b>104730 (100.00)</b>	<b>3780 (100.00)</b>	<b>88725 (100.00)</b>	<b>15000 (100.00)</b>	<b>107505 (100.00)</b>

Source: Seed Wing, MoA (2008).

Note: Figures in parentheses refer to percentage of total.

### 3.2 Fertiliser

Supply of adequate level of fertiliser is essential to ensure production. Trends in fertiliser supply during the last five years are reported in Table 6. Total supply of fertiliser in FY2007-08 was 37.80 lakh tonnes comprising 26.68 lakh tonnes of urea, 4.61 lakh tonnes of triple super phosphate (TSP), 2.50 lakh tonnes of diammonium phosphate (DAP) and 4.01 lakh tonnes of muriate of potash (MoP). The MoA has estimated total demand for fertiliser in FY2008-09 as 39.50 lakh tonnes comprising 28.50 lakh tonnes of urea, 5.0 lakh tonnes of

TSP, 2.0 lakh tonnes of DAP and 4.0 lakh tonnes of MoP. Estimated fertiliser demand in FY2008-09, compared to the last year is 6.82 per cent higher for urea and 8.51 per cent higher for TSP (Table 7), but for MoP it came to slightly lower than previous year. In case of DAP and single super phosphate (SSP), estimated demand is more than 20 per cent and about 7.5 per cent lower than last year's actual supply. Considering higher targeted area for Boro rice and other crops, fertiliser requirement seems to be underestimated.

**Table 6: Supply of Fertiliser in Bangladesh**

Fertiliser	FY2004-05	FY2005-06	FY2006-2007	FY2007-08	(in lakh MT)
					FY2008-09 (Demand)
Urea	25.23	24.61	25.27	26.68	28.50
TSP	4.2	4.36	3.4	4.61	5.00
DAP	1.71	1.3	1.15	2.50	2.00
MoP	2.6	2.91	2.3	4.01	4.00
Total	33.74	33.18	32.12	37.80	39.50

Source: DAE, MoA.

**Table 7: Demand for Chemical Fertilisers in Bangladesh**

	Urea	TSP	MoP	DAP	SSP
Targeted demand for fertiliser (lakh ton) in FY2008-09	28.50	5.00	4.00	2.00	1.00
Actual distribution of fertiliser (lakh ton) in FY2007-08	26.68	4.61	4.01	2.50	1.08
Target of FY2008-09 as % of actual in FY2007-08	106.82	108.51	99.80	79.92	92.45

Source: DAE, MoA.

In this backdrop, it is pertinent to report here the level of recommended fertilisers for achieving different levels of yield goals in various crops (Table 8). Considering prices of agricultural commodities and need for increased production with a view to reduce market price, a pragmatic plan should aim for high yield goals. High yield goals may be attained in some fertile soils without applying the recommended dose. Factoring out for such exceptions, estimation for total fertiliser requirement in FY2008-09 is 35.00 lakh MT of urea, 5.90 lakh MT of TSP, 5.00 lakh MT of MoP and 3.20 lakh MT of DAP (Table 9). In other words, there is a gap of 6.50 lakh MT for urea, 0.90 lakh MT for TSP, 1.00 lakh MT for MoP and 1.20 lakh MT for DAP. This implies that an upward revision of the demand estimated by the concerned agencies of the government is urgently needed. In fact, underestimation of fertiliser requirement in earlier years by MoA was also pointed out by noted soil scientist *Dr Z Karim* and by the Centre for Policy Dialogue (CPD) in their reports (CPD 2008; Karim 2008). Karim (2008), after visiting farmers' field in many areas of the country, opined that supply of fertiliser was able to cater the need of medium yield goals in FY2007-08. The report added that for achieving high yield goals, there was a gap between fertiliser requirement and fertiliser demand (supply) estimates by MoA. According to Karim (2008), this gap in FY2007-08 was 7.0 lakh MT for urea, 1.2 lakh MT for TSP, 1.0 lakh MT for MoP and 0.7 lakh MT for DAP.

**Table 8: Fertiliser Recommendation Dose for High Yield Goal**

Crops	High Yield Goal (ton/ha)	Fertiliser Recommendation Dose (Kg/ ha)			
		Urea	TSP	MoP	Total
Aus	3.5 ± 0.35	130.2	30.0	30.0	190.2
Aman	5 ± 0.5	227.9	35.0	48.0	310.9
Boro	6.0 ± 0.6	342.9	90.0	76.0	508.9
Wheat	4.0	256.1	110.0	197.0	563.1
Maize	8.0	347.2	145.0	268.0	760.2
Potato	30.0	284.3	100.0	386.0	770.3
Onion	35.0	260.4	110.0	266.0	636.4
Lentil	1.0	123.7	32.5	36.0	192.2
Jute	3.0	212.7	100.0	400.0	712.7
Chili	1.5 ± 0.5	173.6	125.0	120.0	418.6

Source: Fertiliser Recommendation Guide 2005.

**Table 9: Fertiliser Demand to Attain High Yield Goal: FY2008-09**

(in lakh MT)

Fertiliser	MoA Estimated Demand in FY2008-09	Fertiliser Required to Attain High Yield Goal		Gaps in FY2008-09
		FY2008-09	FY2008-09 (Rabi Season)	
Urea	28.50	35.00	15.00	6.50
TSP	5.00	5.90	4.00	0.90
MoP	4.00	5.00	3.50	1.00
DAP	2.00	3.20	2.50	1.20
Total	39.50	49.40	25.00	9.60

Source: Authors' calculation.

### *Water Management and Crop Husbandry Practices*

Efficiency of water used for irrigation is low in Bangladesh. Scientists have already proved that adoption of alternate wet and dry (AWD) irrigation technology for Boro rice cultivation can save 25 per cent irrigation water, as well as save energy (electricity, diesel) without reducing the yield level. Therefore, special efforts should be made to promote AWD instead of current practice of constant irrigation with standing water in the field. This will reduce per unit production cost of rice. Introduction of System of Rice Intensification (SRI) has also the potential for reducing cost and increasing yield. Special efforts should be made to promote SRI technology.

### *Agricultural Research and Extension Service*

Adequate support for agricultural research and extension service would be required to achieve higher production. To this end, training and research supports for frontier rice science particularly for bio-technology and hybrid should get priority. Training for the extension workers, particularly for agricultural officers and assistant officers working at the upazila and block levels are essential. Use of information and communication technology (ICT) and electronic media for dissemination of agricultural technologies should be promoted.

### **3.3 Irrigation**

Irrigation is a major challenge for farmers growing crops in the dry season. Majority of the farmers purchase water from pump owners. Three modes of payment of water charge are

currently in place. These are crop sharing arrangement, fixed charge on per acre basis, and machine rental system where the farmers directly supply diesel. The fixed water charge has increased to Tk. 2,000 to Tk. 2,400 per bigha for Boro paddy, from Tk. 1,200 to Tk. 1,500 a few years ago. The water charge is paid in installments and must be paid fully by the time of flowering of the plant. In case of crop sharing arrangement, currently one-fourth of the produce is paid to the shallow tube-well owner, and the crop is shared in the field at the time of the harvest. Two types of engines – electricity-operated and diesel-driven – are used for irrigation in Bangladesh. About three-fourth of the total irrigated area is under diesel-driven engines, while rest of the area is under electricity-operated engines. Price of diesel in the current Boro season are higher than that of last year. It is a concern for both the pump owners and Boro farmers.

Given that more than 70 per cent of the total irrigation in Bangladesh depends on diesel-driven engines, adjustment of petroleum price has always been a contentious issue, particularly during the Boro season. In response to the declining international price of petroleum products (including diesel), the new government have reduced price of diesel by Tk. 2.00 per litre. It is pertinent to mention here that irrigation cost in Bangladesh is two to three times higher than in India, Thailand and Vietnam, because Bangladeshi farmers have to use diesel for irrigation, while farmers of other countries have the scope to irrigate through subsidised electricity and large-scale irrigation projects.

#### *Electricity for Irrigation*

Generally, farmers experience a shortfall in electricity supply in the Boro season. In FY2007-08, the government paid special attention to the electricity supply for irrigation pumps during the Boro season. As a result, the consumption of electricity by irrigation pumps during November-March of FY2007-08 (72.99 mkwh) was 24.6 per cent higher than the comparable months in FY2006-07. The government subsidy on account of electricity for irrigation was about Tk. 75 crore in FY2007-08. A similar support along with uninterrupted supply of electricity will be needed for another bumper Boro production. Government carried out some special measures to ensure the supply of required electricity for irrigation. It strictly enforced the rule of closing all shops and shopping malls (except pharmacies, food stores and restaurants) by 8:00 pm. Thus, it was able to divert the electricity for irrigation. An analysis of irrigated area data of FY2007-08 Rabi season revealed that total area under electricity-operated engines in Bangladesh was 14 lakh ha (i.e. 29 per cent of total irrigated area under modern method). There was differential distribution of irrigated area under electricity (Figures 10 to 13). In FY2007-08 Rabi season, area irrigated under electricity in the Dhaka district was 18,554 ha (50 per cent of the irrigated area of the district); Chittagong district 18,924 ha (45 per cent of the irrigated area of the district); Rajshahi district 79,387 ha (46 per cent of the irrigated area of the district); Comilla district 97,679 ha (59 per cent of the irrigated area of the district); and Narayanganj district 9,227 ha (71 per cent of the irrigated area of the district). Considering this reality, we think that the decision taken by the concerned authority in FY2007-08 as regards closure of shops after 8:00 pm may also be implemented this year. In such case, priority should be given to those districts where absolute area and relative share is high (Figures 10 and 11).

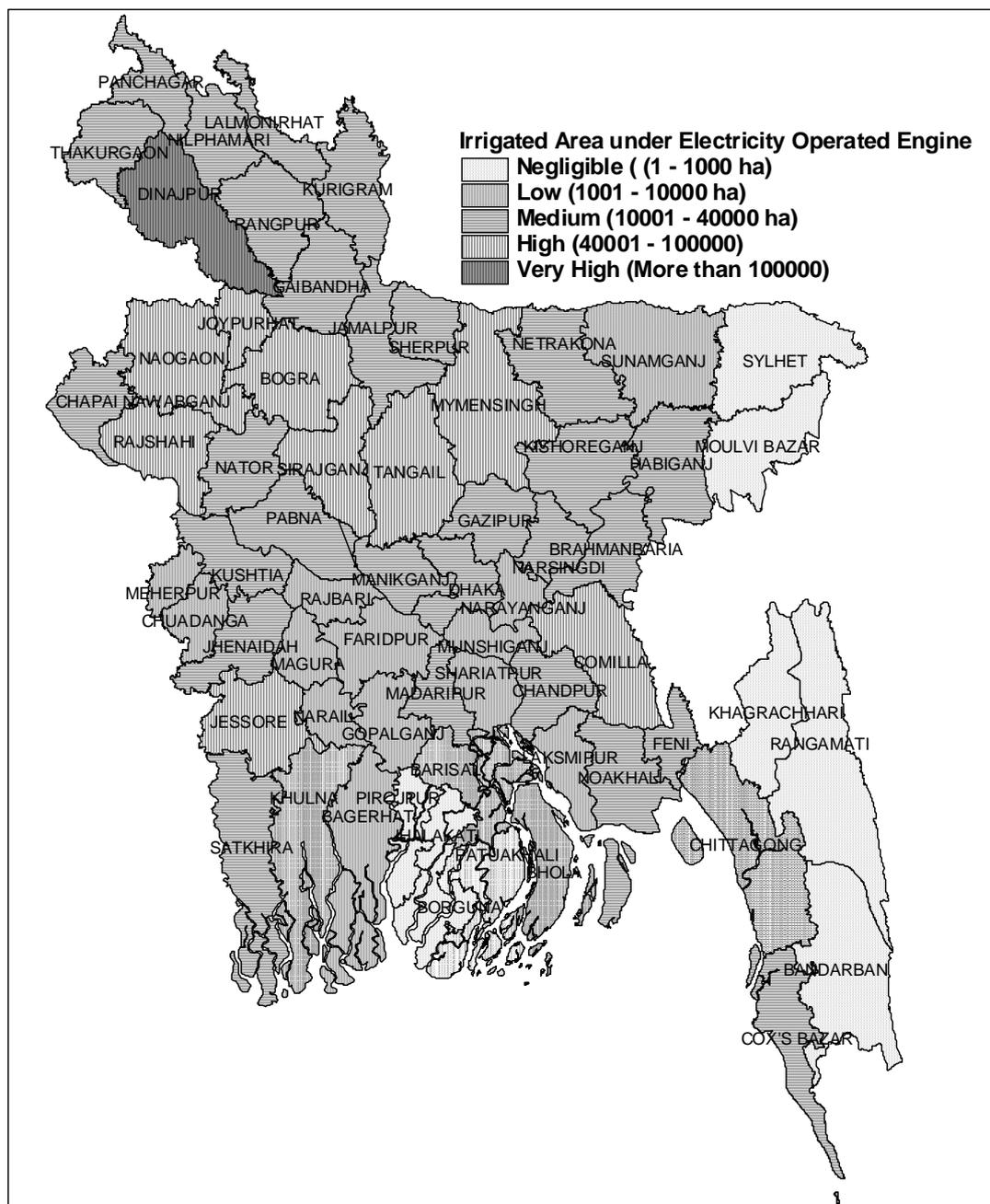
An analysis of the distribution of irrigated area under electricity in FY2007-08 revealed that in two districts (Jhalakathi and Patuakhali), there is no electricity-operated engines. Seven districts (Bandarban, Barguna, Khagrachhari, Moulvibazar, Pirojpur, Rangamati and Sylhet) have negligible (upto 1,000 ha) area under electricity-operated irrigation system; 16 districts

(Bagerhat, Barisal, Bhola, Chuadanga, Faridpur, Gopalganj, Khulna, Lakshmipur, Magura, Meherpur, Munshiganj, Narail, Narayanganj, Rajbari, Shariatpur and Sunamganj) have medium area (10,001 to 40,000 ha) under electricity-operated engines; and eight districts have high area (40,001 to 100,000 ha) under irrigation (Tangail, Sirajganj, Rajshahi, Naogaon, Mymensingh, Jessore, Comilla and Bogra). Only one district (Dinajpur) has very high area under electricity-operated engines (more than 100,000).

In case of per cent of irrigated area under electricity in FY2007-08, two districts (Jhalakathi and Patuakhali) do not have any electricity-operated engines. 10 districts (Bagerhat, Barguna, Khagrachhari, Khulna, Moulvibazar, Narail, Pirojpur, Rangamati, Sunamganj and Sylhet) have negligible (0-5 per cent area) area under electricity-operated engines; 19 districts (Bandarban, Barisal, Bhola, Chuadanga, Faridpur, Gaibandha, Gopalganj, Jhenidaha, Kishoreganj, Kurigram, Kushtia, Lalmonirhat, Magura, Meherpur, Natore, Netrokona, Panchagarh, Rajbari and Satkhira) have low (5.01-20 per cent area) area under electricity-operated engines. 20 districts (Bogra, Brahmanbaria, Chandpur, Gazipur, Habiganj, Jamalpur, Jessore, Lakshmipur, Madaripur, Manikganj, Munshiganj, Nilphamari, Noakhali, Pabna, Rangpur, Shariatpur, Sherpur, Sirajganj, Tangail and Thakurgaon) have medium (20.01-40 per cent area) under electricity-operated irrigation system; and 13 districts (Nawabganj, Chittagong, Comilla, Cox's Bazar, Dhaka, Dinajpur, Feni, Joypurhat, Mymensingh, Naogaon, Narayanganj, Narsingdi and Rajshahi) have high (more than 40 per cent) area under electricity-operated irrigation system.

Upazila level analysis of electricity-operated irrigation system is presented in Figures 12 and 13; and Annex Tables 2 and 3. MoA, particularly those who are responsible to monitor supply situation, may like to use these. Based on the level of usage of electricity-operated irrigation system and relative dependence on electricity for irrigation, all upazilas were grouped into six categories: (i) no electricity-operated irrigation; (ii) negligible; (iii) low; (iv) medium; (v) high; and (vi) very high. The Committee may look into the electricity supply situation in the upazilas under the category of medium, high and very high.

