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Public food grain storage facilities in Bangladesh

An assessment of functionality, repair needs, and alternative usage

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ACRONYMS AND ABBREVIATIONS

BIDS	Bangladesh Institute of Development Studies
BDT	Bangladesh Taka
CI	Corrugated Iron
CSD	Central Storage Depot
DC Food	District Controller of Food
DG Food	Directorate General of Food
DSGD	Development Strategy and Governance Division
FAO	Food and Agriculture Organization of the United Nations
FPMU	Food Planning and Monitoring Unit
GI	Galvanized Iron
GIS	Geographic Information System
GPS	Global Positioning System
HBB	Herringbone Bond
IFPRI	International Food Policy Research Institute
IFPRP	Integrated Food Policy Research Program
JV	IFPRI-BIDS-UIUC Joint Venture
LC	Lime Concrete
LSD	Local Supply Depot
MFSP	Modern Food Storage Facilities Project
MS	Mild Steel
MT	Metric tons
NCF	Neat Cement Finishing
NGO	Non-Government Organization
O/C LSD	Officer-in-Charge of the LSD
PFDS	Public Food Distribution System
PMU	Project Management Unit
RC Food	Regional Controller of Food
RCC	Reinforced Cement Concrete
TCB	Trading Corporation of Bangladesh
UIUC	University of Illinois at Urbana Champaign
WFP	World Food Programme

CHAPTER 1. INTRODUCTION

1.1 Background

The public food grain management in Bangladesh has evolved through tests of times. Initiated following the Bengal famine of 1943, the system has played important roles in dealing with food insecurity, maintaining price stability, as well as promoting green revolution in the country. However, the level of engagement—in both relative and absolute terms—has declined over the years. Compared to its operation in the 1970s and 1980s, currently the program is limited to handling a much smaller stock, with a mandate to achieve specific objectives targeted at specific beneficiaries (Ahmed, 2000; Benarjee, et al. 2014). At present there are 633 local supply depots (LSDs) distributed across 476 upazilas, 13 central storage depots (CSDs) constructed in different strategic locations of the country, 6 silos constructed at the critical seaports and river ports of the country, and 1 multistoried modern warehouse located in Santahar. The combined rated capacity of these facilities is 2,137,234 metric tons (MT). However, given the natural wear and tear, many of the facilities are partially or a few are completely ruined owing to dilapidated structures and poor maintenance. Consequently, actual or usable capacity is significantly lower in many of these facilities. Even though 8 modern food storage silos are being constructed to add to the capacity of the existing facilities[1], the total capacity would still be inadequate in view of the government's plan for expansion of storage capacity to 3 million MTs.

The Modern Food Storage Facilities Project (MFSP) was conceptualized in the above context. The project involves both constructing modern facilities as well as upgrading the existing ones. The central objectives of this investment are to (a) increase shelf life / storability of public grains and (b) ensure safety of the grains distributed from the public warehouses. This study is an attempt towards understanding the physical conditions of each of the public storage facilities in the county. There are two justifications for undertaking such a study:

1. **Public warehouses are getting old**. Most of the current public warehouses were constructed in the 1960s and 1970s—that is, they are 40 to 60 years old. Given the unprecedented changes in infrastructure and food security landscape, re-assessing the physical condition is now a necessity.

2. **Changes in technology:** Ensuring food safety is now an integral part of food security; and the building technology has evolved to address food safety in more efficient ways than the technologies of the 1960s and 1970s.

It is therefore pertinent to conduct a situation analysis of current physical conditions of the existing silos, CSDs, and LSDs and assess the needed repairs and refurbishments to make the worn-out facilities usable if there is adequate demand for these facilities. Alternatively, to recommend for divestment if there is hardly any demand for these facilities or to assess if the facilities need to be salvaged through dismantling. It is in this background the Directorate Generate of Food (DG Food) through the MFSP commissioned this study along with other relevant studies. To the best of our knowledge, this is the first study to undertake such a detailed data gathering exercise and associated analysis.

[1] A list of these future silo locations along with information regarding their capacity is provided as a Supplementary Table in **Appendix - A** (Table A.3).

1.2 Research Issues and Scope of Work

Informed administrative decision about a facility or any of its warehouses[2] needs to be based on rigorous assessment of the economic benefits and costs of improving the existing physical conditions. From a policy stand point, making such a decision requires answering some critical questions. Are the existing facilities adequate given the changes in the economic context of the country with regards to improved infrastructure, sustained growth, reduction in poverty, and proposed changes in the modalities (cash or kind) of disbursing benefits of social safety net programs? If the government does decide to improve the existing facilities at any cost, what would be the scope of the physical works? Is there any felt need for expansion of any facility through new construction of main structures or supporting infrastructures? If there are such genuine felt needs, is there available land or open space for such construction of structures and infrastructures within the premises? The study does not delve into many of these broader questions. Instead, it focuses on estimating the repair needs of the existing facilities in traditional ways. The study attempts to accomplish the following specific objectives:

1. Assess the physical conditions of the overall facilities as well as individual warehouses within each of them from the view point of safety and security of food grains stored;
2. Identify and quantify the needed repairs/reconstructions and new constructions to make the facility suitable for prospective use; and
3. Categorize the level of repairs required in terms of major, moderate and minor works at the facility and warehouse levels.

1.3 Approach and Methodology

The study began by characterizing the key features of the warehouse facilities. Typically, a public food grain storage facility has three key features—protective features, the main structure, and maintenance and access infrastructure. The protective features include a boundary wall with a secure main gate to ward off encroachment, theft and other mischievous and criminal activities. The main structure includes the warehouses where grains are stored. The maintenance and access infrastructure include drainage to prevent waterlogging, and an approach road for entry and exit of loaded/unloaded heavy vehicles such as trucks. In addition to these general aspects, further measures are required for proper functioning of each of the warehouses within the facility such as interior and exterior walls, floor, ceiling and roof as well as columns and beams, loading docks and canopies, drains, apron, together with security door and sliding door and ventilation facility. The quality of these warehouse-specific features ensures safety of the food grains stored, free of rodents, mold and infestation and loss of weight.

The study began with a list of key features of the warehouses, as presented in Table 1.1. A group of specialized enumerators (detailed later) equipped with the necessary devices and appliances were deployed to inspect, test wherever necessary, and take appropriate physical measurement of the features. These include detailed engineering assessment of the repair work of the damaged and worn out features. Wherever the features are totally absent at the time of the survey, measurement was taken for possible new construction of the features.

[2] Warehouses are popularly called godowns in Bangladesh and other parts of South Asia. Warehouse(s) will be used in place of godown(s) throughout the report except the Multistoried Modern Warehouse complex constructed in Santahar, which will be referred to as “Multistoried Modern Warehouse”.

Table 1.1 Ideal features of a standard food grain storage facility

Sl. No.	Infrastructures/Structures Assessed	Specific Items for Repair/Reconstruction
	Overall	
1	Approach Road	Broken, repair, and new construction of RCC[3]/HBB[4] roads
2	Main Drain	Broken/worn out, plaster, and new construction
3	Boundary Wall	Plaster, snowcem[5] painting, coping[6], column, new construction, and barbed wire
4	Main Gate	Painting, repair, and new construction
	Warehouse	
1	Interior walls (4)	Plaster, skirting[7] plaster, crack, and painting
2	Exterior walls (4)	Plaster, dado[8] plaster, crack, and snowcem painting
3	Floor	Plaster, depressed/worn out floor, and crack
4	Ceiling	Plaster, crack, exposure of reinforced bar, and painting
5	Column	Plaster, crack, exposure of reinforced bar, and painting
6	Beam	Plaster, crack, exposure of reinforced bar, and painting
7	Loading docks (2)	Nosing and angle, and plaster
8	Canopies (2)	Plaster with and without neat cement finishing, patent stone, and lime concrete
9	Roof	Screeding[9], and lime concrete
10	Warehouse drain	Broken/worn out, plaster, and new construction
11	Apron	Broken/worn out, plaster, and new construction

[3] **RCC** stands for reinforced cement concrete.
[4] **HBB** stands for herringbone bond.
[5] **Snowcem** is a waterproof paint with three main components: (i) **pigment** gives it color; (ii) **binder** or resin makes the pigment stick when the paint is applied and forms a solid layer of paint; and (iii) **carrier** or solvent keeps the paint in liquid form and evaporates once the paint is exposed to air.
[6] **Coping** is covering used on the exposed top of the wall to protect the masonry works from seepage, as well as to drain off the rain water.
[7] **Skirting** is done for the joint where the wall and floor join, like a 5–6" strip of marble or concrete protrusion to avoid seepage from joints. They are there to protect the bottom of the wall against being damaged by brooms, vacuums, and mops.
[8] **Dado** is the lower part of a wall, below the dado rail and above the skirting board.
[9] **Screeding** is the application of concrete to a floor or other surface to form a leveled layer.

Sl. No.	Infrastructures/Structures Assessed	Specific Items for Repair/Reconstruction
12	Sliding door	M.S. Section (F.I. Bar, Angle), M.S. Sheet, ball bearings, painting, and new construction
13	Security door	M.S. Section (F.I. Bar, Angle), G.I. Net, ball bearings, painting, and new construction
14	Ventilator	M.S. Section (F.I. Bar, Angle), M.S. Sheet, G.I. Net, glass, painting, and new construction

1.4 Survey Design and Implementation

This study is based on primary data generated through a census of public food grain storage facilities (i.e., LSDs, CSDs and silos) operated by the DG Food. The list of LSDs, CSDs and silos under the DG Food was collected before the initiation of the survey to ensure that the census is free of under-count. The field enumerators also kept close contacts with the concerned Regional Controller of Food (RC Food) and the District Controller of Food (DC Food). These field officers acted as conduits between the enumerators and the officials of the respective facilities.

The survey design and implementation involved three main activities: (a) development and programming of survey instruments, (b) recruitment and training of civil engineers as enumerators, and (c) collection and analysis of data. Each of these activities is detailed below.

1.4.1 Survey Instrument

To address the issues raised above, a survey instrument with three modules was developed. The development of the survey questionnaire relied on inputs from the PMU, officials from the DG Food, and scoping field visits and consultations with the concerned officials of the storage facilities. The first module deals with the contextual information about the location of the facility, current functionality, total stocks held at the time of interview with the concerned official, requirement for new construction, and transfer and rental value of land in the neighborhood of the facility to gauge the market valuation of the facility itself. The second module is a repair estimate form used to collect data and information on damages to individual line items for each of the warehouses within the facility. Finally, the third module is an overall infrastructure repair estimate form used to collect data and information on damages to infrastructures and repair needs for the entire facility.

First drafts of the modules were used for training of enumerators. Feedback from the training was used to develop a revised draft to be used for pre-testing; and the feedback from the pre-testing was used to develop the final questionnaire. Alongside the paper-based questionnaire, a customized Computer-Assisted Personal Interview (CAPI) form was developed using SurveyCTO for Android. The CAPI form included skip logic and value constraints to minimize data entry error. During the training, enumerators were trained to collect data using Android tablets, and to upload the data on a regular interval onto a dedicated server for the study (at: https://bifprp.surveycto.com).

1.4.2 Selection of Enumerators, Training, and Pre-testing

A total of 30 of diploma civil engineers, out of 47 short-listed, were selected through proper interview and grading process that consisted of five criteria: educational qualifications, experience, ability to use to

computer/tablet, communication skill, and personality in June 2017. The panel of interviewers consisted of experts and consultants from the IFPRI-led JV, and the DG Food. The selected enumerators were asked to join the training event to be held at the Bangladesh Institute of Development Studies (BIDS) from July 17 to 20, 2017.

The training event was conducted by a panel consisting of personnel from the IFPRI-led JV with active inputs from the officials and experts from the PMU. The 4-day long training was broken down into 5 themes for the convenience of the trainees. After inauguration, a major part of the **first day** was devoted to emphasizing the importance of this research in downstream policy decisions, the uniqueness of the survey – the first of its kind in Bangladesh, and the need for quality data to make these decisions possible. The **second day** of the training was devoted to thoroughly explaining the questionnaire to the enumerators. Moreover, the enumerators were introduced to the online data collection tool, SurveyCTO, and how to input data in the software.

In close cooperation with the DG Food, the IFPRI-led JV organized a simulated activity for the enumerators to assess warehouses at the Tejgaon CSD on the **third day**. During the pre-testing, the enumerators worked in small groups to assess physical conditions of selected warehouses and input the collected data using SurveyCTO. The simulation increased both technical capacity and confidence of the enumerators to conduct the field survey.

On the **last day** of the training, the paper and electronic questionnaires were updated, and final versions of the tools were shared with the enumerators. After a brief recap, necessary logistics and tablets for data collection from the field were handed over to the enumerators. In summary, the hands-on training helped to increase competency and capacity of the enumerators and attuned them to the survey tools and data collection process.

1.5 Field Operators and Data Collection

Data collection at the facilities started in July 25, 2017 and continued till October 17, 2017, using both paper-based instruments and electronic tablets. Enumerators initially filled out a paper questionnaire and then entered data on to pre-programmed Android tablets using SurveyCTO. Data were uploaded on a regular interval on to a dedicated server for the study. Raw data thus uploaded were extracted periodically from the server to check for logical consistency and entry errors. The entered data were further cross-checked with the completed paper-version of the questionnaire for consistency and validity. Enumerators were also monitored on a regular basis through daily phone calls with them as well as the respective host facility managers, and through scheduled field visits.

All repair measurements were re-checked by a team of two enumerators supervised by the Field Survey Coordinator employed especially for this purpose. Once the measurements for the repair works were verified, these measurements that were found formed the basis for categorizing repairs as minor, moderate, major or if the structure should be demolished.

The report is organized as follows: After this introductory **Chapter 1**, characteristics of the facilities are presented in **Chapter 2**. The current physical conditions, repair and new construction needs of infrastructures and the warehouses within the facilities are presented in **Chapter 3**. **Chapter 4** presents categories indicating the level of repair required at both the facility and warehouse levels. **Chapter 5** explores the infrastructure conditions and recommends dismantling or divesture of those storage facilities that have been found non-functional. Finally, **Chapter 6** presents a summary and conclusions.

CHAPTER 2. CHARACTERISTICS OF THE FACILITIES

This chapter presents the characteristics of all public food grain storage facilities in the country. The summary statistics are presented by division, including the new division Mymensingh, under six sub-sections, ranging from land utilization to review of past repairs. This section presents an overview and summary of those data.

2.1 Land Utilization of the Facilities

The premises of the storage facilities are usually used for construction of warehouses, and ancillary such office space and residential buildings for the officers and staff of the facility and other structures for smooth operations of business. Besides, facilities often have open space some of which can be used for construction of new warehouses. It is thus essential to have a clear idea about the utilization of the premises for different purposes. Table 2.1 presents the total area (in acres) of the premises and the utilization of the space for storage of food grains across the divisions.

Table 2.1 Land area of the premises and utilization for warehouses

Division	Indicator	Facility type			Total
		LSD	CSD	Silo	
Barishal	Total area (acres)	110	25	-	135
	Area per facility (acres)	1.60	24.62	-	1.93
	Area used for storage (%)	24	10	-	24
Chattogram	Total area (acres)	190	97	63	350
	Area per facility (acres)	1.65	32.39	31.50	2.92
	Area used for storage (%)	19	29	20	19
Dhaka	Total area (acres)	177	41	29	247
	Area per facility (acres)	1.90	13.68	29.21	2.55
	Area used for storage (%)	22	19	8	22
Mymensingh	Total area (acres)	77	21	-	98
	Area per facility (acres)	1.64	20.99	-	2.04
	Area used for storage (%)	22	28	-	23
Khulna	Total area (acres)	131	110	45	285
	Area per facility (acres)	1.74	54.77	22.43	3.61
	Area used for storage (%)	20	23	4	20
Rajshahi	Total area (acres)	182	67	60	309
	Area per facility (acres)	1.94	33.45	60.00	3.18
	Area used for storage (%)	24	29	1	24
Rangpur	Total area (acres)	178	10	-	188
	Area per facility (acres)	2.02	10.00	-	2.11
	Area used for storage (%)	29	9	-	29
Sylhet	Total area (acres)	83	-	-	83
	Area per facility (acres)	1.59	-	-	1.59
	Area used for storage (%)	17	-	-	17
National	**Total area (acres)**	**1,127**	**370**	**197**	**1,695**

Division	Indicator	Facility type			Total
		LSD	CSD	Silo	
	Area per facility (acres)	**1.78**	**28.48**	**32.85**	**2.60**
	Area used for storage (%)	**22**	**23**	**10**	**22**

Source: IFPRI-BIDS-UIUC Survey, 2017

At the national level, the average area per LSD is about 1.78 acres, ranging from 1.59 acres in Sylhet to 2.02 acres in Rangpur. Land utilization estimates show that only about 22% of the area in the LSD premises is occupied by warehouses, which appears to be the case in most of the divisions, except for Rangpur, where 28% is occupied by warehouses. The average area of CSD premises is 28.48 acres and that of silo is 32.85 acres. While warehouses occupy about 23% of the total area in the case of CSD, it goes down to 10% in the case of silo. These estimates imply that 78% of the area in the case of LSD, about 77% of the total area in the case of CSD and more than 90% of the total area in the case of silo is occupied by ancillary structures and infrastructures or remains unoccupied as open space.

2.2 Total and Functional Facilities

The survey identified a total of 633 LSDs, 13 CSDs, 6 silos, and 1 multistoried modern warehouse[10], giving a total of 653 storage facilities across different administrative divisions (Table 2.2). It may be noted about 29% of the facilities are located in Rajshahi and Rangpur, the so-called rice granary of the country. Chattogram and Dhaka respectively account for about 33% of the facilities.

The study also collected data on the functional status of the storage facility. Following DG Food's convention, a facility is termed as functional if it was used for procurement and/or storage and/or distribution operations at the time of the survey. Given this definition, overall, 577 LSDs (91%), 11 CSDs (85%), 5 silos (83%), and 1 multistoried modern warehouse (100%) were found to be functional (Table 2.2). Notice that the functionality status is worst in Barishal division (64%). Given that head count poverty rate in Barishal (26.5%) is higher than national average of 24.3% (BBS, 2017)[11], it can be assumed that social safety net activities in the division play a dominant role. Therefore, this estimate might seem counter-intuitive at first glance. However, when these warehouses were constructed, Barishal used to be the granary of Bangladesh. Procurement was a consideration at that time, which changed significantly after green revolution made inroads. Among the 8 divisions, Rangpur has the highest level (100%) of functional LSDs and Barishal has the lowest percentage (64%) of functional LSDs. Functionality of LSDs in Chattogram (91%), Dhaka (96%), Mymensingh (94%), Khulna (93%), Rajshahi (98%) and Sylhet (87%) divisions falls in between.