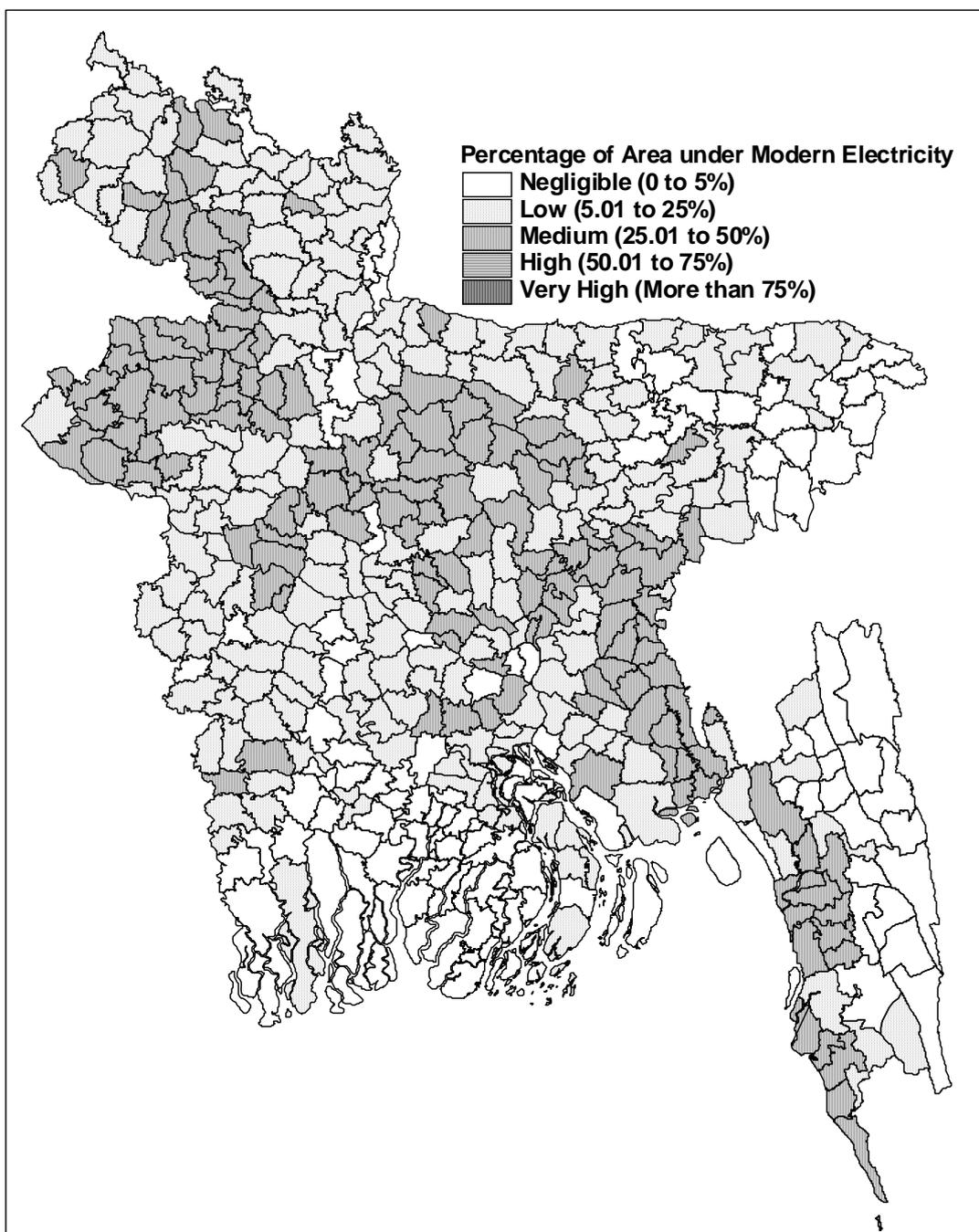
**Figure 10: Irrigated Area under Electricity-operated Engines in the Rabi Season, by Districts: FY2007-08**



Source: Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

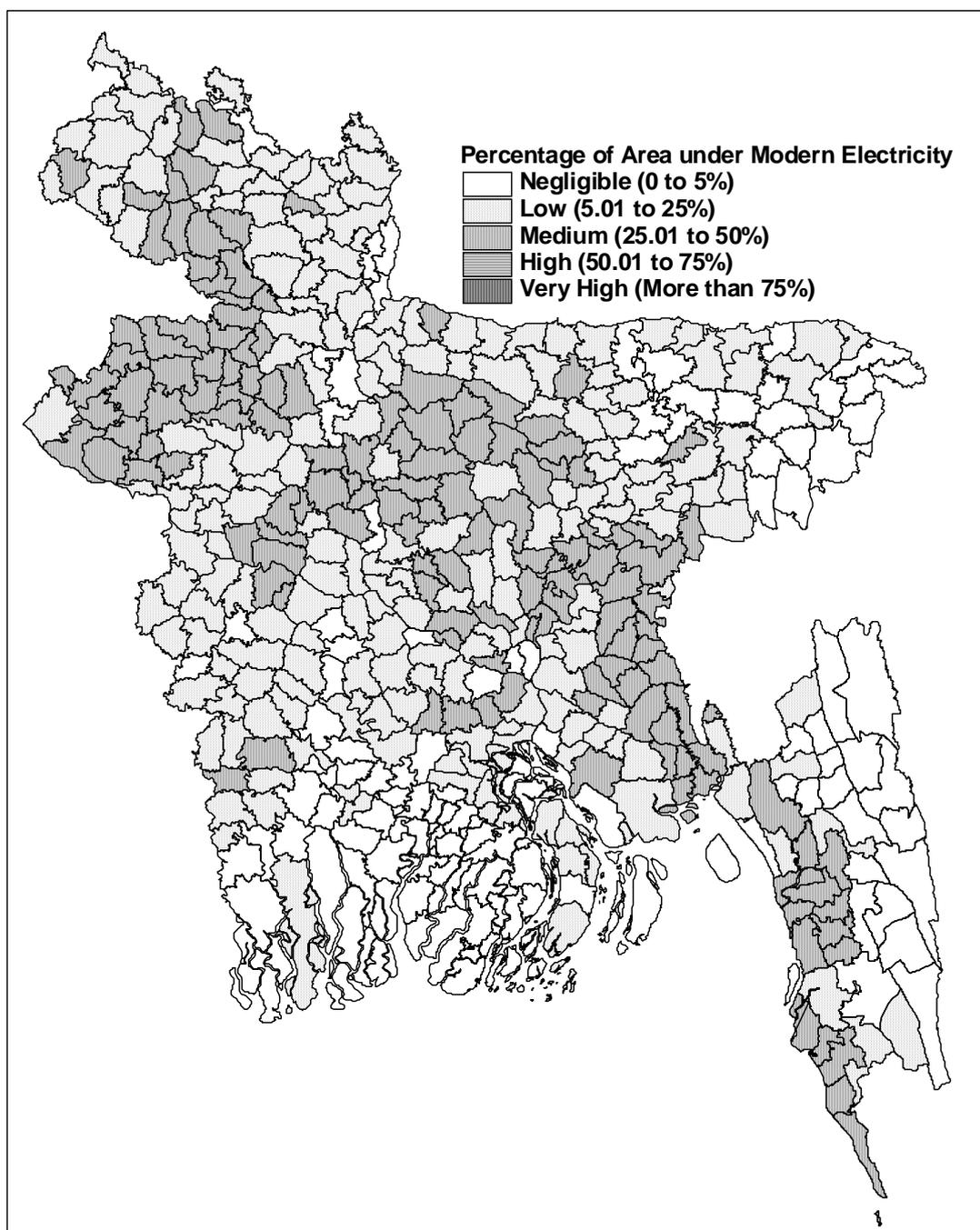


**Figure 12: Irrigated Area under Electricity-operated Engines in the Rabi Season, by Upazila: FY2007-08**



**Source:** Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

**Figure 13: Percentage of Irrigated Area under Electricity-operated Engines in the Rabi Season, by Upazila: FY2007-08**



**Source:** Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

*Diesel Subsidy for Irrigation*

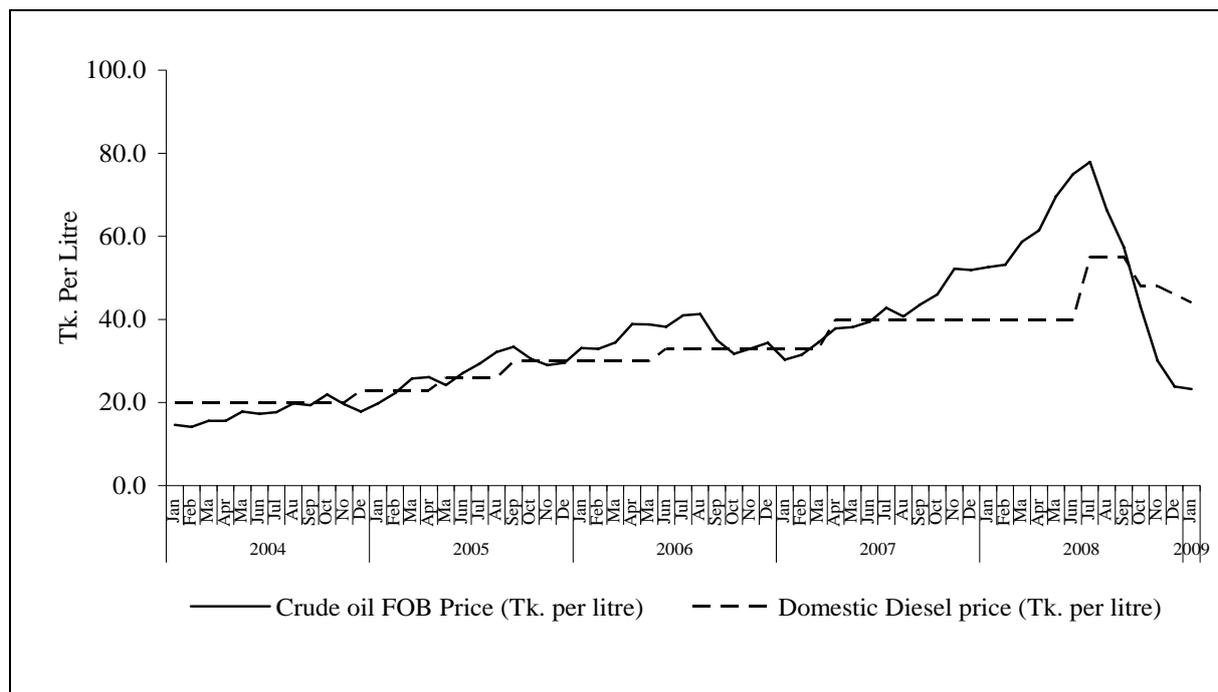
Price of diesel has been adjusted five times since April 2007 to January 2009 in order to cope up with international market. The highest change was brought out in July 2008, when diesel prices were increased Tk. 55 per litre to adjust with rising international price of USD 133 per barrel. In view of decline in international price of diesel, it was fixed at Tk. 48 in October 2008, and then to Tk. 46 per litre in December 2008. International market price began to fall from USD 133 in July 2008 to USD 73 in October, and USD 43 in December 2008. Finally, it has been fixed at Tk. 44 per litre in January 2009, in order to adjust with drastically low international price of USD 39 per barrel (Table 10 and Figure 14). However, it is pertinent to mention here that the price of diesel during the last Boro season was Tk. 40 per litre, and after reduction of diesel prices on 13 January 2009, it is currently sold at Tk. 44 per litre. In the Boro season, about 12 lakh MT of diesel are used for irrigation. Thus, farmers will have to bear about additional Tk. 480 crore in the current Boro season. This implies that the government will have to distribute Tk. 540 crore, allocated as diesel subsidies in the present budget through proper channels. In distributing diesel subsidy, widespread banking channels can be utilised, local government organisation can prepare the list of eligible farmers along with citizenship number provided in their national ID card. Districts and upzilas with high concentration of diesel-driven irrigation system should get priority attention for an effective implementation of the diesel subsidy programme. Concerned officials may take help of Figures 15 to 18 and Annex Tables 4 and 5.

**Table 10: Comparison of Administered Price of Diesel in Bangladesh and International Price of Crude Oil: May 2004 – January 2009**

Period	Domestic Diesel Price (Tk. per Litre)	Price in International Market (Tk. per Litre)	Price in International Market (USD per Barrel)
May 2004	20	18	35
December 2004	23	18	35
May 2005	26	24	45
September 2005	30	34	60
June 2006	33	38	64
April 2007	40	38	64
July 2008	55	78	133
October 2008	48	43	73
December 2008	46	24	40
January 2009	44	23	39

**Source:** Energy Information Administration (EIA), USA; Bangladesh Petroleum Corporation (BPC); and CPD-IRBD database.

**Figure 14: International vs Domestic Crude Oil/ Diesel Price**



**Source:** Energy Information Administration (EIA), USA; Bangladesh Petroleum Corporation (BPC); and CPD-IRBD database.

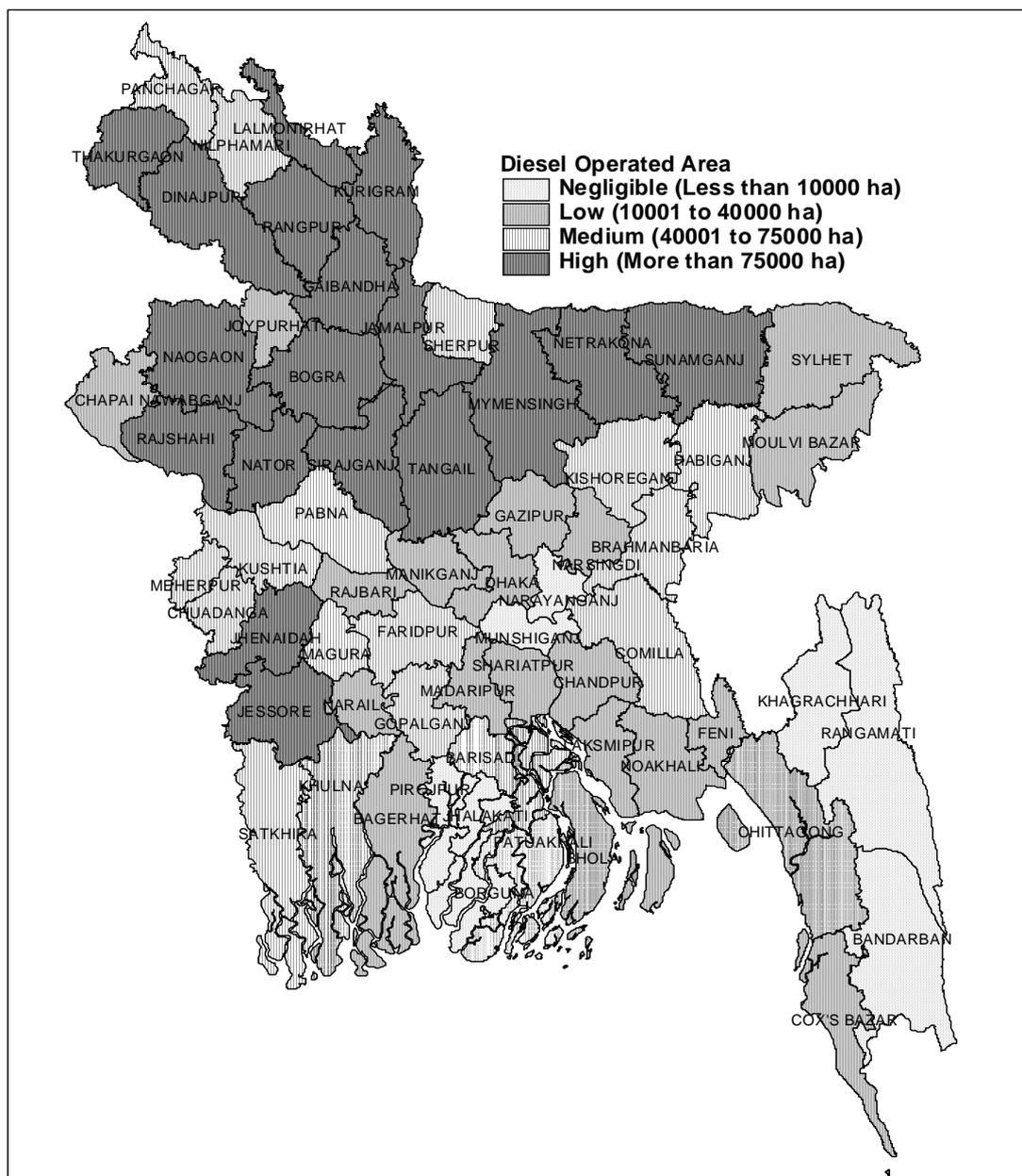
District and upazila level analysis of diesel-driven irrigation system (Figures 15 to 18; Annex Table 4 and 5) reveals that, based on the level of diesel-driven irrigation, all upazilas can be grouped into five categories: (i) negligible; (ii) low; (iii) medium; (iv) high; and (v) very high. The MoA may look into the diesel supply situation in the upazilas under medium, high and very high category.

An analysis of distribution of irrigated area under diesel-driven system in FY2007-08 revealed nine districts (Bandarban, Barguna, Jhalokathi, Khagrachhari, Munshiganj, Narayanganj, Patuakhali, Pirojpur and Rangamati) have negligible (less than 10,000 ha) area under diesel- driven irrigation system; 20 districts (Bagerhat, Bhola, Chandpur, Nawabganj, Chittagong, Cox's Bazar, Dhaka, Feni, Gazipur, Joypurhat, Lakshmipur, Moulvibazar, Madaripur, Manikganj, Narail, Narsingdi, Noakhali, Rajbari, Shariatpur and Sylhet) have low area (10,001-40,000 ha) under diesel- driven engines; 17 districts (Barisal, Brahmanbaria, Chuadanga, Comilla, Faridpur, Gopalganj, Habiganj, Khulna, Kishoreganj, Kushtia, Magura, Meherpur, Nilphamari, Pabna, Panchagarh, Satkhira and Sherpur) have high area (40,001 to 75,000 ha) under irrigation. The rest 18 districts (Bogra, Dinajpur, Gaibandha, Jamalpur, Jessore, Jhenidaha, Kurigram, Lalmonirhat, Mymensingh, Naogaon, Natore, Netrokona, Rajshahi, Rangpur, Sirajganj, Sunamganj, Tangail and Thakurgaon) have very high area (more than 75,000 ha) under diesel-irrigated system.