[10] This modern warehouse is rated to house a total of 25,000 MT of food grain. While this modern warehouse was identified during the census, no data were collected from the facility. It is also excluded from all calculations involving warehouses in this report.

[11] Preliminary Report on Household Income and Expenditure Survey, 2016. Bangladesh Bureau of Statistics.

Table 2.2 Number of total and functional storage facilities

Division	Indicator	Facility type				Total
		LSD	CSD	Silo	Multistoried Modern Warehouse	
Barishal	Total facilities (Number)	69	1	-	-	70
	Functional facilities (Number)	44	0	-	-	44
	Functional facilities (%)	64	0	-	-	63
Chattogram	Total facilities (Number)	115	3	2	-	120
	Functional facilities (Number)	105	3	2	-	110
	Functional facilities (%)	91	100	100	-	92
Dhaka	Total facilities (Number)	93	3	1	-	97
	Functional facilities (Number)	89	2	1	-	92
	Functional facilities (%)	96	67	100	-	95
Mymensingh	Total facilities (Number)	47	1	-	-	48
	Functional facilities (Number)	44	1	-	-	45
	Functional facilities (%)	94	100	-	-	94
Khulna	Total facilities (Number)	75	2	2	-	79
	Functional facilities (Number)	70	2	1	-	73
	Functional facilities (%)	93	100	50	-	92
Rajshahi	Total facilities (Number)	94	2	1	1	98
	Functional facilities (Number)	92	2	1	1	96
	Functional facilities (%)	98	100	100	100	98
Rangpur	Total facilities (Number)	88	1	-	-	89
	Functional facilities (Number)	88	1	-	-	89
	Functional facilities (%)	100	100	-	-	100
Sylhet	Total facilities (Number)	52	-	-	-	52
	Functional facilities (Number)	45	-	-	-	45
	Functional facilities (%)	87	-	-	-	87
National	**Total facilities (Number)**	**633**	**13**	**6**	**1**	**653**
	Functional facilities (Number)	**577**	**11**	**5**	**1**	**594**
	Functional facilities (%)	**91**	**85**	**83**	**100**	**91**

Source: IFPRI-BIDS-UIUC Survey, 2017

2.3 Total and Functional Warehouses at Functional Facilities

There is a total of 2,743 warehouses across all LSDs and CSDs in Bangladesh. Of these, 2,123 are located at LSDs, and 620 at CSDs. At functional facilities, the census identified 2,615 warehouses consisting of 2,023 at functional LSDs and 592 at functional CSDs. These include both functional and non-functional warehouses. Repair estimates were only collected for those warehouses which were functional at the time of the survey and did not need to be dismantled (n = 2,461)[12]. A total of 140 warehouses need to be dismantled, and 14 were being newly constructed.[13] It was found that 2,306 (94%) of the 2,461 functional warehouses required repair (Table 2.3).

[12] There are 2,463 functional warehouses. Two of these are currently functional (i.e., food grain are still stored there despite their poor condition) but need to be dismantled. Therefore, the total number of functional warehouses that do not need to be dismantled is 2,461.

[13] The warehouses under construction were in Chattogram (1), Khulna (11) and Rangpur (2).

Table 2.3 Total, functional and worn-out warehouses at functional storage facilities

Division	Indicator	Need to be Dismantled	Under Construction	Functional	Functional but Repair Required	Total
Barishal	Number	9	-	140	136	149
	Percent	6	-	94	91	100
Chattogram	Number	8**	1	265	255	273
	Percent	3	0*	97	93	100
Dhaka	Number	23**	-	311	284	333
	Percent	7	-	93	85	100
Mymensingh	Number	12	-	147	125	159
	Percent	8	-	92	79	100
Khulna	Number	3	11	217	205	231
	Percent	1	5	94	89	100
Rajshahi	Number	14	-	369	366	383
	Percent	4	-	96	96	100
Rangpur	Number	12	2	361	343	375
	Percent	3	1	96	92	100
Sylhet	Number	4	-	116	113	120
	Percent	3	-	97	94	100
National (LSDs)	**Number**	**85**	**14**	**1,926**	**1,827**	**2,023**
	Percent	**4**	**1**	**95**	**90**	**100**
National (CSDs)	**Number**	**55**	**-**	**537**	**479**	**592**
	Percent	**9**	**-**	**91**	**81**	**100**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Percentage values marked (*) are reported as zero due to rounding error.

** Includes both non-functional as well as functional warehouses.

Table 2.4 Number of functional storage facilities requiring warehouses to be dismantled

Division	Indicator	None	1-2 Warehouses	3-4 Warehouses	≥ 5 Warehouses
Barishal	Number	37	7	-	-
	Percent	84	16	-	-
Chattogram	Number	98	7	-	-
	Percent	93	7	-	-
Dhaka	Number	73	13	3	-
	Percent	82	15	3	-
Mymensingh	Number	36	7	1	-
	Percent	82	16	2	-
Khulna	Number	67	3	-	-
	Percent	96	4	-	-
Rajshahi	Number	84	6	2	-
	Percent	91	7	2	-
Rangpur	Number	80	8	-	-
	Percent	91	9	-	-

Division	Indicator	None	1-2 Warehouses	3-4 Warehouses	≥ 5 Warehouses
Sylhet	Number	41	4	-	-
	Percent	91	9	-	-
National (LSDs)	**Number**	**516**	**55**	**6**	**-**
	Percent	**89**	**10**	**1**	**-**
National (CSDs)	**Number**	**3**	**2**	**2**	**4**
	Percent	**27**	**18**	**18**	**36**

Source: IFPRI-BIDS-UIUC Survey, 2017

Of the total 140 warehouses that need to be dismantled at functional facilities, 85 are located at LSDs and 55 at CSDs. This represents about 4% of warehouses at LSDs and 9% of warehouses at CSDs, respectively. Overall, 11% of functional LSDs have at least 1 warehouse that needs to be dismantled, compared to 72% of functional CSDs. Around 10% of these LSDs need 1-2 warehouses to be dismantled; by contrast, 36% of functional CSDs need at least 5 warehouses to be dismantled (Table 2.4).

2.4 Age Structure of the Facilities

As mentioned earlier, the public food grain storage facilities were constructed in the 1960s and 1970s and hence are rather old (Table 2.5). In terms of the age of establishment, the average age of LSDs across Bangladesh is 42.5 years; for each individual division, the age of LSDs ranges from the highest in Sylhet (44.6 years) and Chattogram (44 years), followed by Dhaka (43.5 years), Khulna (42.9 years), Mymensingh (42.6 years), Barishal (42.3 years), Rajshahi (41.3 years), and to the lowest in Rangpur (39.5 years). Nationally, the majority of LSDs fall within the 21-40-year age group (51%). The average age of the CSDs and silos are 54.3 years and 39 years respectively. Most CSDs (54%) and silos (67%) are 41-60 years old.

Table 2.5 Age distribution of the facilities

Division	Mean Age (years)	Indicator	Number of storage facilities by age group					Total
			1-20 years	21-40 years	41-60 years	>60 years	Age not known	
Barishal	42.3	Number	1	37	30	1	-	69
		Percent	1	54	44	1	-	100
Chattogram	44.0	Number	5	55	49	6	-	115
		Percent	4	48	43	5	-	100
Dhaka	43.5	Number	6	45	29	8	5	93
		Percent	7	48	31	9	5	100
Mymensingh	42.6	Number	4	19	14	1	9	47
		Percent	9	40	30	2	19	100
Khulna	42.9	Number	-	44	28	2	1	75
		Percent	-	59	37	3	1	100
Rajshahi	41.3	Number	8	51	26	8	1	94
		Percent	9	54	28	9	1	100
Rangpur	39.5	Number	11	46	27	4	-	88
		Percent	13	52	31	5	-	100

Division	Mean Age (years)	Indicator	Number of storage facilities by age group					Total
			1-20 years	21-40 years	41-60 years	>60 years	Age not known	
Sylhet	44.6	Number	-	28	22	2	-	52
		Percent	-	54	42	4	-	100
National (LSDs)	**42.5**	**Number**	**35**	**325**	**225**	**32**	**16**	**633**
		Percent	**6**	**51**	**36**	**5**	**3**	**100**
National (CSDs)	**54.3**	**Number**	**-**	**2**	**7**	**4**	**-**	**13**
		Percent	**-**	**15**	**54**	**31**	**-**	**100**
National (Silos)	**39.0**	**Number**	**1**	**1**	**4**	**-**	**-**	**6**
		Percent	**17**	**17**	**67**	**-**	**-**	**100**
National (Multistoried Modern Warehouse)	**1.0**	**Number**	**1**	**-**	**-**	**-**	**-**	**1**
		Percent	**100**	**-**	**-**	**-**	**-**	**100**