In case of percentage of irrigated area under diesel in FY2007-08, no districts under low (less than 20 per cent) category of diesel- driven engines. 13 districts (Nawabganj, Chittagong, Comilla, Cox's Bazar, Dhaka, Dinajpur, Feni, Joypurhat, Mymensingh, Naogaon, Narayanganj, Narsingdi and Rajshahi) have medium (20.01-60 per cent area) area under diesel-driven engines; 35 districts (Bhola, Bogra, Brahmanbaria, Chandpur, Faridpur, Gaibandha, Gazipur, Habiganj, Jamalpur, Jessore, Jhenidaha, Kishoreganj, Kurigram,

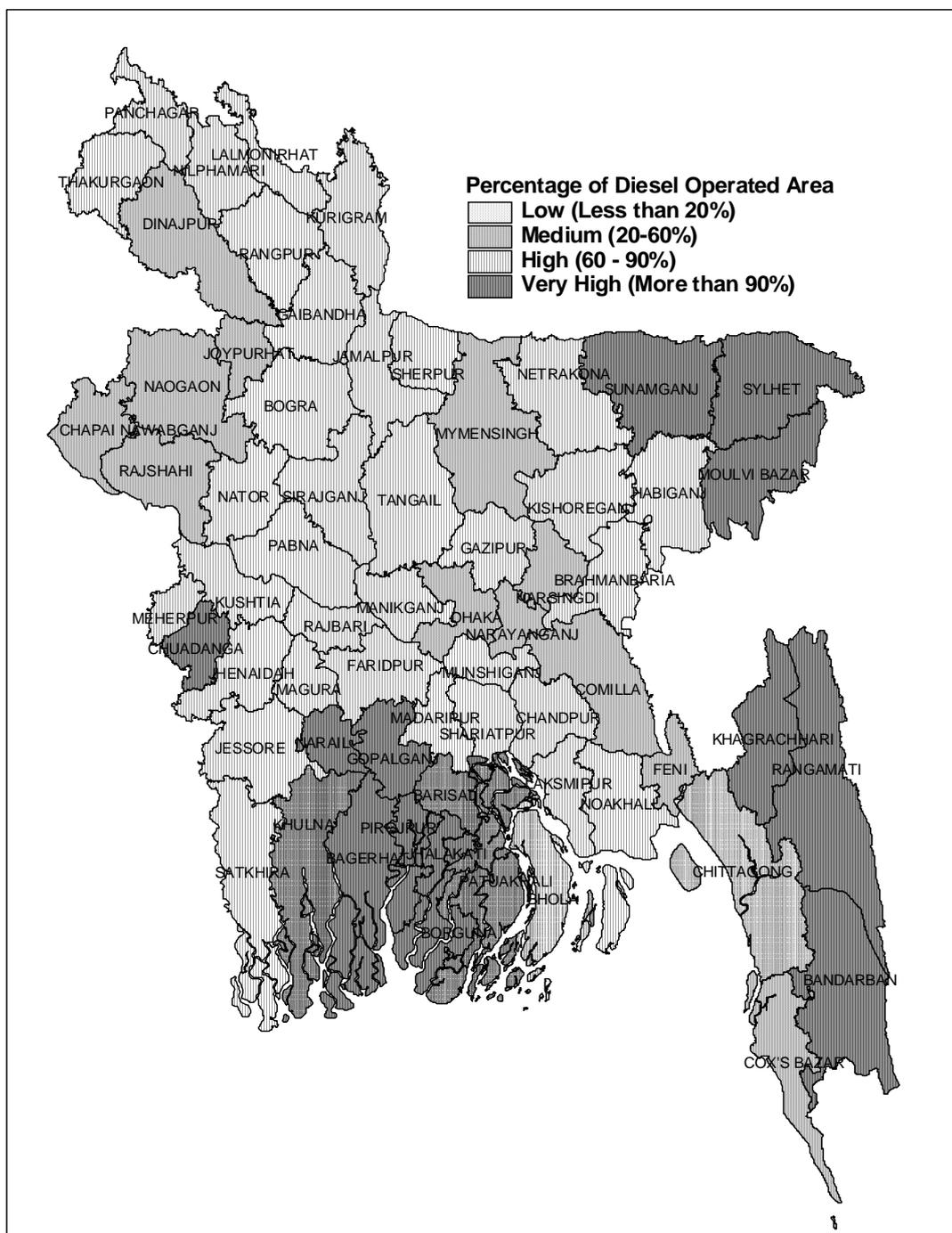
Kushtia, Lakshmipur, Lalmonirhat, Madaripur, Magura, Manikganj, Meherpur, Munshiganj, Natore, Netrokona, Nilphamari, Noakhali, Pabna, Panchagarh, Rajbari, Rangpur, Satkhira, Shariatpur, Sherpur, Sirajganj, Tangail and Thakurgaon) have high (60.01-90 per cent area) area under diesel-driven engines. 16 districts (Bagerhat, Bandarban, Barisal, Barguna, Chuadanga, Gopalganj, Jhalokathi, Khagrachhari, Khulna, Moulovibazar, Narail, Patuakhali, Pirojpur, Rangamati, Sunamganj and Sylhet) have high (more than 90 per cent) area under diesel-driven irrigation system.

**Figure 15: Irrigated Area under Diesel-driven Engines in the Rabi Season, by District: FY2007-08**



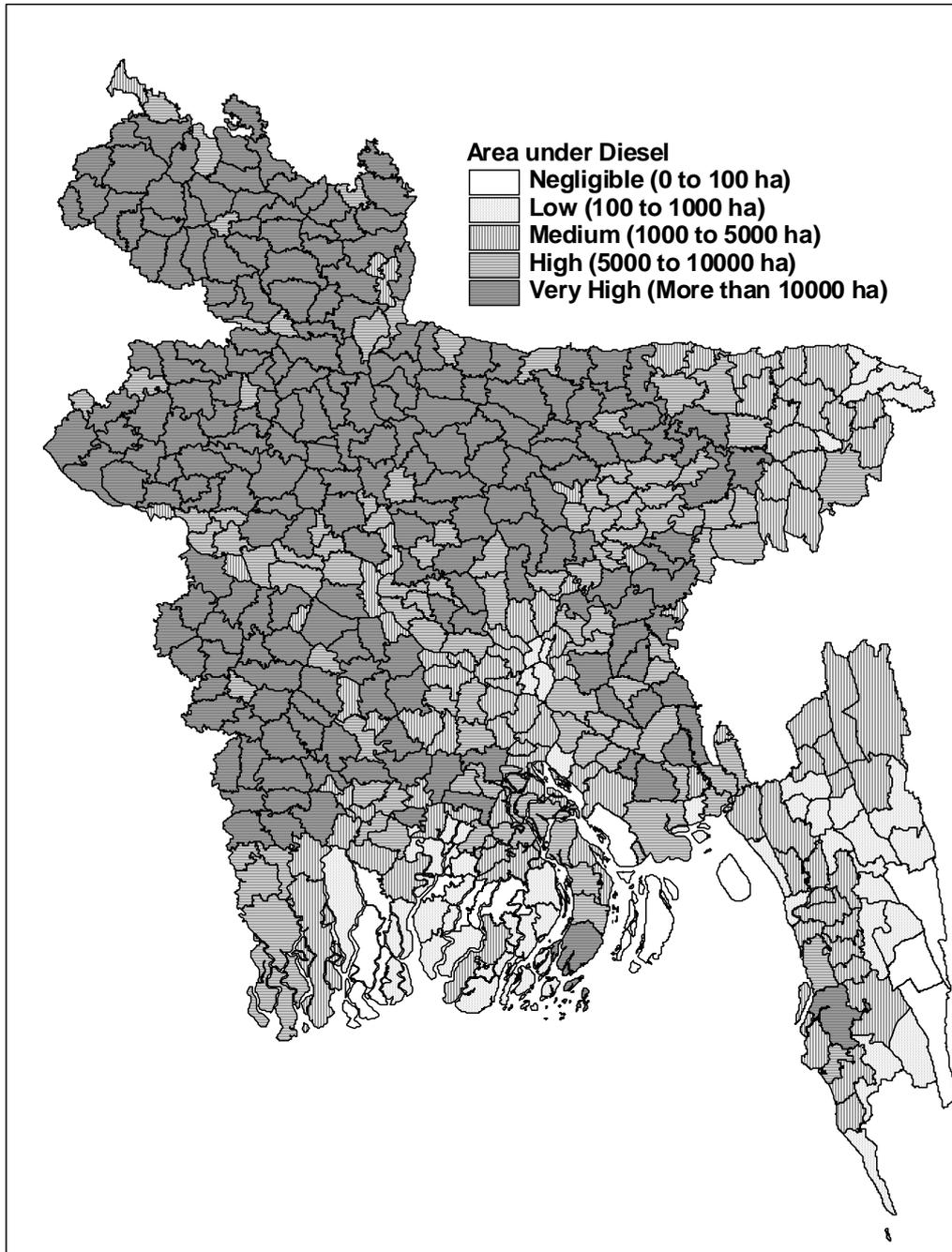
Source: Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

**Figure 16: Percentage of Irrigated Area under Diesel-driven Engines in the Rabi Season, by District: FY2007-08**



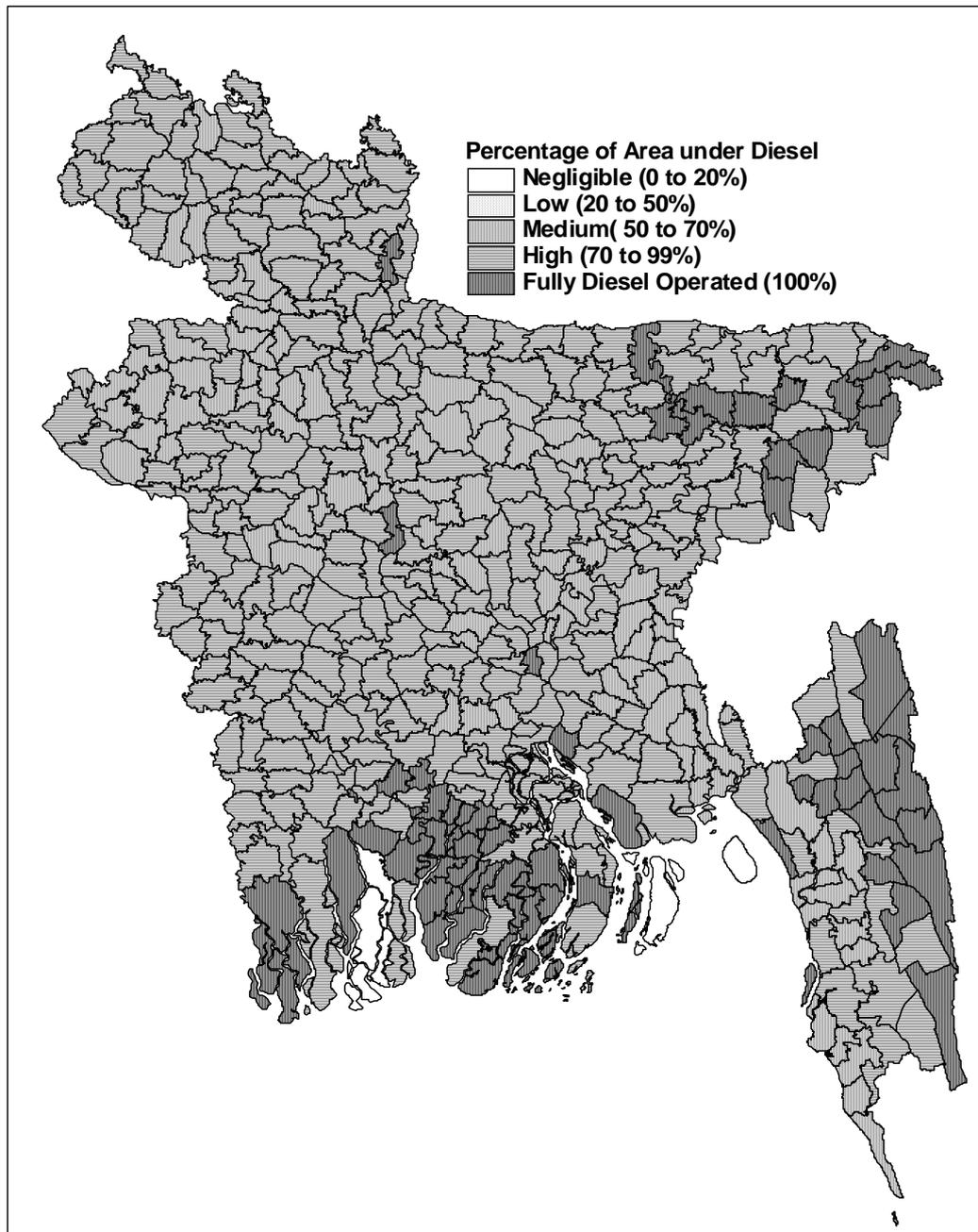
Source: Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

Figure 17: Irrigated Area under Diesel-driven Engines in the Rabi Season, by Upazila: FY2007-08



Source: Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

**Figure 18: Percent of Irrigated Area under Diesel-driven Engines in the Rabi Season, by Upazila: FY2007-08**



**Source:** Prepared by CPD, based on the data from Minor Irrigation Survey Report 2007-08.

### **3.4 Agricultural Credit**

Availability of working capital for agriculture is needed to ensure timely purchase of inputs. The government should have a coordinated initiative, particularly involving the private sector banks, along with the specialised government banks, to enhance inflow of credit to rural areas. The NGOs providing microcredit could play an effective role in this area. But the usual practice of recovering microcredit in weekly installments immediately after disbursement will not work for the supply of agricultural loans. There is a need for devising appropriate delivery and recovery mechanism for agricultural credit operations to be effective. Farmers would need Tk. 6,000 to 12,000 per acre as cash for cultivation of Boro depending on the mode of payment of the irrigation charge.

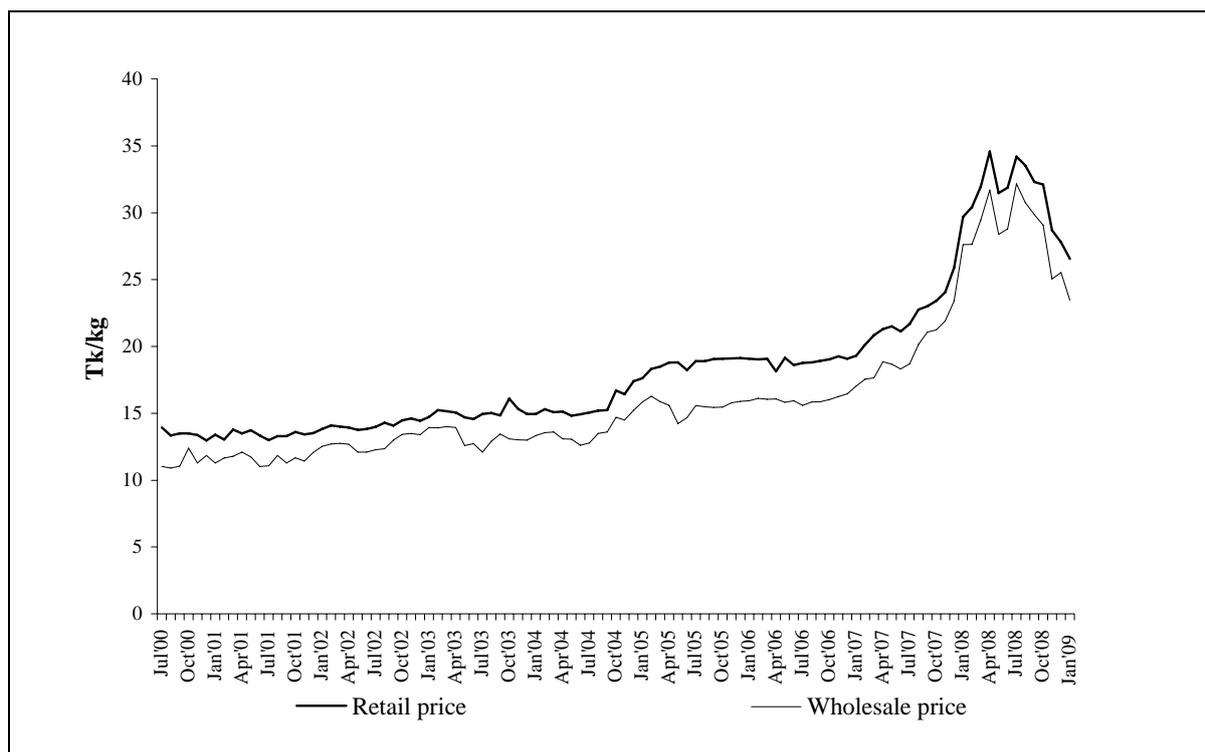
In the national budget for the FY2008-09, Tk. 9,379.23 crore for agricultural credit has been proposed, which is 9.31 per cent higher than that of actual distribution in the FY2007-08. During July-November period, total disbursement of agricultural credit stood at Tk. 3,378.56 crore, which was 27.22 per cent (Tk. 2,655.62 crore) higher than the disbursement during the comparable period of FY2007-08. Conversely, recovery remained 3.68 per cent lower than the corresponding figure of the previous fiscal year. Thus in net terms, credit flow to the agriculture sector registered a positive rise (Tk. 392.6 crore), recovering from a negative trend during the previous fiscal. The maximum rise took place in areas of crop and agricultural equipment.

## 4. PRICING OF INPUTS, OUTPUT AND SUBSIDY

### 4.1 Prices of Rice

An analysis of domestic prices (both for wholesale and retail) of coarse and medium rice (Figures 19 and 20) revealed that price of rice has increased exponentially during February 2007 to April 2008. On the other hand, rice prices increased at a high rate during February 2003 to January 2007. Prices started to decline since May 2008 after starting of Boro harvest. However, there were some fluctuations in prices. Finally, substantial decline in rice was observed in late December 2008 and early January 2009. Though there is an apparent correlation between retail and wholesale price, the response of the former is usually quicker to an increasing wholesale price, and conversely, slower to a decline in price. As a result, the consumers have to pay higher price immediately when there is a price rise in the wholesale market, but they do not get the benefit to the same extent when price declines. The new government will need to resolve this tension. The incentive for growers will need to be maintained, whilst the consumers will need to be given the benefit of lower prices at a time of declining purchasing power due to high inflation. To this end, input prices and the attendant subsidies are important.

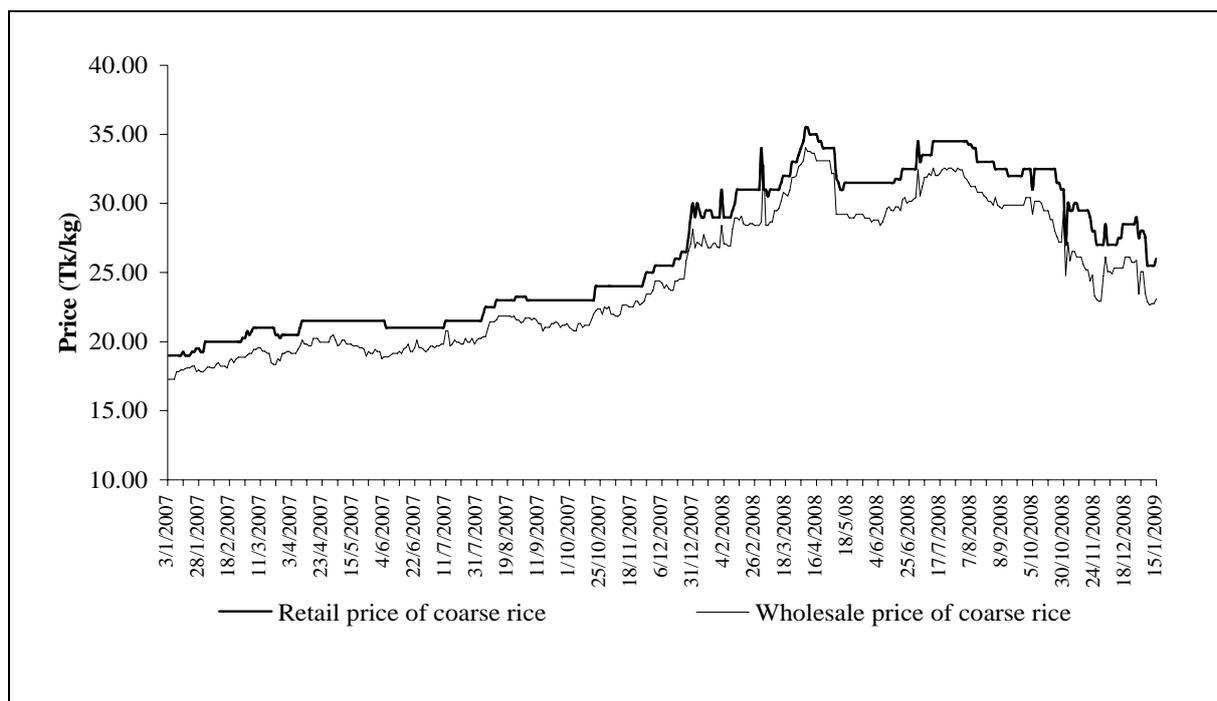
**Figure 19: Monthly Wholesale and Retail Price of Rice (Coarse): July 2000 to 15 January 2009**



**Source:** Department of Agricultural Marketing (DAM).

**Note:** Data for January 2009 indicates first 15 days' average.

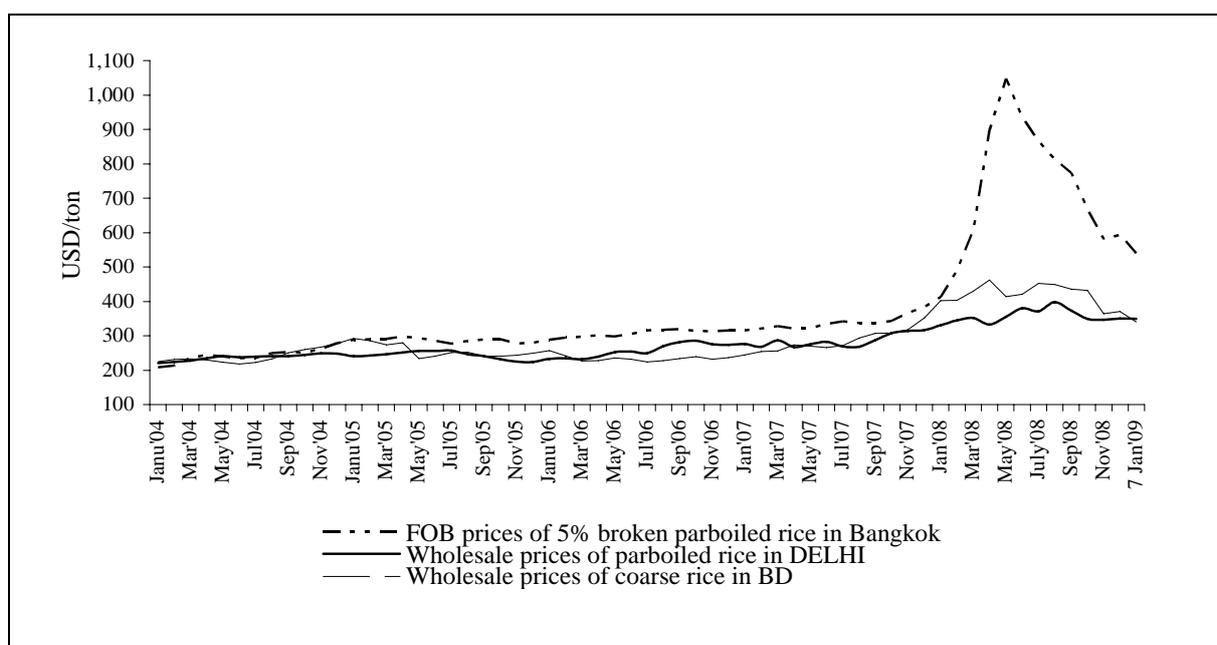
**Figure 20: Daily Retail and Wholesale Prices of the Coarse Rice (BR 8, BR 11 and Swarna): January 2007 – January 2008**



Source: Department of Agricultural Marketing (DAM).

A comparison of rice prices in Bangladesh, India and Thailand revealed that rice price in Bangladesh was lower than that of Thailand (Figure 21). On the other hand, rice price in Bangladesh was generally higher than in India with some exceptions.

**Figure 21: Comparison of Domestic Rice Prices among Bangladesh, Delhi and Bangkok: January 2004 to December 2008**



Source: Department of Agricultural Marketing (DAM), Bangladesh; Thai Rice Exporters Association, Thailand; and Ministry of Consumer Affairs, Food and Public Distribution, Government of India.

Trends in real wage for agricultural labourers are reported in Table 11, and it is evident that real wage declined with rise in rice price particularly in FY2007-08. On the other hand, it was steadily increasing in late 1990s and early 2000s.

**Table 11: Average Daily Rice Wage of Agricultural Labour (Without Food) in Bangladesh: 1990-91 – 2006-07**

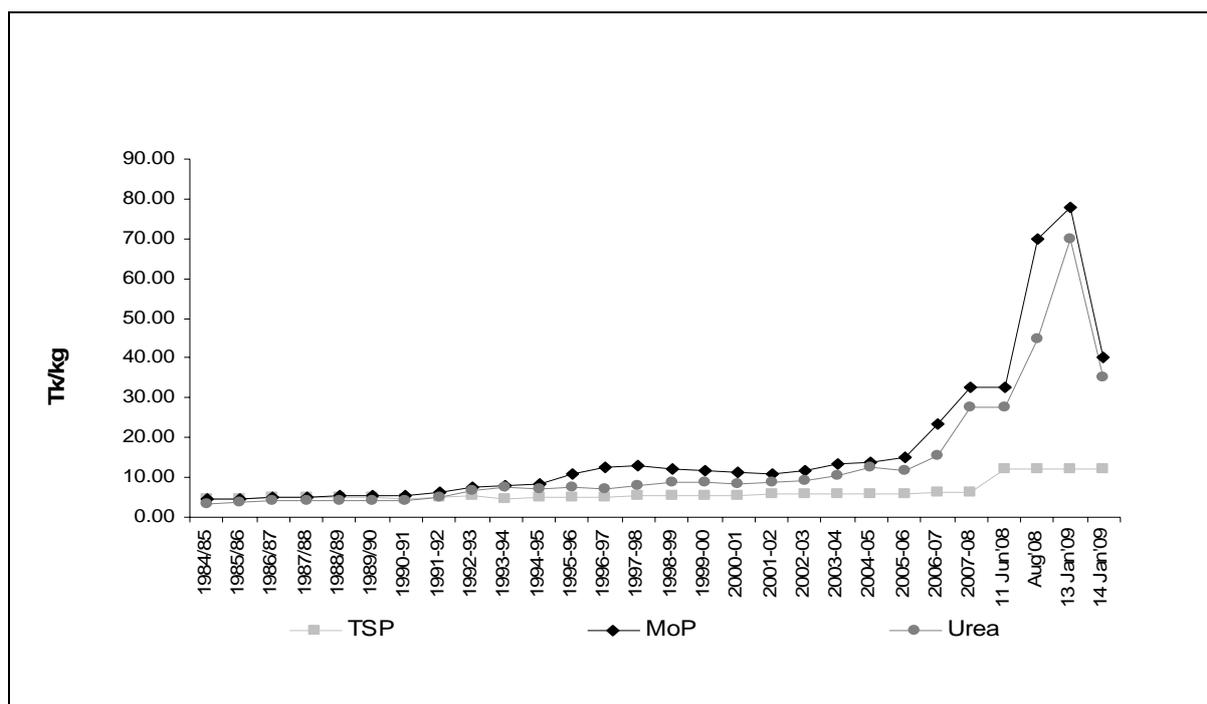
Year	Wholesale Price of Coarse rice (Tk./kg)	Wage Rate	
		(Tk./day)	Rice Wage (kg/day)
1990-91	10.59	37.13	3.51
1991-92	11.08	40.00	3.61
1992-93	9.42	41.50	4.41
1993-94	9.60	42.75	4.45
1994-95	12.28	44.20	3.60
1995-96	12.58	46.00	3.66
1996-97	10.87	47.00	4.32
1997-98	12.09	49.00	4.05
1998-99	13.98	52.00	3.72
1999-00	12.36	55.00	4.45
2000-01	11.62	57.81	4.98
2001-02	12.71	61.08	4.81
2002-03	13.31	74.56	5.60
2003-04	13.07	75.42	5.77
2004-05	14.74	78.67	5.34
2005-06	15.80	89.83	5.69
2006-07	17.00	100.00	5.88
2007-08	25.00	115.00	4.60

Source: Bangladesh Bureau of Statistics (BBS), Monthly Statistical Bulletin (various issues).

## 4.2 Prices of Fertiliser

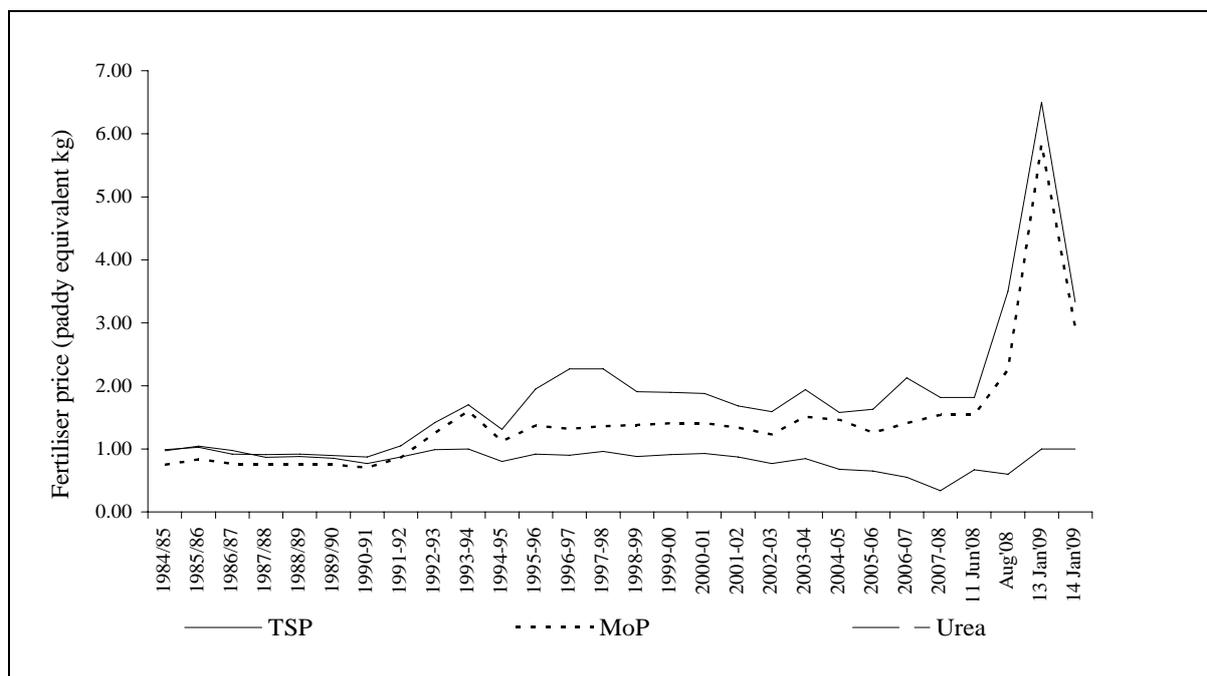
Following the global price trend, farm-level prices of all types of fertiliser in Bangladesh have increased significantly over the years, but without any decrease in domestic price when there is a decline in international price of fertilisers. A comparison of farm-level prices of fertilisers during the last seven months (May-December 2008) revealed that price of urea and TSP fertiliser has more than doubled. In December 2008, compared to May 2008, price of urea fertiliser at the farm-level increased from Tk. 6/kg to Tk. 14/kg; price of TSP from Tk. 34 to Tk. 75-80/kg, and price of MoP from Tk. 30/kg to Tk. 45-48 per kg (Figure 22). In other words, to buy a kg of urea, farmers were required to sell 0.34 kg of paddy in May 2008, but they have to sell 1.00 kg paddy in December 2008 (Figure 23). To buy a kg of TSP, farmers needed to sell 1.82 kg of paddy in May 2008, but they have to sell 6.50 kg paddy in December 2008. In case of MoP, it increased from 1.54 kg paddy in May 2008 to 5.85 kg in December 2008.

**Figure 22: Trends in Fertiliser Price (Tk./kg) in Bangladesh: 1984-85 – 2008-09**



Source: CPD-IRBD database.

**Figure 23: Trends in Fertiliser Price (in Terms of Paddy Equivalent kg): 1984-85 – 2008-09**

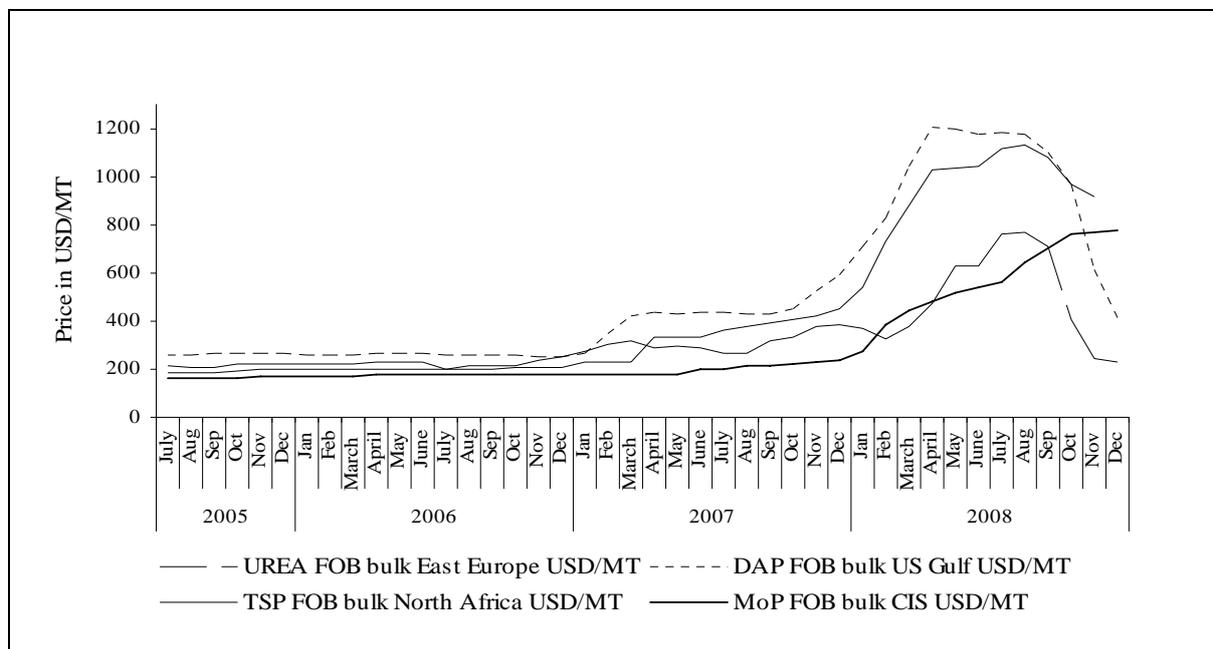


Source: CPD-IRBD database.

On the other hand, international prices of all types of fertilisers, except MoP, has decreased substantially between August and December 2008 (Figure 24). Within this period, international price of urea decreased from USD 770 to USD 248 per MT (i.e. 70 per cent decrease), while that of DAP decreased from USD 1,177 to USD 413 per MT (64 per cent decrease). During this same time, price of TSP decreased from USD 1,132 to USD 915 per

MT (around 19 per cent decrease), but price of MoP increased from USD 640 to USD 772 per MT (about 21 per cent increase).

**Figure 24: International Prices of Fertilisers (Urea, DAP, TSP and MoP): July 2005 – November 2008**



Source: Commodity market review, World Bank.

However, the recent fall of fertiliser prices in the international markets (except for MoP) was not reflected in our local markets. High price of fertilisers particularly TSP and MoP has already created imbalanced use of fertiliser and this problem might be aggravated in the Boro season. The new government has made a timely decision to provide subsidy on non-urea fertiliser to promote balanced fertiliser use and reduction in cost of production. On 13 January 2009, government fixed the price of TSP, MoP and DAP at Tk. 40, Tk. 35 and Tk. 45 per kg, respectively. However, in many places dealers are not selling at the new price. Immediate actions will be required to ensure smooth supply of these fertilisers.

### 4.3 Cost of Boro Rice Production during the April-June 2009 Harvesting Season

Estimated cost of Boro rice production during the current Boro season is provided in Table 12.

#### Production Cost per Acre

- Per acre production cost of diesel- driven HYV Boro rice: Tk. 29,185
- Per acre production cost of electricity-operated HYV Boro rice: Tk. 26,035
- Per acre production cost of diesel-driven Hybrid Boro rice: Tk. 32,191
- Per acre production cost of electricity-operated Hybrid Boro rice: Tk. 29,041

#### Production Cost per kg

- Per kg production cost of HYV Boro paddy: Tk. 12.16 for diesel- driven production, and Tk. 10.85 for electricity-operated production

- Per kg production cost of Hybrid Boro paddy: Tk. 11.92 for diesel-irrigated production, and Tk. 10.76 for electricity-operated production
- Per kg production cost of HYV Boro rice: Tk. 19.33 for diesel- driven production, and Tk. 17.35 for electricity-operated production
- Per kg production cost of Hybrid Boro rice: Tk. 18.97 for diesel- driven production, and Tk. 17.21 for electricity-operated production
- Weighted average cost of production of Boro paddy: Tk. 11.83 per kg; and Boro rice: Tk. 18.84 per kg.

*Proposed Minimum Support Price (MSP)*

- Paddy: Tk. 13.00 per kg; and Rice: Tk. 21.00 per kg.