Source: IFPRI-BIDS-UIUC Survey, 2017

Table 2.6 Age distribution of warehouses at functional storage facilities

Division	Mean Age (years)	Indicator	Number of warehouses by age group						Total
			1-20 years	21-40 years	41-60 years	>60 years	Age not known	Under construction	
Barishal	41.0	Number	7	73	64	4	1	-	149
		Percent	5	49	43	3	1	-	100
Chattogram	41.6	Number	21	121	112	10	8	1	273
		Percent	8	44	41	4	3	0*	100
Dhaka	41.8	Number	18	136	108	21	50	-	333
		Percent	5	41	32	6	15	-	100
Mymensingh	35.5	Number	21	72	34	1	31	-	159
		Percent	13	45	21	1	20	-	100
Khulna	39.5	Number	11	134	72	3	-	11	231
		Percent	5	58	31	1	-	5	100
Rajshahi	30.7	Number	96	195	64	12	16	-	383
		Percent	25	51	17	3	4	-	100
Rangpur	27.5	Number	102	122	52	2	95	2	375
		Percent	27	33	14	1	25	1	100
Sylhet	42.2	Number	5	70	34	9	2	-	120
		Percent	4	58	28	8	2	-	100
National (LSDs)	**36.6**	**Number**	**281**	**923**	**540**	**62**	**203**	**14**	**2,023**
		Percent	**14**	**46**	**27**	**3**	**10**	**1**	**100**
National (CSDs)	**37.0**	**Number**	**159**	**165**	**151**	**110**	**7**	**-**	**592**
		Percent	**27**	**28**	**26**	**19**	**1**	**-**	**100**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Percentage values marked (*) are reported as zero due to rounding error.

The survey also collected information on the age of warehouses[14] at functional facilities. On average, warehouses at both LSDs and CSDs are similar in age, at 36.6 years and 37 years old respectively (Table 2.6). Nearly half (46%) of the warehouses at LSDs are between 21-40 years old, compared to 28% of those at CSDs. Around 19% of warehouses at CSDs are older than 60 years, compared to just 3% at LSDs. The older warehouses at LSDs are concentrated in Dhaka, Chattogram and Sylhet (42 years), and the newer ones in Rangpur (28 years).

2.5 Rated and Usable Capacities of the Facilities

Data were collected on the rated and usable capacity of individual warehouses within the facility. The rated capacity was defined as the maximum amount of grain in MT that can be stored in a warehouse. However, the maximum capacity at times cannot be used because of wear and tear. Accordingly, the actual maximum capacity that can be used at the time of survey is termed as the functional capacity. While the rated capacity is recorded in the official document of the facility, the functional capacity of individual warehouse was assessed during data collection following the definition used by the DG Food.[15]

It was noted during the survey that some had reduced functional capacity due to circumstances specific to the warehouse despite being functional. For instance, a few warehouses in Khulna were found to have raised the level of the floor by several feet to avoid infiltration of water and consequent damage, which in turn reduced the overall storage capacity of the warehouse.

Overall, the total rated capacity across all public storage facilities in Bangladesh is 2,137,234 MT, and the functional capacity 1,931,363 MT (Table 2.7). This represents a non-functional capacity of 205,871 MT, which is 10% lower than the rated capacity. The gap between rated and functional capacity is estimated to be highest in the Barishal division (41%) and lowest in Rangpur, Rajshahi and Chattogram divisions (5%).

Table 2.7 Rated and functional capacity of the facilities

Division	Capacity	Facility type				Total
		LSD	CSD	Silo	Multistoried Modern Warehouse	
Barishal	Rated (MT)	105,750	22,780	-	-	128,530
	Functional (MT)	76,350	-	-	-	76,350
	Functional to Rated (%)	72	-	-	-	59
Chattogram	Rated (MT)	176,050	179,086	150,000	-	505,136
	Functional (MT)	155,700	171,706	150,000	-	477,406
	Functional to Rated (%)	88	96	100	-	95
Dhaka	Rated (MT)	194,108	64,000	50,000	-	308,108
	Functional (MT)	176,012	39,100	50,000	-	265,112
	Functional to Rated (%)	91	61	100	-	86
Mymensingh	Rated (MT)	91,250	32,500	-	-	123,750
	Functional (MT)	82,350	31,250	-	-	113,600

[14] The age estimates are based on only those warehouses for which the officer in charge could report the year of construction. The estimates also included those warehouses that need to be dismantled if the officer in charge reported the age but excludes those warehouses that are currently under construction.

[15] According to DG Food, a warehouse within a facility is functional if the space can be used for storage of grains.

Division	Capacity	Facility type				Total
		LSD	CSD	Silo	Multistoried Modern Warehouse	
	Functional to Rated (%)	90	96	-	-	92
Khulna	Rated (MT)	136,935	135,350	50,800	-	323,085
	Functional (MT)	117,085	125,950	50,000	-	293,035
	Functional to Rated (%)	86	93	98	-	91
Rajshahi	Rated (MT)	244,400	105,850	25,000	25,000	400,250
	Functional (MT)	231,300	97,460	25,000	25,000	378,760
	Functional to Rated (%)	95	92	100	100	95
Rangpur	Rated (MT)	271,375	4,750	-	-	276,125
	Functional (MT)	258,500	4,750	-	-	263,250
	Functional to Rated (%)	95	100	-	-	95
Sylhet	Rated (MT)	72,250	-	-	-	72,250
	Functional (MT)	63,850	-	-	-	63,850
	Functional to Rated (%)	88	-	-	-	88
National	**Rated (MT)**	**1,292,118**	**544,316**	**275,800**	**25,000**	**2,137,234**
	Functional (MT)	**1,161,147**	**470,216**	**275,000**	**25,000**	**1,931,363**
	Functional to Rated (%)	**90**	**86**	**100***	**100**	**90**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: The percentage value marked (*) is reported as 100 due to rounding error. The true value is 99.7%.

In order to characterize the current status, information was collected on the average functional capacity of individual warehouses. Table 2.8 describes the characteristics of two dominant size groups – rated capacities of 500 MT and 1,000 MT together with the all size groups (average rated capacity of 911 MT). However, there is large variation in size—ranging from 100 MT to up to 5,000 MT.

Table 2.8 Average functional capacity per warehouse at functional facilities by selected size

Division	Indicator	Warehouse rated capacity categories			
		500 MT warehouses	1,000 MT warehouses	All other sizes	All sizes
Barishal	Functional capacity (MT)	464	942	679	512
	Number of warehouses	130	12	7	149
Chattogram	Functional capacity (MT)	467	976	763	570
	Number of warehouses	216	53	4	273
Dhaka	Functional capacity (MT)	472	929	340	529
	Number of warehouses	274	45	14	333
Mymensingh	Functional capacity (MT)	452	1,000	0	518
	Number of warehouses	138	20	1	159
Khulna	Functional capacity (MT)	457	844	312	507
	Number of warehouses	197	31	3	231
Rajshahi	Functional capacity (MT)	488	932	800	603
	Number of warehouses	275	78	30	383
Rangpur	Functional capacity (MT)	480	981	489	689

Division	Indicator	Warehouse rated capacity categories			
		500 MT warehouses	1,000 MT warehouses	All other sizes	All sizes
	Number of warehouses	196	156	23	375
Sylhet	Functional capacity (MT)	478	1,000	310	495
	Number of warehouses	103	7	10	120
National (LSDs)	**Functional capacity (MT)**	**472**	**955**	**564**	**572**
	Number of warehouses	**1,529**	**402**	**92**	**2,023**
National (CSDs)	**Functional capacity (MT)**	**420**	**982**	**868**	**794**
	Number of warehouses	**173**	**299**	**120**	**592**

Source: IFPRI-BIDS-UIUC Survey, 2017

For all size groups, the average usable capacity of warehouses for LSDs and CSDs is estimated to be of 572 MT and 794 MT, respectively. The average functional capacity of warehouses at CSDs appear to be higher than that at LSDs. Across the divisions, the average functional capacity is relatively higher in northwestern region and lower the southern region. Specifically warehouses at LSDs in Rangpur have the highest usable capacity on average (689 MT), while those in Khulna have the lowest (507 MT).

2.6 Supporting Infrastructures of the Facilities

As the facilities deal with procurement and receipt as well as distribution and dispatch of grains, a few supporting infrastructures such as weighing bridge, pre-cleaning and drying facilities are required to ensure the quality of grain. Table 2.9 presents the incidence of availability of the supporting facilities by divisions.