**Table 12: Projected per Acre Production Cost of Boro Rice in Bangladesh during the April-June 2009 Harvesting Season**

Srl.	Input Use	Unit	HYV Boro Rice: FY2008-09				Hybrid Rice: FY2008-09			
			Unit Price (Tk.)	Quantity per Acre	Diesel-driven (Tk.)	Electricity-operated (Tk.)	Unit Price (Tk.)	Quantity per Acre	Diesel-driven (Tk.)	Electricity-operated (Tk.)
1	Seed	kg	25.00	25	625.00	625.00	200.00	6	1200.00	1200.00
2	Fertiliser	kg								
2.1	Urea		12.00	100	1200.00	1200.00	12.00	110	1320.00	1320.00
2.2	TSP		40.00	35	1400.00	1400.00	40.00	40	1600.00	1600.00
2.3	MoP		35.00	30	1050.00	1050.00	35.00	40	1400.00	1400.00
2.4	Gypsum (S)		6.00	22	132.00	132.00	6.00	25	150.00	150.00
2.5	Zinc		-	-	-	-	-	-	-	-
2.6	Manure		1.75	200	350.00	350.00	1.75	200	350.00	350.00
3	Pesticide	Tk.			500.00	500.00			1000.00	1000.00
4	Human labour	Man-days	140.00	70	9800.00	9800.00	140.00	80	11200.00	11200.00
5	Land cultivation (bullock/PT)	Tk.			2500.00	2500.00			2200.00	2200.00
6	Irrigation	Tk.			5000.00	2000.00			5000.00	2000.00
7	Interest on operating capital	Tk.			1127.85	977.85			1271.00	1121.00
8	Land rent				5500.00	5500.00			5500.00	5500.00
9	<b>Per acre total production cost</b>				<b>29184.85</b>	<b>26034.85</b>			<b>32191.00</b>	<b>29041.00</b>
10	Paddy Production per acre	kg		2400				2700		
11	<b>Per kg production cost: Paddy</b>				<b>12.16</b>	<b>10.85</b>			<b>11.92</b>	<b>10.76</b>
12	Rice (clean) production per acre				1584.00	1584.00			1782.00	1782.00
13	Milling cost (including parboiling)	kg	0.60		1440.00	1440.00	0.60		1620.00	1620.00
14	<b>Per kg production cost: Rice</b>				<b>19.33</b>	<b>17.35</b>			<b>18.97</b>	<b>17.21</b>

**Source:** Authors' estimation.

**Note:** Weighted average cost of production of Boro paddy: Tk. 11.83/kg; and Boro rice: Tk. 18.84/kg.

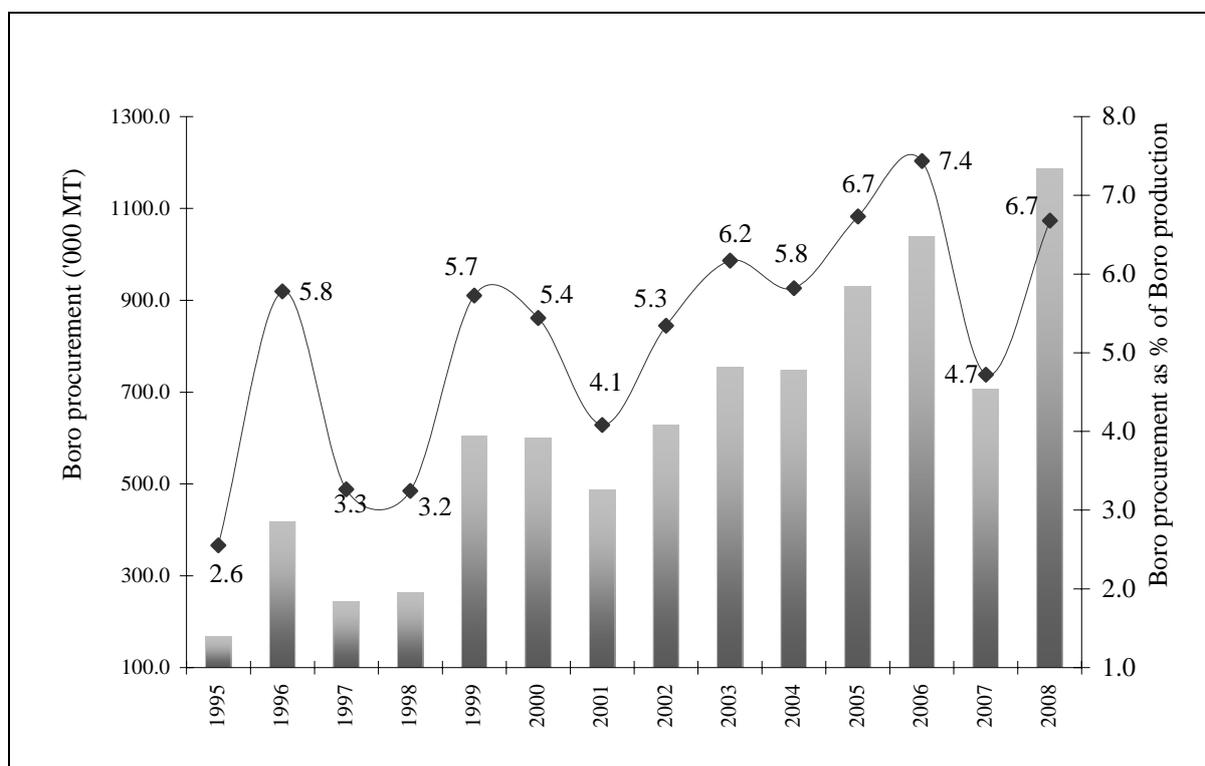
## 5. PROCUREMENT AND PUBLIC DISTRIBUTION

### 5.1 Procurement Strategy

Government needs to design its Boro procurement programme considering the following issues: (1) cost of Boro production; (2) adequate incentives for the Boro rice growers; (3) market price at the time of fixation of price; (4) consumers' interest as regards affordable price for rice; and (5) increased public stock of rice.

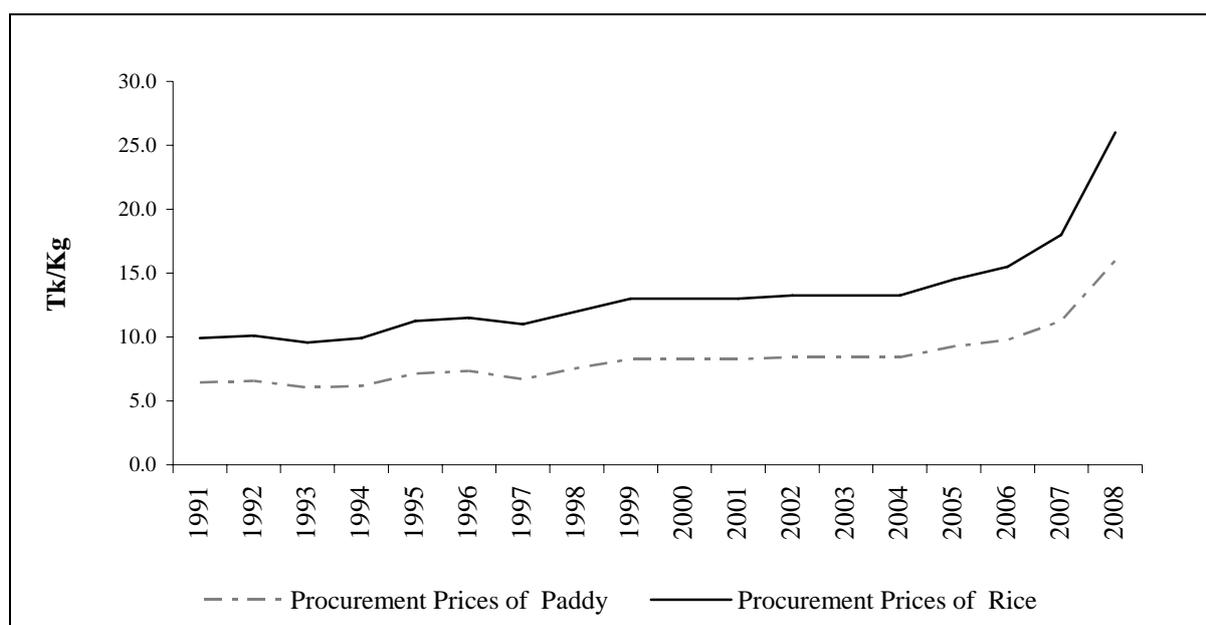
Trends in procurement of Boro rice during the last 13 years (1995-2008) is shown in Figure 25. It is evident from the Figure that total Boro rice procured (in terms of rice equivalent) in 2005, 2006 and 2007 were 9.31 lakh MT, 10.39 lakh MT and 7.06 lakh MT, respectively. In terms of Boro, rice procured as per cent of total Boro production was 6.7 per cent, 7.4 per cent and 4.7 per cent in 2005, 2006 and 2007, respectively. In 2008, amount of Boro rice procured by the government was 11.68 lakh MT, which was 6.7 per cent of production of Boro rice.

**Figure 25: Government Internal Procurement of Boro Rice: 1995-2008**



**Source:** Based on the data collected from Food Planning and Monitoring Unit (FPMU), Ministry of Food and Disaster Management.

It is pertinent to mention here that procurement prices of both Boro paddy and Boro rice has increased over time (Figure 6.26). Procurement price of Boro paddy has increased from Tk. 6.40 per kg in 1991 to Tk. 18.00 per kg in 2008. During this period, procurement price of Boro rice has increased from Tk. 9.90 per kg to Tk. 28.00 per kg.

**Figure 26: Procurement Prices of Boro Paddy and Rice in Bangladesh: 1991-2008**

Source: FPMU, Ministry of Food and Disaster Management.

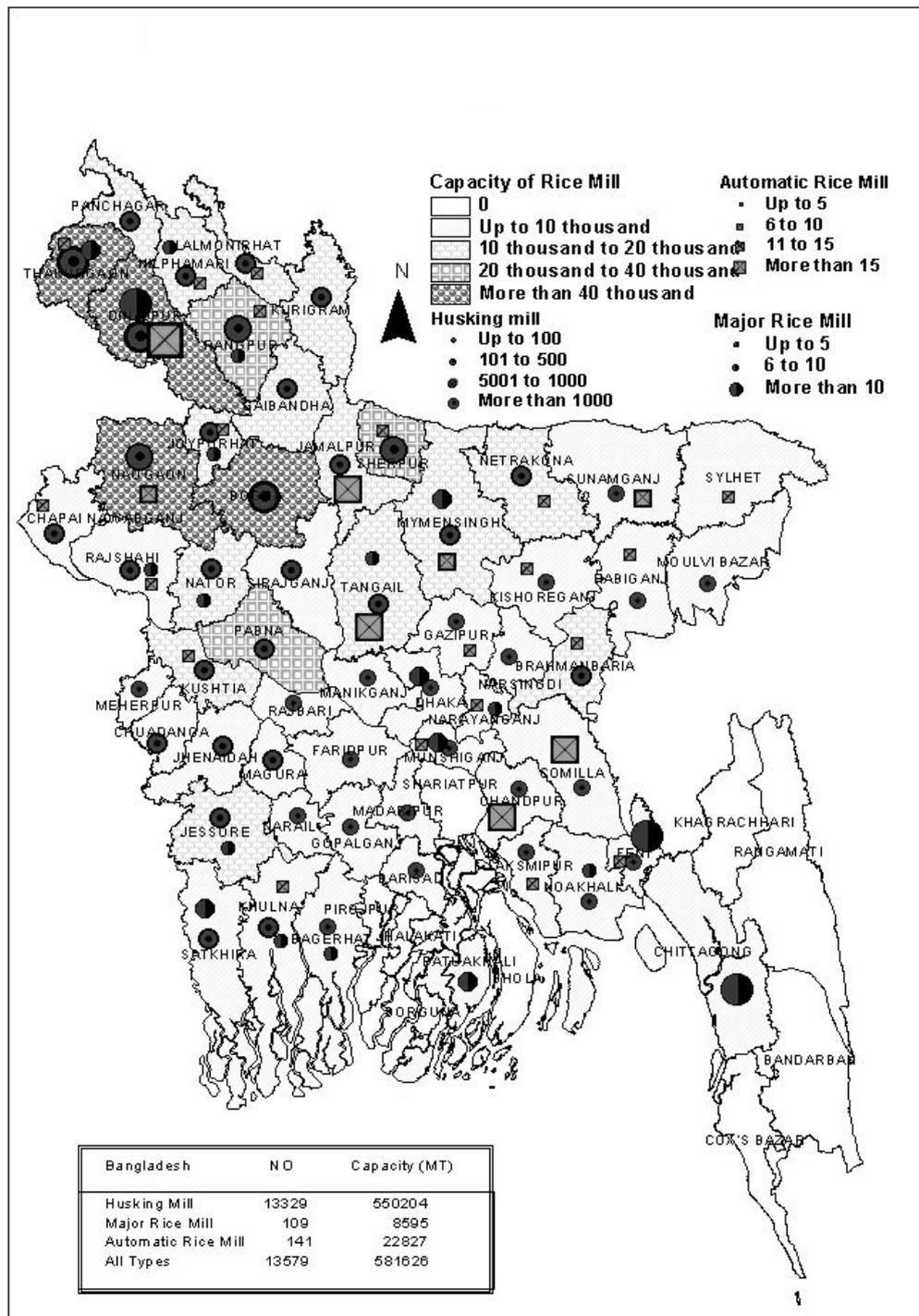
To provide adequate incentive for the producers, government may declare minimum price of Boro rice. Considering the likely average cost of production of Boro paddy (Tk. 11.88 per kg) and Boro rice (Tk. 18.84 per kg), MSP for Boro paddy (Tk. 13.00 per kg) and Boro rice (Tk. 22.00 per kg) may be declared to protect the farmers. If market price goes below to this, then farmers will have the option to sell to the government at this price.

To achieve the targets of Boro rice procurement few specific districts should get priority. During the last Boro season (in 2007), the government procured Rice and Boro paddy equivalent to 7.06 lakh MT of clean rice from 42 districts. About 53 per cent of the procured Boro rice was from six districts (Dinajpur, Bogra, Thakurgaon, Naogaon, Rangpur and Joypurhat), while about 27 per cent of the total Boro rice procurement was from eight districts (Kurigram, Gaibandha, Sherpur, Natore, Pabna, Mymensingh, Jamalpur and Netrokona). These districts may also be the major source of Boro procurement this year.

Procurement strategy needs to consider the rice milling capacity and the storage capacity of the government. Figure 27 shows the number and capacity of rice mills in Bangladesh. Total number of rice mills in Bangladesh is 13,579 with a total capacity of 5.8 lakh MT. Among the rice mills, 98 per cent are husking mills. Number of "Major Rice Mills" is 109 and number of automatic rice mills are 141. Husking mills are more concentrated in Dinajpur, Bogra and Thakurgaon districts.

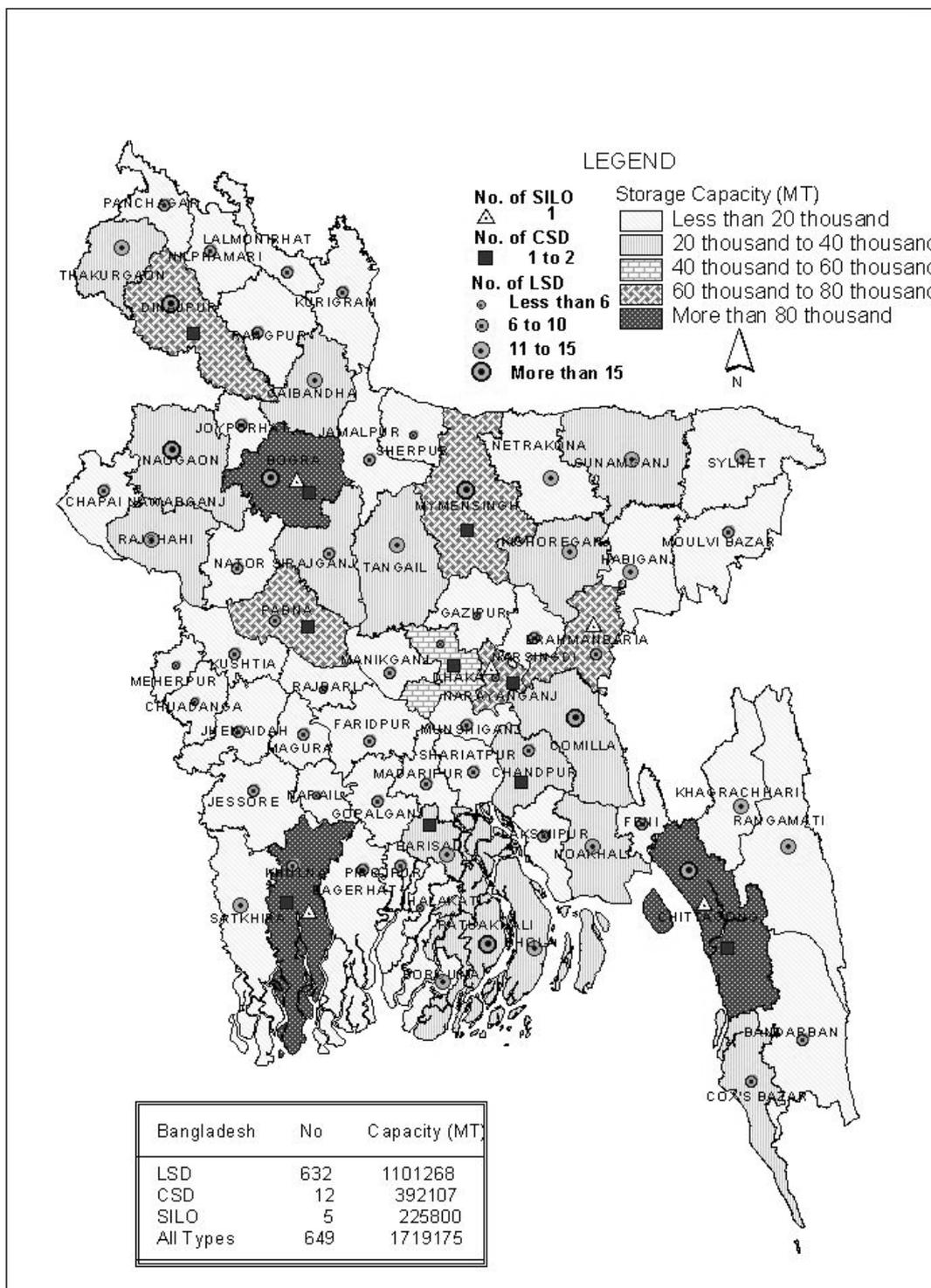
In case of grain storage facility, the government has 649 storage facilities with a total capacity of 17 lakh MT for rice and wheat (Figure 28). Out of these, 632 local storage depots (LSD) have the capacity to store 11 lakh MT, while rests of the storage facilities are in central storage depots (CSD) and Silo. About 28 per cent of the total storage capacity of LSD is in eight districts (Dinajpur, Bogra, Mymensingh, Naogaon, Patuakhali, Chittagong, Comilla and Sylhet).

Figure 27: Number and Capacity of Rice Mills in Bangladesh



Source: Prepared by CPD, based on the data collected from Directorate of Food.

**Figure 28: Foodgrain Storage Capacity in Bangladesh**



Source: Prepared by CPD, based on the data collected from the Directorate of Food.

## 5.2 Food Aid and Commercial Import

In conjunction with the satisfactory domestic production, the total food availability in FY2007-08 was complemented by a 43.4 per cent annual growth in total food aid and import (32 per cent growth in commercial import). Though food aid and public commercial import also registered significant growth rates of 187.8 per cent and 144.6 per cent respectively, the external source of food supply has been mainly featured by the private sector, which imports more than 80 per cent of the total available supply. Total import of foodgrains in FY2007-08 was 3.47 million MT (rice: 2.06 million MT and wheat: 1.41 million MT), compared to 2.42 million MT (rice: 0.72 million MT and wheat: 1.70 million MT) in FY2006-07 (Table 13).

**Table 13: Import of Foodgrains by Bangladesh in FY2007-08**

(in '000 MT)

Category of Imports	FY2006-07			FY2007-08		
	Rice	Wheat	Total Foodgrains	Rice	Wheat	Total Foodgrains
Food aid	25	65	90	82	177	259
Public commercial import	-	121	121	296	-	296
Private import	695	1514	2209	1681	1235	2916
Total	720	1700	2420	2059	1412	3471

Source: FPMU, Ministry of Food and Disaster Management.

Following the prospect of a better domestic production and volatility in the rice price in the international market, both food aid and commercial food import slowed down during the first five months of FY2008-09. However, commercial import by the public sector (mainly from India) increased extensively (Table 14) which are part of the 0.5 million MT of rice contracts for purchase from India, signed in FY2007-08.

**Table 14: Food Import to Bangladesh in FY2008-09 (July - 24 December)**

(in '000 MT)

Category of Imports	FY2007-08			FY2008-09		
	Rice	Wheat	Total Foodgrains	Rice	Wheat	Total Foodgrains
Food aid	16.0	101.8	117.8	22.7	26.7	49.4
Public commercial import	101.2	0.0	101.2	385.1	201.4	586.5
Private import	518.8	825.1	1343.9	48.1	475.2	523.3
Total	636.0	926.9	1562.9	455.8	703.4	1159.2

Source: FPMU, Ministry of Food and Disaster Management.

In response to the global food crisis, exporting countries have been implementing restrictions by imposing export quotas, export duties, minimum export prices (MEP), and even imposing export bans on certain commodities. Currently, India has a ban on export of rice and wheat. Total rice and wheat production (174.80 million tonnes comprising 96.40 million tonnes of rice and 78.40 million tonnes of wheat) in India in 2007-08 was 3.33 per cent higher than that of 2006-07. India is projecting an additional production of 20 million tonnes of rice this year, which is likely to lead to a withdrawal of the ban on rice export. As rice price is also declining globally, private sector import of rice might increase in the coming days, raising a concern for the domestic growers.

### 5.3 Designing Social Safety Net Programmes

Increased production alone would not be sufficient to ensure food security for the lower income group. Social safety net programme needs to be designed in such a way so that hardcore poor families can be covered.

Total outlay for social safety net in FY2008-09 is Tk. 16,932 crore which is 2.8 per cent of the gross domestic product (GDP). Allocation for social safety net is projected to be increased by 48 per cent and number of beneficiaries from such programmes will be increased by 45.8 per cent. It is planned that 257.14 lakh man-month equivalent employment will be created through these programmes in FY2008-09, compared to 235.75 lakh man-month in FY2007-08 (that is, 9.0 per cent increase in employment generation). In FY2008-09, the government has planned to distribute 2,974,000 MT of foodgrains through the monetised and non-monetised channels under the PFDS.

Total foodgrains distribution in FY2008-09 (1 July- 20 November) through PFDS was 697.89 thousand MT, which was 78.72 per cent higher than that distributed during 1 July-22 November 2007 (390.48 thousand MT) (Table 15).

**Table 15: Channel-wise Distribution of Foodgrains under PFDS in Bangladesh: FY2008-09 (1 July- 20 November) and FY2007-08 (1 July-22 November)**

*(in '000 mt)*

Channel	Allocation FY2007- 08	Distribution (1 July - 22 November, FY2007-08)		Allocation FY2008- 09	Distribution (1 July - 20 November, FY2008-09)	
		Total	%		Total	%
<i>Priced</i>						
Essential Priorities	255.37	84.27	33.00	256.00	83.69	32.69
Other Priorities	27.00	7.15	26.48	27.00	7.64	28.30
Large Employers	18.00	5.38	29.89	12.00	3.58	29.83
OMS	723.00	62.88	8.70	1350.00	185.56	13.75
Flour Mill	-	-	-	-	-	-
Fair Price Campaign (FPC)	-	-	-	-	-	-
Chittagong Hill Tracts (CHT)/Others	50.00	3.02	6.04	-	-	-
<i>Sub-total</i>	1073.37	162.7	15.16	1645.00	280.47	17.05
<i>Non-priced</i>						
FFW*	236.00	1.03	0.44	500.00	7.38	1.48
Test Relief (TR)	150.00	0.75	0.50	200.00	17.02	8.51
VGD	200.00	99.30	49.65	265.00	103.38	39.01
VGF	400.00	79.25	19.81	225.00	235.63	104.72
Gratuitous Relief (GR)	64.00	22.07	34.48	64.00	6.18	9.66
VGF (Relief)	-	-	-	-	31.29	-
CHT/Others	75.00	25.37	33.83	75.00	16.53	22.04
<i>Sub-total</i>	1125.00	227.77	20.25	1329.00	417.41	31.41
<b>Total</b>	<b>2198.37</b>	<b>390.48</b>	<b>17.76</b>	<b>2974.00</b>	<b>697.88</b>	<b>23.47</b>

**Source:** FPMU, Ministry of Food and Disaster Management.

**Note:**\* includes direct distribution of wheat by World Vision International.

- No available data.

It is notable that allocation of foodgrains for OMS and FFW in FY2008-09 was respectively 86.72 per cent and 111.86 per cent higher than those allocated in FY2007-08.

On the other hand, foodgrains allocation for VGF in FY2008-09 was reduced by 44 per cent as against FY2007-08 allocation. However, VGF distribution during 1 July-20 November of FY2008-09 was 235.63 thousand MT while the allocation for the full fiscal was 225 thousand MT. The comparable figures for FY2007-08 were 79.25 thousand MT and 400 thousand MT respectively.

In view of surpassing of the allocated quantity before the halfway mark of FY2008-09, implementation of VGF programme will be needed for resource-poor people, in coordination with other safety net programmes.

As part of the 100-day employment generation scheme, government spent Tk. 123.70 crore in the 7 *monga*-affected districts of the northern part of the country. This spending accounted for 15.6 per cent of the expenditure for the rest 57 districts and 13.5 per cent of the total spent amount.

On an average, the government equally distributed the amount between *monga* affected districts and others regions. However, given the vulnerability of the northern districts, a larger share of the allocation should have been targeted to these poverty-prone areas. In this context, it needs to be seen as to how the second phase of the project (i.e. 40 days) is implemented.

The recent initiative of 5-years' guaranteed employment for the destitute women of *monga*-prone Panchgar and Rangpur districts is certainly praiseworthy. It is hoped that the new government will put in place adequate policy and institutional measures to ensure successful implementation of the programme.

In brief, production, safety net programmes and poverty reduction programmes must be implemented and integrated in a coordinated manner. Regular monitoring, feedback and adjustment will be helpful to make these programmes effective.

## 6. POLICY IMPLICATIONS

To ensure higher Boro production in the current season as like last year and keep it up for the upcoming years, government will have to prepare an integrated strategy regarding input delivery mechanism, output pricing and procurement policy. In this perspective, following recommendations need proper attention for immediate implementation:

### **Seed Supply**

In view of the importance of quality seed supply for higher Boro production, government should increase seed production through expanding the capacity of BADC and establishing a special seeds production zone with public-private partnership (PPP). To increase domestic production of hybrid seed, research allocation should increase. Besides, the farmers who have rich indigenous knowledge and expertise in quality seed production should be provided with proper incentives.

### **Fertiliser Delivery**

In case of fertiliser, an upward revision of the peak period (January-March) demand by the concerned agencies of the government is urgently needed. Besides, establishing an efficient delivery mechanism, and preparing a policy regarding alternate use of chemical fertiliser in industrial sector, e.g. dying and melamine production, require immediate fixation. Any kind of delay in fertiliser distribution at announced subsidised price, whether due to dealers' syndicate attempting to create artificial shortage or selling at higher price will have to be handled strictly by the government. A Citizen Committee comprising farmers, dealers, member of local governments and government officials can be formed to monitor and ensure fertiliser delivery. In the previous Boro season, phosphorus-based fertiliser use (TSP and MoP) was very low which should increase to ensure sufficient nutrition for the plants and sustainable future production. As phosphorus-based fertilisers has become scarcer in international market, DAP (di-ammonium phosphate), which is the source of both phosphorus and nitrogen nutrients, needs to be used intensively. Besides, the use of biofertiliser and guti urea should be encouraged. Government may build up a buffer stock of fertiliser, whether the form and norms of usage needs immediate fixation.

### **Electricity for Irrigation and Subsidy for Diesel**

Ensuring electricity and diesel supply for irrigation is another challenge for higher Boro production. To confirm uninterrupted electricity supply, government can continue the decision taken in FY2007-08 as regards closure of shops after 8:00 pm in the urban areas. Priority may be given to those districts where absolute area and relative share of electricity-operated irrigation is higher. For diesel-driven pumps, ensuring diesel supply at subsidised price will have to confirm for expected Boro harvest. Government may set up diesel price even at much lower level and compensate it through making profit from comparatively higher petrol or octane price. In order to implement diesel subsidy, exploring the best method of disbursement and identifying eligible farmers is an important issue. Coupon system, cash disbursement and disbursement through banking channels using national ID cards may be potential alternatives for diesel subsidy.

## Procurement Strategy

To keep up the spirit and endeavour of Boro farmers, government should ensure logical price of paddy so that they get incentive to produce Boro in the next year. To do this, government may provide price incentive to the farmers through declaring high procurement price now. Considering the likely average cost of production of Boro paddy (Tk. 11.88 per kg) and Boro rice (Tk. 18.84 per kg), MSP for Boro paddy (Tk. 13.00 per kg) and Boro rice (Tk. 21.00 per kg) may be declared to protect the farmers. If market price goes below to this, then farmers will have the option to sell to the government at this price. Any kind of delay in determining procurement price, amount and storing system will adversely affect the food security. Government procurement centres can be established so that farmers can directly sell their product at these points. Storage capacity of agricultural input and output should be enhanced. A decentralised storage chain among rural areas needs to be constructed immediately. Regarding this, construction of storehouses at union level can be a useful option.

## Social Safety Net

The range and coverage of social safety net programmes to ensure food security need to be widened. In this regard, government can introduce target rationing system incorporating ultra and marginal poor, *monga*-affected people, garment and transport labourer and slum-dwellers. Beside this, efficient and effective implementation of the declared 100-Days Employment Generation Programme should be ensured in the current budget.

## Agricultural Credit

There remains intense shortage of working capital in agricultural sector which is hindering the achievement of Boro production. A well coordinated initiative of the government is necessary to enhance credit inflow in an indiscriminant manner through specialised government banks along with more involvement of the private sector banks. NGOs providing microcredit can also play significant role by disbursing season wise harvest loan at minimum interest rate.

## Others

A task force and/or a central monitoring committee should be formed to supervise Boro production which would implement decisions in the field level quickly. Besides, MoA can also open *Boro Production Monitoring Cell* in every district to provide instant support to the farmers regarding complains about input delivery and advice about production technique. Decisions taken by the higher authority should reach the field level instantly. Short Message Service (SMS) may be used for this purpose.

A realistic, rational and feasible production target needs to be put forwarded on the basis of available input endowment. A feasibility study can be conducted by MoA to estimate required inputs and available supply of seeds, fertiliser and irrigation facilities in every season.

Allocation and incentives for technological innovation and agricultural research should be intensified.

Agricultural forecast system should be modernised and easily accessible to the farmers, so that they can take the best cultivation strategy for higher production. In this regard,

government should revive the Bangladesh Space Research and Remote Sensing Organisation (SPARRSO) to get effective forecast support.

Protection against smuggling of agricultural inputs, especially fertiliser and diesel in neighbouring countries should be ensured.

Telecommunication and media can play important role in raising agricultural production through providing instructions on efficient use of seeds and fertiliser, time and technique of cultivation, procedure of irrigation, preventing diseases and preventing huge harvest loss by catastrophic events through appropriate weather forecasting.

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## ANNEX

Annex Table 1: Total Irrigated Area under Modern System: FY2007-08

<b>No modern irrigation</b>
Hatiya, Manpura, Mongla (3 upazilas)
<b>Negligible (up to 500 ha)</b>
Bamna, Bandarban Sadar, Barguna Sadar, Barkal, Bauphal, Belai Chhari, Betagi, Bhandaria, Chittagong City, Dacope, Dashmina, Galachipa, Jaintiapur, Kala Para, Kanthalia, Kaptai, Kawkhali, Lakshmichhari, Manikchhari, Manpura, Mathbaria, Mirzaganj, Narayanganj Sadar, Patharghata, Patuakhali Sadar, Pirojpur Sadar, Rajapur, Rajasthali, Ramgati, Rangamati, Kawkhali, Rowangchhari, Ruma, Sarankhola, Teknaf, Thanchi, Zakiganj (36 upazilas)
<b>Low (501 – 2,000 ha)</b>
Alikadam, Baghai Chhari, Bandar, Beani Bazar, Bishwanath, Boalia, Companiganj, Companyganj, Dhaka City, Dighinala, Dowarabazar, Fenchuganj, Golabganj, Gowainghat, Haim Char, Jurai Chhari, Kachua, Kanaighat, Khagrachhari Sadar, Khulna Sadar, Kutubdia, Lama, Langadu, Lohajang, Mahalchhari, Matiranga, Morrelganj, Munshiganj Sadar, Naikhongchhari, Nanner Char, Nazirpur, Nesarabad, Swarup, Panchhari, Ramgarh, Rampal, Rangamati Sadar, Sitakunda, Tazimuddin, Tongibari (39 upazilas)
<b>Medium (2,001 – 10,000 ha)</b>
Ajmiriganj, Akhaura, Alfadanga, Amtali, Anowara, Araihasar, Assasuni, Austagram, Babuganj, Bagati Para, Bagerhat Sadar, Bagha, Bahubal, Bajitpur, Bakerganj, Balaganj, Banari Para, Banshkali, Barisal Sadar, Barlekha, Batiaghata, Belabo, Bera, Bhairab, Bhanga, Bhedarganj, Bheramara, Bhuapur, Bishwambarpur, Boalkhali, Burhanuddin, Chandanaish, Chandpur Sadar, Char Bhadrason, Char Rajibpur, Charghat, Chauhali, Chhagalnaiya, Chhatak, Chilmari, Chunarughat, Daganbhuiyan, Damudya, Daulatkhan, Daulatpur, Debhata, Dewanganj, Dhobaura, Dighalia, Dohar, Fakirhat, Faridpur, Fatikchhari, Fulchhari, Gaurnadi, Gazaria, Ghior, Goalandaghat, Gosairhat, Habiganj Sadar, Harirampur, Hathazari, Hizla, Homna, Hossainpur, Ishwardi, Itna, Jagannathpur, Jamalganj, Jhalakathi Sadar, Jhenaigati, Kaliganj, Kamalganj, Karimganj, Keraniganj, Khoksa, Kishoreganj Sadar, Kotchandpur, Koyra, Kulaura, Kuliari Char, Lakhai, Lalmohan, Lalpur, Lohagara, Maheshkhali, Moulovibazar Sadar, Mehendiganj, Mirsharai, Mithamain, Mollahat, Muladi, Nalchity, Naria, Nikli, Noakhali Sadar, Paikgachha, Pakundia, Palash, Palong, Parshuram, Patiya, Phultala, Rajnagar, Rajoir, Ramganj, Ramu, Rangunia, Raozan, Roypur, Rugganj, Rupsa, Sadarpur, Satkania, Saturia, Serajdikhan, Shahrasti, Shib Char, Shibalaya, Shyamnagar, Sonagazi, Sonargaon, Sreemangal, Sreenagar, Sreepur, Sunamganj Sadar, Sylhet Sadar, Tahirpur, Tarail, Tentulia, Terokhada, Tungi Para, Ukhia, Zanjira (135 upazilas)
<b>High (10,001 – 25,000 ha)</b>
Abhaynagar, Adamdighi, Aditmari, Agailjhara, Akkelpur, Atgharia, Atpara, Atrai, Atwari, Badalgachhi, Badarganj, Bagher Para, Bakshiganj, Baliakandi, Baliadangi, Banchharampur, Baraigram, Barhatta, Barura, Basail, Begumganj, Belkuchi, Bhaluka, Bhangura, Bholi Sadar, Bholahat, Bhurungamari, Birampur, Boalmari, Bochaganj, Boda, Bogra Sadar, Brahman Para, Burichang, Chakaria, Chandina, Char Fasson, Chatkhil, Chatmohar, Chauddagranj, Chaugachha, Chitalmari, Chuadanga Sadar, Daulatpur, Debiganj, Delduar, Derai, Dhamrai, Dharampasha, Dhupchanchia, Dimla, Domar, Dumuria, Durgapur, Faridganj, Faridpur Sadar, Feni Sadar, Gabtali, Gaibandha Sadar, Gangachara, Gauripur, Gazipur Sadar, Ghatail, Ghoraghat, Gomastapur, Gopalganj Sadar, Gopulpur, Gurudaspur, Hajiganj, Hakimpur, Haluaghat, Harinakunda, Haripur, Hatibandha, Ishwarganj, Islampur, Jaldhaka, Jiban Nagar, Joypurhat Sadar, Kachua, Kaharole, Kalai, Kalaroa, Kalia, Kaliakair, Kaliganj, Kalihati, Kalkini, Kalmakanda, Kamarkhanda, Kapasia, Kasba, Kashiani, Katiadi, Kaunia, Kazipur, Kendua, Keshabpur, Khaliajuri, Khansama, Khetlal, Kishoreganj, Kotali Para, Kumarkhali, Kurigram Sadar, Kushtia Sadar, Laksam, Lakshmipur Sadar, Lalmonirhat Sadar, Madan, Madarganj, Madaripur Sadar, Madhabpur, Madhukhali, Madhupur, Manikganj Sadar, Manohardi, Matlab, Melandaha, Mirpur, Mirzapur, Mohammadpur, Mohanganj, Mohanpur, Muksudpur, Muradnagar, Nabiganj, Nabinagar, Nachole, Nagarkanda, Nakla, Nalitabari, Nangalkot, Narail Sadar, Narsingdi Sadar, Nasirnagar, Nawabganj, Nawabganj Sadar, Netrokona Sadar, Pabna Sadar, Palashbari, Panchagarh Sadar, Pangsha, Patgram, Patnitala, Phulbari, Pirgachha, Porsha, Purbadhala, Puthia, Rajarhat, Rajbari Sadar, Raninagar, Ranisankail, Raumari, Roypura, Cox's Bazar Sadar, Sadullapur, Saghatta, Saidpur, Sakhipur, Santhia, Sapahar, Sarail, Sariakandi, Savar, Senbagh, Shaikupa, Shalikhia, Shibpur, Singair, Sirajganj Sadar, Sonatola, Sreebardi, Sreepur, Sujanagar, Sulla, Tala, Tangail Sadar, Taraganj, Wazirpur (181 upazilas)
<b>Very high (&gt; 25,000 ha)</b>