Table 2.9 Availability of pre-cleaning, drying and weighing bridge facilities

Division	Indicator	Pre-cleaning Facility	Drying Facility	Weighing Bridge	Weighing Bridge is Functional
Barishal	Number	14	8	-	-
	Percent	32	18	-	-
Chattogram	Number	4	3	1	-
	Percent	4	3	1	-
Dhaka	Number	10	13	2	2
	Percent	11	15	2	100
Mymensingh	Number	3	4	4	3
	Percent	7	9	9	75
Khulna	Number	14	23	2	1
	Percent	20	33	3	50
Rajshahi	Number	4	20	6	6
	Percent	4	22	7	100
Rangpur	Number	17	34	8	4
	Percent	19	39	9	50
Sylhet	Number	9	6	3	1
	Percent	20	13	7	33
National (LSDs)	**Number**	**75**	**111**	**26**	**17**

Division	Indicator	Pre-cleaning Facility	Drying Facility	Weighing Bridge	Weighing Bridge is Functional
	Percent	**13**	**19**	**5**	**65**
National (CSDs)	**Number**	**1**	**1**	**10**	**9**
	Percent	**9**	**9**	**91**	**90**
National (Silos)	**Number**	**-**	**-**	**4**	**3**
	Percent	**-**	**-**	**80**	**75**

Source: IFPRI-BIDS-UIUC Survey, 2017

At the national level, 13% of the LSDs have pre-cleaning facilities, less than one-fifth have drying facilities, but only about 5% have weighing bridge facilities of which about two-thirds are functional. However, there are wide variations across the divisions. In Barishal division, 32% of the LSDs have pre-cleaning facilities, 18% have drying facilities, but none have weighing bridge facilities. About 4% of the LSDs in Chattogram have pre-cleaning facilities and 3% have drying facilities. Even though 1% of the LSDs in the division have weighing bridge facilities, they are not even functional. In Dhaka division, only 2% of the LSDs have weighing bridge facilities and all of them are functional. About 11% of the LSDs in the division have pre-cleaning facilities and 15% have drying facilities. In Mymensingh division, only 9% of the LSDs have weighing bridge facilities of which 75% are functional. About 7% the LSDs in the division have pre-cleaning facilities and 9% have drying facilities. In Khulna division, only 3% of the LSDs have weighing bridge facilities of which 50% are functional. About 20% of the LSDs in Khulna division have pre-cleaning facilities and 33% have drying facilities. In Rajshahi division, only 6.5% of the LSDs have weighing bridge facilities and all of them are functional. About 4% of the LSDs in the division have pre-cleaning facilities and 22% have drying facilities. The situation is relatively better in Rangpur division, where 9% of the LSDs have weighing bridge facilities, but only half of these are functional. Around 19% of the LSDs have pre-cleaning facilities and 39% have drying facilities. In Sylhet division, only 7% of the LSDs have weighing bridge facilities of which one-third are functional. About 20% of the LSDs in the division have pre-cleaning facilities and 13% have drying facilities.

Availability of weighing bridge facilities is higher in LSDs in Rangpur and Rajshahi divisions, and LSDs in Dhaka and Rajshahi divisions have the highest percentage of functional weighing bridges. Higher percentage of LSDs in Barishal and Rangpur divisions have pre-cleaning and drying facilities respectively. Chattogram division is worst for having both pre-cleaning and drying facilities. Among the 11 CSDs, 91% of facilities have weighing bridges of which 90% are functional, and 9% of them have pre-cleaning and drying facilities. Out of the 5 silos, 80% have weighing bridge facilities of which 75% are functional. It is not surprising that there is no pre-cleaning or drying facility in the silos as these facilities are not involved in direct procurement of paddy.

Table 2.10 Warehouses with functional weighing scales

Division	Indicator	Warehouses with functional weighing scales
Barishal	Number	122
	Percent	82
Chattogram	Number	186
	Percent	68
Dhaka	Number	246
	Percent	74
Mymensingh	Number	114
	Percent	72
Khulna	Number	132

Division	Indicator	Warehouses with functional weighing scales
	Percent	57
Rajshahi	Number	237
	Percent	62
Rangpur	Number	174
	Percent	46
Sylhet	Number	91
	Percent	76
National (LSDs)	**Number**	**1,302**
	Percent	**64**
National (CSDs)	**Number**	**376**
	Percent	**64**

Source: IFPRI-BIDS-UIUC Survey, 2017

On average, around 2 warehouses per LSD had functional weighing scales compared to roughly 34 warehouses per CSD. It is required to have functional weighing scales at each warehouse to weigh sacks as they are brought in and out of it. At LSDs, a total of 1,302 warehouses (64%) have functional weighing scales, compared to 376 warehouses (64%) at CSDs (Table 2.10).

CHAPTER 3. REPAIR NEEDS

This chapter presents the core results of the survey. In particular, it presents the estimates of needed repairs. The results are presented by division along with the national aggregates. It is worth noting here that the present survey has collected detailed disaggregated data, which are summarized in a user-friendly GIS data base. In that database, all warehouses are mapped, with detail data on type of facilities, repair needs, etc. It is expected that the database will be a useful tool for the policy makers to cross check and validate the information. The importance of access to such a tool is evident from the fact that the needs assessments are presented in 18 different subsections—reflecting the features discussed earlier in the report.

3.1 Repair and Construction of Approach Roads

An approach road is a critical component of a public food grain storage facility, as loaded vehicles enter because of procurement and/receipt and exit as result of distribution and/or dispatch. Usually the approach road is constructed during the initial years of the establishment of facility using RCC or HBB materials. However, the road may become less accessible with time due to factors such as natural wear and tear or adverse environmental impacts. Thus, periodic repair and maintenance is required to keep the approach road accessible round the year.

During the survey, data were collected on the status of the existing approach road. The first issue was if the road needs repair and/or new construction. If found legitimacy of such needs, the assessment issues were: broken road segment measured in cubic feet (cft.), repair of a road segment measured in square feet (sft.), and altogether new construction of a road segment measured in sft. Table 3.1 shows the number and percent of facilities that required such intervention, and the extent of physical works for both RCC and HBB roads across the divisions. About 34% of LSDs, 46% of CSDs and 17% of silos have broken RCC road; the incidence of broken RCC road appears to be highest in Mymensingh division (55%) and lowest in Barishal division (12%). The volume of physical works was found at 814 cft. per LSD; the highest volume was recorded in Rangpur division (1,194 cft.) and the lowest volume was recorded in Rajshahi division (451 cft.).

Table 3.1 Repair and construction of approach roads

Division	Indicator	RCC Road			HBB Road	
		Broken (cft.)	Repair (sft.)	Construction (sft.)	Broken (sft.)	Removal (sft.)
Barishal	Number	8	21	4	7	5
	Percent	12	30	6	10	7
	Civil works	1,111	3,660	2,460	516	363
Chattogram	Number	30	25	22	27	26
	Percent	26	22	19	23	23
	Civil works	625	2,635	1,597	1,319	1,254
Dhaka	Number	34	17	23	9	9
	Percent	37	18	25	10	10
	Civil works	602	2,510	6,067	444	444
Mymensingh	Number	26	5	14	2	1
	Percent	55	11	30	4	2
	Civil works	849	2,312	2,076	75	125
Khulna	Number	25	9	26	5	5

Division	Indicator	RCC Road			HBB Road	
		Broken (cft.)	Repair (sft.)	Construction (sft.)	Broken (sft.)	Removal (sft.)
	Percent	33	12	35	7	7
	Civil works	1,130	3,038	2,824	1,543	1,543
	Number	35	19	21	3	1
Rajshahi	Percent	37	20	22	3	1
	Civil works	451	4,827	2,131	367	24
	Number	34	43	32	22	22
Rangpur	Percent	39	49	36	25	25
	Civil works	1,194	2,894	3,113	1,651	1,651
	Number	25	15	11	6	4
Sylhet	Percent	48	29	21	12	8
	Civil works	869	1,919	1,481	385	339
	Number	**217**	**154**	**153**	**81**	**73**
National (LSDs)	**Percent**	**34**	**24**	**24**	**13**	**12**
	Civil Works	**814**	**3,047**	**2,926**	**1,121**	**1,150**
	Number	**6**	**6**	**3**	**2**	**1**
National (CSDs)	**Percent**	**46**	**46**	**23**	**15**	**8**
	Civil works	**904**	**8,242**	**27,867**	**2,450**	**3,000**
	Number	**1**	**-**	**1**	**-**	**-**
National (Silos)	**Percent**	**17**	**-**	**17**	**-**	**-**
	Civil works	**2,160**	**-**	**6,000**	**-**	**-**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per facility.

Further, about one quarter of LSDs (24%) and 46% of CSDs need repair of RCC road; the incidence of repair of RCC roads appears to be the highest in Rangpur (49%) and the lowest in Mymensingh division (11%). In addition, a nontrivial number of LSDs except those in Barishal lack completed RCC road, therefore new construction of road segment is required in those LSDs; the highest area of new construction was recorded in LSDs in Dhaka at 6,067 sft. and the lowest was recorded in LSDs in Sylhet at 1,481 sft. However, the percentage of LSDs requiring new construction of RCC road was recorded to be the highest in Rangpur division (36%).

About 13% of the LSDs reported broken HBB road segment. The incidence was the highest at 25% in Rangpur division and the lowest in Rajshahi division. The average recorded area was about 1,121 sft.; the highest average area was found in LSDs in Rangpur division (1,651 sft.) and the lowest average area was recorded in Mymensingh division (75 sft.). Besides broken HBB road, small segments of HBB road need removal of the misaligned bricks. Nationally it was found that 1,150 sft. of bricks need to be removed; the highest area was recorded in Rangpur division (1,651 sft.) and the lowest area was recorded in Rangpur division (24 sft.).