Alamdanga, Baghmara, Baniachong, Biral, Birganj, Brahmanbaria Sadar, Chirirbandar, Comilla Sadar, Damurhuda, Daudkandi, Debidwar, Dhamoirhat, Dhunat, Dinajpur Sadar, Durgapur, Fulbari, Fulbaria, Gaffargaon, Gangni, Gobindaganj, Godagari, Jamalpur Sadar, Jessore Kotwali, Jhenaidahaa Sadar, Jhikargachha, Kahaloo, Kaliganj, Madhupur, Magura Sadar, Mahadebpur, Maheshpur, Manda, Manirampur, Meherpur Sadar, Mitha Pukur, Muktagachha, Mymensingh Sadar, Nageshwari, Nandail, Nandigram, Naogaon Sadar, Natore Sadar, Nawabganj, Niamatpur, Nilphamari Sadar, Paba, Panchbibi, Parbatipur, Phulpur, Pirganj, Rangpur Sadar, Royganj, Sarishabari, Satkhira Sadar, Shahjadpur, Sharsha, Sherpur, Sherpur Sadar, Shibganj, Singra, Sundarganj, Tanore, Tarash, Thakurgaon Sadar, Trishal, Ulipur, Ullah Para (70 upazilas)

Source: Authors' calculation, based on the data from Minor Irrigation Survey Report 2007-08.

**Annex Table 2: Upazilas Irrigated under Electricity: FY2007-08**

<b>No electricity-operated irrigation</b>
Baghai Chhari, Bamna, Barguna Sadar, Barkal, Bauphal, Beani Bazar, Belai Chhari, Betagi, Bhandaria, Bishwanath, Dacope, Dashmina, Galachipa, Hatiya, Jhalakathi Sadar, Jurai Chhari, Kachua, Kala Para, Kanthalia, Kawkhali, Kutubdia, Lakshmichhari, Langadu, Mahalchhari, Manikchhari, Manpura, Mathbaria, Moulovibazar Sadar, Mirzaganj, Mongla, Morrelganj, Nalchity, Nanner Char, Nesarabad, Patharghata, Patuakhali Sadar, Pirojpur Sadar, Rajapur, Rajasthali, Ramgati, Rangamati Sadar, Rowangchhari, Sandwip, Sitakunda, Sreemangal, Thanchi, Tongibari, Zakiganj (48 upazilas)
<b>Negligible (&lt; 100 ha)</b>
Alikadam, Balaganj, Banari Para, Bandarban Sadar, Barlekha, Boalia, Char , Rajibpur, Chauhali, Companiganj, Derai, Dharampasha, Dighinala, Fenchuganj, Golabganj, Haim Char, Jagannathpur, Jaintiapur, Kamalganj, Kanaighat, Kaptai, Kawkhali (Betbunga), Khagrachhari Sadar, Khulna Sadar, Kultura, Lalmoan, Lama, Matiranga, Mollahat, Munshiganj Sadar, Naikhongchhari, Narayanganj Sadar, Nazirpur, Rajnagar, Ramgarh, Rampal, Ruma, Sarankhola, Shyamnagar, Teknaf, Terokhada, Tungi Para (41 upazilas)
<b>Low (100 – 1,000 ha)</b>
Amtali, Assasuni, Austagram, Babuganj, Bagerhat Sadar, Bahubal, Bakerganj, Baliakandi, Bandar, Barisal Sadar, Batiaghata, Bera, Bheramara, Bishwambarpur, Burhanuddin, Chandanaish, Char Bhadrasan, Chorghat, Chhagalnaiya, Chhatak, Chilmari, Chitalmari, Chittagong City, Chuadanga Sadar, Companyganj, Damudya, Daulatkhan, Debhata, Dewanganj, Dhaka City, Dhobaura, Dhunat, Dighalia, Dowarabazar, Dumuria, Fakirhat, Fulchhari, Gaurnadi, Gazaria, Goalandaghat, Gopalganj Sadar, Gosairhat, Gowainghat, Harinakunda, Hatibandha, Hizla, Homna, Itna, Jamalganj, Jiban Nagar, Kalia, Kaliganj, Karimganj, Keraniganj, Khaliajuri, Kotali Para, Koyra, Kuliari Char, Lakhai, Lalpur, Lohagara, Lohajang, Madhukhali, Mehendiganj, Mirsharai, Mithamain, Mohammadpur, Nabiganj, Narail Sadar, Nikli, Noakhali Sadar, Paikgachha, Pakundia, Panchhari, Phultala, Ramganj, Raumari, Roypur, Rupsa, Sadarpur, Santhia, Sariakandi, Serajdikhan, Shib Char, Sonatola, Sreepur, Sujanagar, Sulla, Sunamganj Sadar, Sylhet Sadar, Tahirpur, Tarail, Tazumuddin, Tentulia, Zanjira (95 upazilas)
<b>Medium (1,001 – 5,000 ha)</b>
Abhaynagar, Aditmari, Agailjhara, Ajmiriganj, Akhaura, Alamdanga, Alfadanga, Anowara, Araihaaz, Atpara, Atrai, Atwari, Bagati Para, Bagha, Bagher Para, Bajitpur, Bakshiganj, Banchharampur, Banskhali, Baraigram, Barhatta, Basail, Begumganj, Belabo, Belkuchi, Bhairab, Bhanga, Bhangura, Bhedarganj, Bhola Sadar, Bholahat, Bhuapur, Bhurungamari, Boalkhali, Boalmari, Bochaganj, Boda, Brahman Para, Chakaria, Chandpur Sadar, Char Fasson, Chatkhil, Chaugachha, Chunarughat, Daganbhuiyan, Damurhuda, Daulatpur, Debiganj, Delduar, Dohar, Durgapur, Faridganj, Faridpur, Faridpur Sadar, Fatikchhari, Feni Sadar, Gabtali, Gaibandha Sadar, Gangachara, Gauripur, Gazipur Sadar, Ghior, Gurudaspur, Habiganj Sadar, Haluaghat, Haripur, Harirampur, Hathazari, Hossainpur, Ishwardi, Islampur, Jaldhaka, Jhenaigati, Kalaroa, Kaliakair, Kaliganj, Kaliganj (Jhenaidaha), Kaliganj (Satkhira), Kalkini, Kalmakanda, Kamarkhanda, Kapasia, Kashiani, Katiadi, Kazipur, Kendua, Keshabpur, Khansama, Khoksa, Kishoreganj, Kishoreganj Sadar, Kotchandpur, Kumarkhali, Kurigram Sadar, Kushtia Sadar, Lakshmipur Sadar, Lalmonirhat Sadar, Lohagara, Madan, Madarganj, Madaripur Sadar, Madhabpur, Madhupur, Magura Sadar, Maheshkhali, Maheshpur, Manikganj Sadar, Manohardi, Matlab, Meherpur Sadar, Melandaha, Mirpur, Mirzapur, Mohanganj, Muksudpur, Muladi, Nagarkanda, Nageshwari, Nakla, Nalitabari, Naria, Nasirnagar, Natore Sadar, Nawabganj, Palash, Palashbari, Palong, Panchagarh Sadar, Pangsha, Parshuram, Patgram, Patiya, Phulbari, Phulpur, Pirgachha, Porsha, Purbadhala, Puthia, Rajarhat, Rajbari Sadar, Rajoir, Ramu, Rangpur Sadar, Rangunia, Raozan, Rupganj, Sadullapur, Saghatta, Saidpur, Sarail, Satkania, Sauria, Savar, Shahrasti, Shailkupa, Shalikka, Shibalaya, Singair, Sonagazi, Sonargaon, Sreebardi, Sreenagar, Sreepur, Tala, Taraganj, Tarash, Ukhia, Ulipur, Wazirpur (171 upazilas)

<b>High (5,001 – 10,000 ha)</b>
Adamdighi, Akkelpur, Atgharia, Badalgachhi, Badarganj, Baliadangi, Baniachong, Barura, Bhaluka, Biral, Birampur, Birganj, Bogra Sadar, Brahmanbaria Sadar, Burichang, Chandina, Chatmohar, Chauddagam, Daudkandi, Dhamoirhat, Dhamrai, Dimla, Domar, Durgapur, Fulbari, Gaffargaon, Gangni, Ghatail, Ghoraghat, Gobindaganj, Gomastapur, Gopalpur, Hajiganj, Hakimpur, Ishwarganj, Jhenaidahaa Sadar, Jhikargachha, Joypurhat Sadar, Kachua, Kaharole, Kalai, Kalihati, Kasba, Kaunia, Laksam, Madhupur, Mitha Pukur, Mohanpur, Muradnagar, Nabinagar, Nandail, Nandigram, Nangalkot, Naogaon Sadar, Nawabganj Sadar, Netrokona Sadar, Niamatpur, Nilphamari Sadar, Paba, Pabna Sadar, Patnitala, Pirganj, Pirganj (Rangpur), Raninagar, Ranisankail, Roenganj, Roypura, Sakhipur, Sapahar, Sarishabari, Satkhira Sadar, Senbagh, Shahjadpur, Sharsha, Sherpur, Sherpur Sadar, Shibganj, Shibganj (Bogra), Shibpur, Singra, Sirajganj Sadar, Sundarganj, Tangail Sadar ( <b>83 upazilas</b> )
<b>Very high (&gt; 10,000 ha)</b>
Baghmara, Chirirbandar, Comilla Sadar, Debidwar, Dhupchachia, Dinajpur Sadar, Fulbaria, Godagari, Jamalpur Sadar, Kahaloo, Khetlal, Kotwali, Mahadebpur, Manda, Manirampur, Muktagachha, Mymensingh Sadar, Nachole, Narsingdi Sadar, Nawabganj, Panchbibi, Parbatipur, Tanore, Thakurgaon Sadar, Trishal, Ullah Para ( <b>26 upazilas</b> )

Source: Authors' calculation, based on the data from Minor Irrigation Survey Report 2007-08.

**Annex Table 3: Percentage of Area under Electricity: FY2007-08**

<b>No electricity-operated irrigation</b>
Baghai Chhari, Bamna, Barguna Sadar, Barkal, Bauphal, Beani Bazar, Belai Chhari, Betagi, Bhandaria, Bishwanath, Dacope, Dashmina, Galachipa, Hatiya, Jhalakathi Sadar, Jurai Chhari, Kachua, Kala Para, Kanthalia, Kawkhali, Kutubdia, Lakshmichhari, Langadu, Mahalchhari, Manikchhari, Manpura, Mathbaria, Moulovibazar Sadar, Mirzaganj, Mongla, Morrelganj, Nalchity, Nanner Char, Nesarabad, Swarup, Patharghata, Patuakhali Sadar, Pirojpur Sadar, Rajapur, Rajasthali, Ramgati, Rangamati Sadar, Rowangchhari, Sandwip, Sitakunda, Sreemangal, Thanchi, Tongibari, Zakiganj ( <b>48 upazilas</b> )
<b>Negligible (0 – 5 %)</b>
Amtali, Assasuni, Bagerhat Sadar, Bakerganj, Balaganj, Baliakandi, Banari Para, Bandarban Sadar, Barlekha, Batiaghata, Char Bhadrason, Char Rajibpur, Chauhali, Chitalmari, Companyganj, Derai, Dewanganj, Dharampasha, Dhunat, Dighalia, Dighinala, Dumuria, Golabganj, Haim Char, Harinakunda, Hatibandha, Hizla, Itna, Jagannathpur, Jamalganj, Jiban Nagar, Kalia, Kaliganj, Kamalganj, Kanaighat, Khagrachhari Sadar, Khaliajuri, Khulna Sadar, Kotali Para, Kulaura, Lalmohan, Lama, Madhukhali, Matiranga, Mehendiganj, Mohammadpur, Mollahat, Munshiganj Sadar, Narail Sadar, Nazirpur, Paikgachha, Phultala, Rajnagar, Rampal, Raumari, Ruma, Sarankhola, Sariakandi, Shyamnagar, Sonatola, Sulla, Terokhada, Tungi Para, Zanjira ( <b>64 upazilas</b> )
<b>Low (5.01 – 25%)</b>
Abhaynagar, Aditmari, Agailjhara, Akhaura, Alamdanga, Alfadanga, Alikadam, Atpara, Atrai, Atwari, Austagram, Babuganj, Bagati Para, Bagha, Bagher Para, Baghmara, Bahubal, Bajitpur, Bakshiganj, Baliadangi, Banchharampur, Baniachong, Baraigram, Barhatta, Barisal Sadar, Begumganj, Bera, Bhaluka, Bhangra, Bhedarganj, Bheramara, Bhola Sadar, Bhuapur, Bhurungamari, Biral, Birganj, Bishwambarpur, Boalia, Boalmari, Bochaganj, Boda, Burhanuddin, Chakaria, Chandpur Sadar, Char Fasson, Charghat, Chatkhil, Chaugachha, Chhagalnaiya, Chhatak, Chilmari, Chuadanga Sadar, Chunarughat, Damudya, Damurhuda, Daudkandi, Daulatkhan, Daulatpur, Debhata, Debiganj, Dhaka City (Tejgaon), Dhobaura, Dwarabazar, Durgapur, Fakirhat, Faridganj, Faridpur, Faridpur Sadar, Fenchuganj, Fulchhari, Gabtali, Gaibandha Sadar, Gangachara, Gangni, Gauripur, Gaurnadi, Gazaria, Gazipur Sadar, Ghior, Goalandaghat, Gobindaganj, Gopalganj Sadar, Gosairhat, Gowainghat, Gurudaspur, Habiganj Sadar, Haluaghat, Haripur, Harirampur, Hathazari, Homna, Islampur, Jaintiapur, Jaldhaka, Jessore Kotwali, Jhenaidahaa Sadar, Jhikargachha, Kaliganj (Jhenaidaha), Kaliganj (Lalmonirhat), Kalkini, Kalmakanda, Kapasia, Kaptai, Karimganj, Kashiani, Katiadi, Kawkhali (Betunia), Kazipur, Kendua, Keshabpur, Kishoreganj, Kotchandpur, Koyra, Kular Char, Kurigram Sadar, Kushtia Sadar, Lakhai, Lalmonirhat Sadar, Lalpur, Lohagara, Madan, Madarganj, Madhupur, Magura Sadar, Maheshpur, Manohardi, Matlab, Meherpur Sadar, Melandaha, Mirpur, Mirsharai, Mirzapur, Mitha Pukur, Mithamain, Mohanganj, Muksudpur, Muladi, Nabiganj, Nagarkanda, Nageshwari, Naikhongchhari, Nakla, Nalitabari, Narayanganj Sadar, Nasirnagar, Natore Sadar, Nikli, Noakhali Sadar, Pakundia, Palashbari, Panchagarh Sadar, Panchhari, Pangsha, Patgram, Phulbari, Phulpur, Pirgachha, Pirganj, Purbadhala, Puthia, Rajarhat, Rajbari Sadar, Ramganj, Ramgarh, Rangpur Sadar, Roypur, Rupsa, Sadarpur, Sadullapur, Saghata, Saidpur, Santhia, Satkhira Sadar, Savar,

Serajdikhan, Shahrasti, Shailkupa, Shalikhha, Sharsha, Sherpur, Sherpur Sadar, Shib Char, Shibalaya, Shibganj, Singair, Singra, Sreebardi, Sreenagar, Sreepur, Sujanagar, Sunamganj Sadar, Sundarganj, Sylhet Sadar, Tahirpur, Tala, Taraganj, Tarail, Tarash, Tazumuddin, Tentulia, Thakurgaon Sadar, Ulipur, Wazirpur <b>(206 upazilas)</b>
<b>Medium (25.01 – 50%)</b>
Adamdighi, Ajmiriganj, Akkelpur, Anowara, Araihasar, Atgharia, Badalgachhi, Badarganj, Bandar, Banshkhali, Barura, Basail, Belabo, Belkuchi, Bhairab, Bhangura, Bholahat, Birampur, Boalkhali, Bogra Sadar, Brahmanbaria Sadar, Brahman Para, Burichang, Chandanaish, Chandina, Chatmohar, Chauddagaram, Chirirbandar, Chittagong City, Comilla Sadar, Companyganj, Cox's Bazar Sadar, Daganbhuiyan, Debidwar, Delduar, Dhamoirhat, Dhamrai, Dhupchanchia, Dimla, Dinajpur Sadar, Dohar, Domar, Durgapur, Fatikchhari, Feni Sadar, Fulbari, Fulbaria, Gaffargaon, Ghatail, Ghoraghat, Godagari, Gomastapur, Gopalpur, Hajiganj, Hakimpur, Hossainpur, Ishwardi, Ishwarganj, Jamalpur Sadar, Jhenaigati, Joypurhat Sadar, Kachua, Kahaloo, Kaharole, Kalai, Kalaroa, Kaliakair, Kaliganj, Kalihati, Kamarkhanda, Kasba, Kaunia, Keraniganj, Khansama, Khetlal, Khoksa, Kishoreganj Sadar, Kumarkhali, Laksam, Lakshampur Sadar, Lohagara, Lohajang, Madaripur Sadar, Madhabpur, Madhupur, Mahadebpur, Maheshkhali, Manda, Manikganj Sadar, Manirampur, Mohanpur, Muktagachha, Muradnagar, Mymensingh Sadar, Nabinagar, Nachole, Nandail, Nandigram, Nangalkot, Naogaon Sadar, Naria, Narsingdi Sadar, Nawabganj, Nawabganj Sadar, Netrokona Sadar, Niamatpur, Nilphamari Sadar, Paba, Pabna Sadar, Palash, Palong, Panchbibi, Parbatipur, Parshuram, Patiya, Patnitala, Porsha, Rajoir, Ramu, Rangunia, Raninagar, Ranisankail, Raozan, Royganj, Roypura, Rupganj, Sakhipur, Sapahar, Sarail, Sarishabari, Satkania, Sauria, Senbagh, Shahjapur, Shibpur, Sirajganj Sadar, Sonagazi, Sonargaon, Sreepur, Tangail Sadar, Tanore, Teknaf, Trishal, Ukhia, Ullah Para <b>(146 upazilas)</b>
<b>High (50.01 – 75%)</b>
<b>Very High (more than 75%)</b>

Source: Authors' calculation, based on the data from Minor Irrigation Survey Report 2007-08.