3.2 Repair and Construction of the Main Gate

The main gate is one of the critical components of the food grain storage facility. It facilitates both entry-exit of vehicles loaded with food grain and the night/security guard ensures security of the grain stored in the facility. As the main gate is made of steel components, the structure needs periodic repair and maintenance to restore broken rods and billets and painting to preempt rust formation that erodes strength and efficacy of

the gate. Table 3.2 presents the repair and painting needs of the main gate, and replacement of the gate with new construction where the existing structure is badly damaged, ruined or missing.

The complement to the good structure of the main gate is periodic painting. It was found that the main gate in 47% of LSDs, 46% of CSDs, and 50% of silos need painting. For the LSDs, the requirement of main gate painting is the highest in the Chattogram and Dhaka divisions (more than half each), and the lowest in Sylhet division (33%). However, the average area of painting was found to be the highest in Dhaka (505 sft.) and the lowest in Barishal (215 sft.) against the national average of 312 sft.

Table 3.2 Repair and construction of the main gate

Division	Indicator	Repair (sft.)	Painting (sft.)	Construction (sft.)
Barishal	Number	4	34	7
	Percent	6	49	10
	Civil Works	49	215	123
Chattogram	Number	27	61	33
	Percent	23	53	29
	Civil Works	125	294	155
Dhaka	Number	37	50	29
	Percent	40	54	31
	Civil Works	109	505	192
Mymensingh	Number	20	21	15
	Percent	43	45	32
	Civil Works	70	432	189
Khulna	Number	21	33	15
	Percent	28	44	20
	Civil Works	115	257	148
Rajshahi	Number	21	36	23
	Percent	22	38	24
	Civil Works	83	271	137
Rangpur	Number	32	43	32
	Percent	36	49	36
	Civil Works	110	232	159
Sylhet	Number	9	17	13
	Percent	17	33	25
	Civil Works	58	256	103
National (LSDs)	**Number**	**171**	**295**	**167**
	Percent	**27**	**47**	**26**
	Civil Works	**100**	**312**	**157**
National (CSDs)	**Number**	**3**	**6**	**5**
	Percent	**23**	**46**	**38**
	Civil Works	**118**	**478**	**443**
National (Silos)	**Number**	**1**	**3**	**1**
	Percent	**17**	**50**	**17**
	Civil Works	**50**	**792**	**383**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per facility.

The estimates show that the main gate needs to be repaired in 27% of LSDs, 23% of CSDs, and 17% of silos. For the LSDs, the requirement is the highest in Mymensingh division (43%) and lowest in Barishal division (6%). The average area that needs to be repaired was found at 100 sft. for the LSDs, 118 sft. for the CSDs, and 50 sft. for the silos. Across the divisions, the highest area was recorded in Chattogram (125 sft.) and the lowest area was recorded in Barishal (49 sft.).

For new construction, the percentage of LSDs requiring this work is highest in Rangpur division (36%), and the lowest in Barishal division (10%), against the national average of 26%. The average area of new construction was found at 157 sft. for LSDs, 443 sft. for CSDs, and 383 sft. for silos. Across divisions, the highest area was estimated in Dhaka (192 sft.) and the lowest area was estimated in Sylhet (103 sft.).

3.3 Repair and Construction of the Main Drain

Insofar as food grain is susceptible to moisture, the facility needs to ensure an adequate drainage system to quickly flush out rain or runoff water. The drainage system is usually brick-built to avoid erosion and siltation. However, the system needs periodic maintenance to ensure proper functioning. Table 3.3 shows the proportion of facilities needing repair works of drains with broken and worn-out segments, and removal of plasters. Besides, a section of the facilities needs construction of new drains.

Table 3.3 Repair and construction of the main drain

Division	Indicator	Broken (ft.)	Worn-out (sft.)	Plaster Removal (sft.)	Construction (ft.)
Barishal	Number	9	5	2	11
	Percent	13	7	3	16
	Civil works	67	75	25	73
Chattogram	Number	27	22	19	41
	Percent	23	19	17	36
	Civil works	44	29	30	212
Dhaka	Number	21	18	16	30
	Percent	23	19	17	32
	Civil works	86	163	169	312
Mymensingh	Number	12	16	15	21
	Percent	26	34	32	45
	Civil works	39	90	83	261
Khulna	Number	5	9	9	34
	Percent	7	12	12	45
	Civil works	84	80	80	778
Rajshahi	Number	13	16	13	23
	Percent	14	17	14	24
	Civil works	79	63	72	549
Rangpur	Number	25	26	14	52
	Percent	28	30	16	59
	Civil works	97	185	117	299
Sylhet	Number	21	10	5	8
	Percent	40	19	10	15
	Civil works	51	49	61	238

Division	Indicator	Broken (ft.)	Worn-out (sft.)	Plaster Removal (sft.)	Construction (ft.)
National (LSDs)	Number	133	122	93	220
	Percent	21	19	15	35
	Civil works	68	102	88	368
National (CSDs)	Number	6	5	5	5
	Percent	46	38	38	38
	Civil works	173	102	102	1,451
National (Silos)	Number	2	1	1	2
	Percent	33	17	17	33
	Civil works	2,757	500	500	9,200

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per facility.

It was found that 21% of the LSDs, 46% of the CSDs and 33% of the silos have segments of their main drain broken. Across the divisions, there are large variations per LSD; it ranges from low at 7% in Khulna to 40% in Sylhet. The average lengths broken were estimated at 68 ft., 173 ft. and 2,757 ft. for each of LSDs, CSDs and silos, respectively, with large variations in LSDs across divisions. The highest length was recorded in Rangpur (97 ft.) and the lowest length was recorded in Mymensingh (39 ft.).

In several facilities, a large segment of the main drain needs new construction to make it functional and effective. The percentage of LSDs reported requiring new construction is the highest (59%) in Rangpur division, and the lowest (15%) in Sylhet division. The longest average length was recorded in Khulna (778 ft.) and the shortest average length was recorded in Barishal (73 ft.).

In addition, information was collected on several segments of the main drain that have become totally worn out due to natural wear and tear, as well as the requisite area of plaster removal required in the process of repairing such segments. The percentage of LSDs reporting worn out segments of the main drain is highest (34%) in Mymensingh division, and lowest (7%) in Barishal division. The largest average area was recorded in Rangpur (185 sft.), and the smallest in Chattogram (29 sft.). As the area of plaster removal closely coincides with these estimates for worn out segments, they are not elaborated here in text.

3.4 Repair and Construction of the Boundary Wall

The boundary wall of the facility provides safety and security of the premises from transgression, theft and encroachment. Usually, the boundary wall involves masonry works with barbed wire fencing and secured steel gate for entry into and exit from the premises. The existing boundary wall needs periodic maintenance and if a segment is ruined or severely damaged, it needs new construction. The major masonry works involves plastering of the wall, removal of worn-out plaster, snowcem painting, and coping. Table 3.4 shows the incidence of facilities that needs such masonry works as well as the extent of works.

Table 3.4 Masonry works of the boundary wall

Division	Indicator	Plaster Removal (sft.)	New Plaster (sft.)	Snowcem Paint (sft.)	Coping (cft.)	Column (cft.)	Construction (ft.)
Barishal	Number	30	31	37	4	5	7

Division	Indicator	Plaster Removal (sft.)	New Plaster (sft.)	Snowcem Paint (sft.)	Coping (cft.)	Column (cft.)	Construction (ft.)
	Percent	43	45	54	6	7	10
	Civil works	3,341	3,235	12,601	31	35	157
	Number	62	66	90	32	22	53
Chattogram	Percent	54	57	78	28	19	46
	Civil works	5,887	5,729	12,393	15	19	408
	Number	63	66	71	50	29	43
Dhaka	Percent	68	71	76	54	31	46
	Civil works	4,777	4,633	10,225	48	45	745
	Number	30	30	36	25	17	23
Mymensingh	Percent	64	64	77	53	36	49
	Civil works	3,443	3,497	9,508	19	19	424
	Number	55	56	65	30	18	14
Khulna	Percent	73	75	87	40	24	19
	Civil works	13,733	13,682	15,140	29	22	248
	Number	58	60	70	36	38	21
Rajshahi	Percent	62	64	74	38	40	22
	Civil works	7,745	7,532	13,553	16	15	233
	Number	62	69	77	50	47	44
Rangpur	Percent	70	78	88	57	53	50
	Civil works	6,203	7,031	13,353	25	49	291
	Number	29	31	37	29	26	20
Sylhet	Percent	56	60	71	56	50	38
	Civil works	4,033	3,774	11,619	14	14	492
	Number	**389**	**409**	**483**	**256**	**202**	**225**
National (LSDs)	**Percent**	**61**	**65**	**76**	**40**	**32**	**36**
	Civil works	**6,621**	**6,624**	**12,507**	**25**	**29**	**425**
	Number	**6**	**8**	**9**	**5**	**4**	**2**
National (CSDs)	**Percent**	**46**	**62**	**69**	**38**	**31**	**15**
	Civil works	**29,664**	**24,398**	**60,524**	**186**	**294**	**1,980**
	Number	**1**	**2**	**3**	**2**	**2**	**-**
National (Silos)	**Percent**	**17**	**33**	**50**	**33**	**33**	**-**
	Civil works	**20,000**	**19,000**	**70,083**	**95**	**200**	**-**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per facility.

About 61% of boundary walls in the LSDs, 46% in the CSDs, and 17% in the silos need removal of worn-out plaster. The incidence of plaster removal in LSDs is the highest (73%) in Khulna division, and the lowest (43%) in Barishal division. Average works per facility was recorded at 6,621 sft. for LSDs, 29,664 sft. for CSDs, and 20,000 sft. for silos. There are variations in average area of the works across divisions; the highest area was recorded in Khulna (13,733 sft.) and the lowest area was recorded in Barishal (3,341 sft.).

Apart from removal of worn-out plaster, certain segments of the wall need new plastering. It has been found that about two-thirds of the LSDs, 62% of the CSDs, and one-third of the silos need new plastering of boundary walls. The percentage of LSDs that require plastering of boundary wall is the highest in Rangpur division (78%),

and lowest in Barishal division (45%). The area of physical works was recorded at 6,624 sft. for the LSDs, 24,398 sft. for the CSDs, and 19,000 sft. for the silos. Across divisions, the highest area was recorded in Khulna (13,682 sft.) and the lowest area was recorded in Barishal (3,235 sft.).

On average, boundary walls would require snowcem painting in 76% of the LSDs and 69% of CSDs, and 50% of the silos. Across divisions, the requirement in LSDs is the highest in Rangpur division (88%), and lowest in Barishal division (54%). About 12,507 sft. of snowcem painting is required for LSDs, 60,524 sft. for CSDs, and 70,083 sft. for silos, respectively. For the LSDs, the highest area was recorded in Rajshahi (13,553 sft.) and the lowest area was recorded in Mymensingh (9,508 sft.).

The percentages of boundary walls that require coping are 40% for LSDs, 38% of CSDs, and 33% for silos. Across the divisions, the percentage of LSDs that require coping of boundary wall is the highest in Sylhet division (56%), the lowest in Barishal division (6%). The volumes of works were estimated at 25 cft. for LSDs, 186 cft. for CSDs, and 95 cft. for silos. Among the LSDs across divisions, the highest volume was estimated in Dhaka (48 cft.) and the lowest was estimated in Sylhet (14 cft.).

In several cases, the columns of the boundary walls have become exposed that require additional works. The percentage of LSDs that require works on exposed columns of boundary wall is about 32%, compared to 31% for the CSDs and 33% for the silos. Across the divisions, the percentage of LSDs that require rehabilitation of column of boundary walls is the highest in Rangpur division (53%), and the lowest in Barishal division (7%). The volumes of works were estimated at 29 cft. in LSDs, about 294 cft. for CSDs and 200 cft. for silos. The highest volume of works was estimated in Rangpur (49 cft.) and the lowest volume was estimated in Sylhet (14 cft.).

Besides, several facilities across the divisions require new construction of boundary wall because of damaged or missing links. The census estimated that 36% of LSDs and 15% of CSDs require new construction of boundary walls; it is important to note that none of the silos require new construction. The division with the highest proportion of LSDs requiring new boundary wall construction is Rangpur (50%), while the lowest percentage was recorded in Barishal (10%). The average estimated length of construction was 425 ft. for LSDs, and 1,980 ft. for CSDs. The highest average length was recorded among LSDs in Dhaka division (745 ft.), and the lowest in Barishal (157 ft.).

Table 3.5 Barbed wire fencing of the boundary wall

Division	Indicator	Barbed wire repair (ft.)	Barbed wire in new wall (ft.)	Barbed wire with RCC pillars (sft.)
Barishal	Number	12	27	1
	Percent	17	39	1
	Civil works	978	1,059	986
Chattogram	Number	21	62	15
	Percent	18	54	13
	Civil works	369	645	1,086
Dhaka	Number	61	40	3
	Percent	66	43	3
	Civil works	638	507	226
Mymensingh	Number	30	16	9
	Percent	64	34	19
	Civil works	392	403	560
Khulna	Number	18	39	-

Division	Indicator	Barbed wire repair (ft.)	Barbed wire in new wall (ft.)	Barbed wire with RCC pillars (sft.)
	Percent	24	52	-
	Civil works	1,441	1,152	-
	Number	46	66	8
Rajshahi	Percent	49	70	9
	Civil works	782	674	1,349
	Number	70	40	2
Rangpur	Percent	80	45	2
	Civil works	821	662	165
	Number	16	17	6
Sylhet	Percent	31	33	12
	Civil works	562	609	786
	Number	**274**	**307**	**44**
National (LSDs)	**Percent**	**43**	**49**	**7**
	Civil works	**725**	**721**	**883**
	Number	**3**	**6**	**-**
National (CSDs)	**Percent**	**23**	**46**	**-**
	Civil works	**967**	**3,883**	**-**
	Number	**3**	**3**	**-**
National (Silos)	**Percent**	**50**	**50**	**-**
	Civil works	**1,220**	**1,220**	**-**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per facility.

In additional to masonry works, the top of the boundary walls needs to be secured with barbed wire fencing to ward off intrusion, transgression, and consequent adverse outcomes. It was found that 43% of boundary walls in LSDs, 23% in CSDs, and 50% in silos need repair of the barbed wire fencing (Table 3.5). For LSDs, the incidence is the highest in Rangpur division (80%), and lowest in Barishal division (17%). The average lengths of wire required were estimated at 725 ft. for the LSDs, 967 ft. for the CSDs, and 1,220 ft. for the silos. Across the LSDs the longest length was estimated in Khulna (1,441 ft.), and the shortest length was estimated in Chattogram (369 ft.).

Several facilities require construction of segment(s) of boundary wall, and the associated requirements of barbed wire fencing were also estimated. It was found that 49% of the LSDs, 46% of CSDs, and 50% of the silos need barbed wire on new segment(s) of boundary walls to be constructed. For LSDs, the incidence is the highest in Rajshahi division (70%), and lowest in Sylhet division (33%). The average length of barbed wire on new segment of the boundary wall was estimated at 721 ft. for the LSDs, 3,883 ft. for the CSDs, and 1,220 ft. for the silos. Across the divisions, the longest length was estimated in Khulna (1,152 ft.) and the shortest length was estimated in Mymensingh (403 ft.). Besides barbed wire fencing on new segments, and repair on the existing segments, a small section of the LSDs requires repair of pillar together with barbed wire fencing. Owing to the relatively low incidence of this kind of work, these estimates are not elaborated further in the report.

3.5 Repair of Warehouse Walls

Arguably the most critical component of each storage facility is the warehouse, where food grains are to be stored within acceptable moisture levels to prevent quality deterioration and weight loss prior to distribution or onward dispatch. While warehouses may vary in their design, most in Bangladesh fall within two categories – 500 MT and 1,000 MT warehouses, the former occupying an average area of 4,000 sft. and the latter 8,000 sft.

As one of the major outputs of the survey, data were collected on repair needs for each of the warehouses under a facility by individual structural features. For each of these features, repair measurements were collected. The structural features as well as a description of their underlying estimation items for repair were delineated in Table 1.1.

Warehouse walls are an integral part of its structure, providing a physical barrier to encroachments/ intrusions. Over time, walls are subject to much of the wear and tear that affects a warehouse, often showing cracks and damage to its layers of plaster and weatherproof paint. As such, this survey gathered repair measurements for both the interior and exterior portions of walls across all functional warehouses (Table 3.6 and Table 3.7).

Table 3.6 Repair of interior walls

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Skirting plaster removal (sft.)	New skirting plaster (sft.)	Crack (ft.)	Painting (sft.)
Barishal	Number of walls	292	293	305	308	179	498
	Percent of walls	52	52	54	55	32	89
	Civil works per wall	403	398	63	63	54	1,377
Chattogram	Number of walls	554	559	437	438	360	902
	Percent of walls	52	53	41	41	34	85
	Civil works per wall	139	137	36	36	65	1,407
Dhaka	Number of walls	645	648	423	429	285	921
	Percent of walls	52	53	34	35	23	74
	Civil works per wall	238	237	55	55	42	1,407
Mymensingh	Number of walls	270	270	107	107	75	449
	Percent of walls	46	46	18	18	13	76
	Civil works per wall	141	141	49	49	22	1,377
Khulna	Number of walls	371	373	498	502	246	794
	Percent of walls	43	43	57	58	28	91
	Civil works per wall	164	163	53	53	51	1,381
Rajshahi	Number of walls	744	757	646	673	755	1,175
	Percent of walls	50	51	44	46	51	80
	Civil works per wall	125	124	34	33	40	1,404
Rangpur	Number of walls	643	649	537	537	529	1,059
	Percent of walls	45	45	37	37	37	73
	Civil works per wall	94	93	60	60	29	1,485
Sylhet	Number of walls	197	199	196	199	262	402
	Percent of walls	42	43	42	43	56	87

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Skirting plaster removal (sft.)	New skirting plaster (sft.)	Crack (ft.)	Painting (sft.)
	Civil works per wall	69	68	97	95	23	1,306
National (LSDs)	**Number of walls**	**3,716**	**3,748**	**3,149**	**3,193**	**2,691**	**6,200**
	Percent of walls	**48**	**49**	**41**	**41**	**35**	**81**
	Civil works per wall	**163**	**162**	**51**	**51**	**42**	**1,405**
National (CSDs)	**Number of walls**	**682**	**696**	**351**	**362**	**511**	**1,547**
	Percent of walls	**32**	**32**	**16**	**17**	**24**	**72**
	Civil works per wall	**264**	**264**	**60**	**60**	**36**	**1,639**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per wall.