**Annex Table 4: Upazilas Irrigated under Diesel: FY2007-08**

<b>No diesel-driven irrigation</b>
Hatiya, Manpura, Mongla <b>(3 upazilas)</b>
<b>Negligible (up to 100 ha)</b>
Belai Chhari, Betagi, Bhandaria, Mirzaganj, Patuakhali Sadar, Ramu, Thanchi <b>(7 upazilas)</b>
<b>Low (101 – 1,000 ha)</b>
Alikadam, Bamna, Bandar, Bandarban Sadar, Barguna Sadar, Barkal, Bauphal, Chittagong City, Companyganj, Dacope, Dashmina, Fenchuganj, Galachipa, Haim Char, Jaintiapur, Jurai Chhari, Kachua, Kala Para, Kanaighat, Kanthalia, Kaptai, Kawkhali, Kawkhali (Betbunia), Lakshnichhari, Manikchhari, Mathbaria, Munshiganj Sadar, Naikhongchhari, Nanner Char, Narayanganj Sadar, Nesarabad, Patharghata, Pirojpur Sadar, Rajapur, Rajasthali, Ramgarh, Rangamati Sadar, Rowangchhari, Sarankhola, Sitakunda, Teknaf, Tongibari, Zakiganj <b>(43 upazilas)</b>
<b>Medium (1,001 – 5,000 ha)</b>
Akhaura, Alfadanga, Amtali, Anowara, Babuganj, Baghai Chhari, Bakerganj, Balaganj, Banari Para, Barlekha, Batiaghata, Beani Bazar, Bera, Bhairab, Bhedarganj, Bheramara, Bishwambarpur, Bishwanath, Boalia, Boalkhali, Chandanaish, Char Bhadrason, Char Rajibpur, Chauhali, Chhatak, Chilmari, Companyganj, Daganbhuiyan, Damudya, Daulatkhan, Dhaka City (Tejgaon), Dighalia, Dighinala, Dohar, Dowarabazar, Fatikchhari, Gazaria, Goalandaghat, Golabganj, Gosairhat, Gowainghat, Harirampur, Hathazari, Hizla, Hossainpur, Kamalganj, Keraniganj, Khagrachhari Sadar, Khoksa, Khulna Sadar, Koyra, Kutubdia, Lama, Langadu, Lohagara, Lohajang, Mahalchhari, Maheshkhali, Matiranga, Moulvibazar Sadar, Mirsharai, Morrelganj, Nalchity, Naria, Nazirpur, Paikgachha, Palash, Palong, Panchhari, Parshuram, Patiya, Phultala, Rajnagar, Rajoir, Rampal, Ramu, Rangunia, Raozan, Roypur, Rupganj, Rupsa, Sadarpur, Satkania, Serajdikhan, Sonargaon, Sreemangal, Sreenagar, Sylhet Sadar, Tahirpur, Tazimuddin, Tetulia, Tungi Para, Ukhia, Zanjira <b>(94 upazilas)</b>
<b>High (5,001 – 10,000 ha)</b>
Agailjhara, Ajmiriganj, Akkelpur, Araihasar, Assasuni, Atgharia, Atpara, Austagram, Bagati Para, Bagerhat Sadar, Bagha, Bahubal, Bajitpur, Banchharampur, Banshkhali, Barisal Sadar, Basail, Belabo, Belkuchi,

Bhanga, Bhangura, Bhola Sadar, Bholahat, Bhuapur, Brahman Para, Burhanuddin, Burichang, Chandina, Chandpur Sadar, Charghat, Chhagalnaiya, Chunarughat, Daulatpur, Debhata, Delduar, Dewanganj, Dhobaura, Domar, Fakirhat, Faridganj, Faridpur, Feni Sadar, Fulchhari, Gaurnadi, Ghior, Ghoraghat, Habiganj Sadar, Hajiganj, Hakimpur, Homna, Ishwardi, Itna, Jagannathpur, Jamalganj, Jhalokathi Sadar, Jhenaigati, Kaliakair, Kaliganj, Kamarkhanda, Karimganj, Katiadi, Kishoreganj Sadar, Kotchandpur, Kulaura, Kuliari Char, Lakhai, Laksam, Lalmohan, Lalpur, Lohagara, Madaripur Sadar, Madhabpur, Matlab, Mehendiganj, Mithamain, Mollahat, Muladi, Nawabganj, Nikli, Noakhali Sadar, Pabna Sadar, Pakundia, Panchagarh Sadar, Phulbari, Porsha, Ramganj, Sadar, Saidpur, Santhia, Sauria, Savar, Senbagh, Shahrasti, Shib Char, Shibhalaya, Shibpur, Shyamnagar, Sonagazi, Sreepur, Sunamganj Sadar, Tarail, Terokhada ( <b>103 upazilas</b> )
<b>Very high (&gt; 10,000 ha)</b>
Abhaynagar, Adamdighi, Aditmari, Alamdanga, Atrai, Atwari, Badalgachhi, Badarganj, Bagher Para, Baghmara, Bakshiganj, Baliakandi, Baliadangi, Baniachong, Baraigram, Barhatta, Barura, Begumganj, Bhaluka, Bhurungamari, Biral, Birampur, Birganj, Boalmari, Bochaganj, Boda, Bogra Sadar, Brahmanbaria Sadar, Chakaria, Char Fasson, Chatkhil, Chatmohar, Chauddagam, Chaugachha, Chirirbandar, Chitalmari, Chuadanga Sadar, Comilla Sadar, Damurhuda, Daudkandi, Daulatpur, Debidwar, Debiganj, Derai, Dhamoirhat, Dhamrai, Dharampasha, Dhunat, Dhupchanchia, Dimla, Dinajpur Sadar, Dumuria, Durgapur, Durgapur (Netrokona), Faridpur Sadar, Fulbari, Fulbaria, Gabtali, Gaffargaon, Gaibandha Sadar, Gangachara, Gangni, Gauripur, Gazipur Sadar, Ghatail, Gobindaganj, Godagari, Gomastapur, Gopalganj Sadar, Gopalpur, Gurudaspur, Haluaghat, Harinakunda, Haripur, Hatibandha, Ishwarganj, Islampur, Jaldhaka, Jamalpur Sadar, Jhenaidaha Sadar, Jhikargachha, Jiban Nagar, Joypurhat Sadar, Kachua, Kahaloo, Kaharole, Kalai, Kalaroa, Kalia, Kaliganj (Lalmoirhat), Kaliganj, Kalihati, Kalkini, Kalmakanda, Kapasia, Kasba, Kashiani, Kaunia, Kazipur, Kendua, Keshabpur, Khaliajuri, Khansama, Khetlal, Kishoreganj, Kotali Para, Jessore Kotwali, Kumarkhali, Kurigram Sadar, Kushtia Sadar, Lakshmipur Sadar, Lalmonirhat Sadar, Madan, Madarganj, Madhukhali, Madhupur, Magura Sadar, Mahadebpur, Maheshpur, Manda, Manikganj Sadar, Manirampur, Manohardi, Meherpur Sadar, Melandaha, Mirpur, Mirzapur, Mitha Pukur, Mohammadpur, Mohanganj, Mohanpur, Muksudpur, Muktagachha, Muradnagar, Mymensingh Sadar, Nabiganj, Nabinagar, Nachole, Nagarkanda, Nageshwari, Nakla, Nalitabari, Nandail, Nandigram, Nangalkot, Naogaon Sadar, Narail Sadar, Narsingdi Sadar, Nasirnagar, Natore Sadar, Nawabganj, Nawabganj Sadar, Netrokona Sadar, Niamatpur, Nilphamari Sadar, Paba, Palashbari, Panchbibi, Pangsha, Parbatipur, Patgram, Patnitala, Phulpur, Pirgachha, Pirganj, Pirganj (Thakurgaon), Purbadhala, Puthia, Rajarhat, Rajbari Sadar, Rangpur Sadar, Raninagar, Ranisankail, Raumari, Royganj, Roypura, Sadullapur, Saghatta, Sakhipur, Sapahar, Sarail, Sariakandi, Sarishabari, Satkhira Sadar, Shahjardpur, Shailakupa, Shalikhia, Sharsha, Sherpur, Sherpur Sadar, Shibganj (Bogra), Shibganj, Singair, Singra, Sirajganj Sadar, Sonatola, Sreebardi, Sreepur, Sujanagar, Sulla, Sundarganj, Tala, Tangail Sadar, Tanore, Taraganj, Tarash, Thakurgaon Sadar, Trishal, Ulipur, Ullah Para, Wazirpur ( <b>212 upazilas</b> )

**Source:** Authors' calculation, based on the data from Minor Irrigation Survey Report 2007-08.

**Annex Table 5: Percentage of Area under Diesel: FY2007-08**

<b>No diesel-driven irrigation</b>
Hatiya, Mongla, Sandwip ( <b>3 upazilas</b> )
<b>Medium (50.01 – 70%)</b>
Adamdighi, Akkelpur, Anowara, Araihasar, Atgharia, Bandar, Barura, Basail, Belabo, Belkuchi, Bhairab, Bhangura, Bholahat, Birampur, Boalkhali, Bogra Sadar, Brahman Para, Burichang, Chandina, Chatmohar, Chauddagam, Chirirbandar, Chittagong City, Comilla Sadar, Companyganj, Daganbhuiyan, Debidwar, Delduar, Dhamrai, Dhupchanchia, Dinajpur Sadar, Dohar, Domar, Fatikchhari, Feni Sadar, Fulbaria, Ghoraghat, Godagari, Gomastapur, Gopalpur, Hajiganj, Hakimpur, Hossainpur, Ishwardi, Ishwarganj, Jamalpur Sadar, Joypurhat Sadar, Kachua, Kahaloo, Kalai, Kaliakair, Kaliganj, Kalihati, Kamarkhanda, Kasba, Kaunia, Khetlal, Laksam, Lohagara, Madaripur Sadar, Madhupur, Mahadebpur, Maheshkhali, Manda, Mohanpur, Muktagachha, Muradnagar, Mymensingh Sadar, Nabinagar, Nachole, Nandail, Nandigram, Nangalkot, Naogaon Sadar, Narsingdi Sadar, Nawabganj Sadar, Nawabganj, Niamatpur, Pabna Sadar, Palash, Palong, Panchbibi, Parshuram, Patiya, Patnitala, Porsha, Rajoir, Ramu, Rangunia, Raozan, Rupganj Sadar, Sakhipur, Satkania, Sauria, Senbagh, Shibpur, Sirajganj Sadar, Sonagazi, Sonargaon, Tanore, Teknaf, Trishal, Ukhia, Ullah Para ( <b>105 upazilas</b> )
<b>High (70.01 – 99%)</b>

<p>Abhaynagar, Aditmari, Agailjhara, Ajmiriganj, Akhaura, Alamdanga, Alfadanga, Alikadam, Amtali, Assasuni, Atpara, Atrai, Atwari, Austagram, Babuganj, Badalgachhi, Badarganj, Bagati Para, Bagerhat Sadar, Bagha, Bagher Para, Baghmara, Bahubal, Bajitpur, Bakerganj, Bakshiganj, Balaganj, Baliakandi, Baliadangi, Banari Para, Banchharampur, Bandarban Sadar, Baniachong, Banshkhali, Baraigram, Barhatta, Barisal Sadar, Batiaghata, Begumganj, Bera, Bhaluka, Bhanga, Bhedarganj, Bheramara, Bhola Sadar, Bhuapur, Bhurungamari, Biral, Birganj, Bishwambarpur, Boalia, Boalmari, Bochaganj, Boda, Brahmanbaria Sadar, Burhanuddin, Chakaria, Chandanaish, Chandpur Sadar, Char Bhadrasan, Char Fasson, Charchat, Chatkhil, Chaugachha, Chhagalnaiya, Chhatak, Chilmari, Chitalmari, Chuadanga Sadar, Chunarughat, Companyganj, Damudya, Damurhuda, Daudkandi, Daulatkhan, Daulatpur, Daulatpur, Debhata, Debiganj, Dewanganj, Dhaka City (Tejgaon), Dhamoirhat, Dhobaura, Dhunat, Dighalia, Dighinala, Dimla, Dowarabazar, Dumuria, Durgapur, Fakirhat, Faridganj, Faridpur, Faridpur Sadar, Fenchuganj, Fulbari, Fulchhari, Gabtali, Gaffargaon, Gaibandha Sadar, Gangachara, Gangni, Gauripur, Gournadi, Gazaria, Gazipur Sadar, Ghatail, Ghior, Goalandaghat, Gobindaganj, Gopalganj Sadar, Gosairhat, Gowainghat, Gurudaspur, Habiganj Sadar, Haluaghat, Harinakunda, Haripur, Harirampur, Hathazari, Hatibandha, Hizla, Homna, Islampur, Itna, Jaintiapur, Jaldhaka, Jamalganj, Jhenaidaha Sadar, Jhenaihati, Jhikargachha, Jiban Nagar, Kaharole, Kalaroa, Kalia, Kaliganj, Kalkini, Kalmakanda, Kamalganj, Kapasia, Kaptai, Karimganj, Kashiani, Katiadi, Kawkhali (Betbunia), Kazipur, Kendua, Keraniganj, Keshabpur, Khansama, Khoksa, Kishoreganj, Kishoreganj Sadar, Kotali Para, Kotchandpur, Kotwali Koyra, Kulaura, Kuliar Char, Kumarkhali, Kurigram Sadar, Kushtia Sadar, Lakhai, Lakshmipur Sadar, Lalmonirhat Sadar, Lalpur, Lama, Lohagara, Lohajang, Madan, Madarganj, Madhabpur, Madhukhali, Madhupur, Magura Sadar, Maheshpur, Manikganj Sadar, Manirampur, Manohardi, Matlab, Mehendiganj, Meherpur Sadar, Melandaha, Mirpur, Mirsharai, Mirzapur, Mitha Pukur, Mithamain, Mohammadpur, Mohanganj, Muksudpur, Muladi, Munshiganj Sadar, Nabiganj, Nagarkanda, Nageshwari, Naikhongchhari, Nakla, Nalitabari, Narail Sadar, Narayanganj Sadar, Naria, Nasirnagar, Natore Sadar, Nawabganj Sadar, Netrokona Sadar, Nikli, Nilphamari Sadar, Noakhali Sadar, Paba, Paikgachha, Pakundia, Palashbari, Panchagarh Sadar, Panchhari, Pangsha, Parbatipur, Patgram, Phulbari, Phulpur, Phultala, Pirgachha, Pirganj, Purbadhala, Puthia, Rajarhat, Rajbari Sadar, Ramganj, Ramgarh, Rangpur Sadar, Raninagar, Ranisankail, Raumari, Royganj, Roypur, Roypura, Ramu, Rupsa, Sadarpur, Sadullapur, Saghatta, Saidpur, Santhia, Sapahar, Sarail, Sarankhola, Sariakandi, Sarishabari, Satkhira Sadar, Savar, Serajdikhan, Shahjadpur, Shahrasti, Shailakupa, Shalikka, Sharsha, Sherpur, Sherpur Sadar, Shib Char, Shiblaya, Shibganj, Singair, Singra, Sonatola, Sreebardi, Sreenagar, Sreepur, Sujanagar, Sunamganj Sadar, Sundarganj, Sylhet Sadar, Tahirpur, Tala, Tangail Sadar, Taraganj, Tarail, Tarash, Tazimuddin, Tetulia, Terokhada, Thakurgaon Sadar, Ulipur, Wazirpur, Zanjira (<b>290 upazilas</b>)</p>
<p><b>Fully diesel-driven</b></p>
<p>Baghai Chhari, Bamna, Barguna Sadar, Barkal, Barlekha, Bauphal, Beani Bazar, Belai Chhari, Betagi, Bhandaria, Bishwanath, Char Rajibpur, Chauhali, Dacope, Dashmina, Derai, Dharampasha, Galachipa, Golabganj, Haim Char, Jagannathpur, Jhalakathi Sadar, Jurai Chhari, Kachua, Kala Para, Kanaighat, Kanthalia, Kawkhali, Khagrachhari Sadar, Khaliajuri, Khulna Sadar, Kutubdia, Lakshmichhari, Lalmohan, Langadu, Mahalchhari, Manikchhari, Manpura, Mathbaria, Matiranga, Moulovibazar Sadar, Mirzaganj, Mollahat, Morrelganj, Nalchity, Nanner Char, Nazirpur, Nesarabad (SwarupKathi), Patharghata, Patuakhali Sadar, Pirojpur Sadar, Rajapur, Rajasthali, Rajnagar, Ramgati, Rampal, Rangamati Sadar, Rowangchhari, Shyamnagar, Sitakunda, Sreemangal, Sulla, Thanchi, Tongibari, Tungi Para, Zakiganj (<b>66 upazilas</b>)</p>

**Source:** Authors' calculation, based on the data from Minor Irrigation Survey Report 2007-08.

**Note:** No upazila under negligible (0-20%) and low (20.01-50%) category.