The survey found that 49% of the interior portion of walls at LSD warehouses and 32% at CSD warehouses required new plaster works. Across divisions, there is little variation, with the lowest proportion recorded in Sylhet (43%) and the highest in Chattogram and Dhaka (53%). However, there is sizeable variation across the divisions in the average area of new plaster work required, from as little as 68 sft. per wall in Sylhet to as much as 398 sft. in Barishal. The division-wide trends in these figures are closely aligned with those for plaster removal work, again ranging from 69 sft. in Sylhet to 403 sft. in Barishal. Nationally, 163 sft. of plaster need to be removed and 162 sft. of new plaster need to be applied per wall at LSD warehouses. At CSDs, there is considerably higher plaster removal and replacement work per wall (264 sft.), although a lower proportion of walls require plaster removal or replacement (32%) when compared to LSDs.

A telling sign of the damage to any wall is the appearance of cracks, which, if left unattended, can severely affect the structural integrity of the warehouse. Given their advanced age, it is perhaps unsurprising that 35% of all interior walls at LSD warehouses and 24% at CSD warehouses have cracks. In Sylhet, 56% of interior walls have cracks, compared to 13% in Mymensingh. The average length of such cracks is also lowest in Mymensingh (22 ft.), and highest in Chattogram (65 ft.). Nationally, the average length of cracks in the interior portion of each warehouse wall is 42 ft. for LSDs and 36 ft. for CSDs.

Following all repair work, much of the area covered by the interior walls needs to be painted. Nationwide, 81% of all interior walls at LSD warehouses need to be painted, with an average area of 1,405 sft. per wall. At CSDs, the corresponding figures are 72% and an average of 1,639 sft. per wall.

Many of the trends reported for interior wall repair hold true for exterior walls (Table 3.7). On average, 44% and 45% of exterior walls at LSD warehouses and 29% of walls at CSDs require plaster removal and new plaster, respectively. On the exterior portion of the wall, dado plaster requirements are largely analogous to those for skirting plaster in the wall's interior. On average, external walls at LSD warehouses have greater new dado plaster works requirements (62 sft.) compared to those at CSD warehouses (45 sft.). However, in the case of cracks, the average length is much greater (70 ft.) per external wall at CSD warehouses when compared to LSD warehouses (36 ft.).

In place of regular paint on the interior portion of walls, the external portions of warehouse walls require snowcem painting, much like boundary walls. On average, walls at LSD warehouses require 1,497 sft. of snowcem works, compared to 1,813 sft. per wall at CSD warehouses. There is little variation across divisions for LSD warehouses, with the highest requirements recorded in Rangpur (1,590 sft.) and the lowest in Sylhet (1,383 sft.).

Table 3.7 Repair of exterior walls

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Dado plaster removal (sft.)	New dado plaster (sft.)	Crack (ft.)	Snowcem (sft.)
Barishal	Number of walls	253	255	144	144	193	502
	Percent of walls	45	45	26	26	34	89
	Civil works per wall	466	466	102	103	49	1,389
Chattogram	Number of walls	584	590	362	374	328	926
	Percent of walls	55	56	34	35	31	88
	Civil works per wall	225	221	73	70	36	1,491
Dhaka	Number of walls	574	591	316	331	265	941
	Percent of walls	46	48	25	27	21	76
	Civil works per wall	228	223	61	60	57	1,494
Mymensingh	Number of walls	218	221	132	134	85	454
	Percent of walls	37	38	22	23	14	77
	Civil works per wall	108	112	36	38	20	1,496
Khulna	Number of walls	293	303	366	380	117	783
	Percent of walls	34	35	42	44	13	90
	Civil works per wall	160	157	102	102	32	1,497
Rajshahi	Number of walls	648	669	713	732	466	1,160
	Percent of walls	44	45	48	49	32	79
	Civil works per wall	126	125	48	47	37	1,509
Rangpur	Number of walls	652	659	531	535	491	1,064
	Percent of walls	45	46	37	37	34	74
	Civil works per wall	70	71	40	41	25	1,590
Sylhet	Number of walls	168	173	157	159	225	429
	Percent of walls	36	37	34	34	48	92
	Civil works per wall	150	145	84	83	25	1,383
National (LSDs)	**Number of walls**	**3,390**	**3,461**	**2,721**	**2,789**	**2,170**	**6,259**
	Percent of walls	**44**	**45**	**35**	**36**	**28**	**81**
	Civil works per wall	**176**	**174**	**62**	**62**	**36**	**1,497**
National (CSDs)	**Number of walls**	**616**	**630**	**283**	**299**	**508**	**1,665**
	Percent of walls	**29**	**29**	**13**	**14**	**24**	**78**
	Civil works per wall	**217**	**215**	**47**	**45**	**70**	**1,813**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per wall.

3.6 Repair of Warehouse Floors

Over time, warehouse floors can suffer varying degrees of damage, ranging from cracks to entire sections being depressed. Table 3.8 reports the works requirements for floor depressions, cracks, area worn out and plaster removal.

Table 3.8 Repair of warehouse floors

Division	Indicator	Depressed (cft.)	Crack (ft.)	Worn out (sft.)	Plaster removal (sft.)
Barishal	Number	3	100	60	58
	Percent	2	67	40	39
	Civil works	594	328	2,613	2,617
Chattogram	Number	18	114	179	177
	Percent	7	42	66	65
	Civil works	488	309	1,129	1,110
Dhaka	Number	24	155	193	186
	Percent	7	47	58	56
	Civil works	641	297	781	803
Mymensingh	Number	6	86	74	71
	Percent	4	54	47	45
	Civil works	159	332	425	406
Khulna	Number	6	90	135	131
	Percent	3	39	58	57
	Civil works	821	183	937	885
Rajshahi	Number	18	234	247	244
	Percent	5	61	64	64
	Civil works	1,415	214	934	928
Rangpur	Number	21	194	250	247
	Percent	6	52	67	66
	Civil works	419	268	996	1,007
Sylhet	Number	16	63	81	80
	Percent	13	53	68	67
	Civil works	322	256	942	903
National (LSDs)	**Number**	**112**	**1,036**	**1,219**	**1,194**
	Percent	**6**	**51**	**60**	**59**
	Civil works	**636**	**268**	**1,003**	**997**
National (CSDs)	**Number**	**12**	**183**	**230**	**215**
	Percent	**2**	**31**	**39**	**36**
	Civil works	**1,336**	**210**	**694**	**686**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

On average, only 6% of LSD warehouses and 2% of CSD warehouses have floors with depressed segments. While the average depressed floor area is 636 sft. at LSD warehouses, it is significantly higher at CSD warehouses (1,336 sft.). The other major item for floors is the area that is worn out. Around 60% of LSD warehouses and 39% of CSD warehouses have worn out floors, estimated at 1,003 sft. and 694 sft. per LSD and CSD warehouse, respectively. This is highest in Barishal (2,613 sft.) and lowest in Mymensingh (425 sft.).

3.7 Repair of Warehouse Ceilings

Damage to warehouse ceilings can lead to leaks and other persistent issues that can adversely affect grain storage. To assess ceiling repair needs, the survey collected information regarding plaster works, cracks, exposures of reinforced bars and painting requirements (Table 3.9).

Table 3.9 Repair of warehouse ceilings

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Crack (ft.)	Painting (sft.)	Reinforced bar exposure (sft.)
Barishal	Number	72	75	17	124	69
	Percent	48	50	11	83	46
	Civil works	2,285	2,197	363	4,632	818
Chattogram	Number	138	139	15	215	135
	Percent	51	51	6	79	50
	Civil works	514	510	113	5,006	229
Dhaka	Number	162	169	25	235	136
	Percent	49	51	8	71	41
	Civil works	754	729	363	4,687	329
Mymensingh	Number	45	47	6	102	60
	Percent	28	30	4	64	38
	Civil works	409	566	30	4,498	179
Khulna	Number	129	130	5	196	107
	Percent	56	56	2	85	46
	Civil works	914	914	23	4,704	1,068
Rajshahi	Number	165	173	33	277	162
	Percent	43	45	9	72	42
	Civil works	907	932	39	4,875	752
Rangpur	Number	146	147	20	255	162
	Percent	39	39	5	68	43
	Civil works	518	515	65	5,500	721
Sylhet	Number	64	65	22	90	50
	Percent	53	54	18	75	42
	Civil works	571	564	28	4,160	280
National (LSDs)	**Number**	**921**	**945**	**143**	**1,494**	**881**
	Percent	**46**	**47**	**7**	**74**	**44**
	Civil works	**820**	**823**	**143**	**4,860**	**579**
National (CSDs)	**Number**	**85**	**89**	**43**	**338**	**126**
	Percent	**14**	**15**	**7**	**57**	**21**
	Civil works	**737**	**750**	**289**	**7,269**	**1,365**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

Much of the repair work that needs to be done for warehouse ceilings involves plaster removal (820 sft. per LSD warehouse and 737 sft. per CSD warehouse) and replacement (823 sft. per LSD warehouse and 750 sft. per CSD warehouse). Only 7% of LSD and CSD warehouses each showed cracks. Nationally, 44% of ceilings at

LSD warehouses and 21% at CSD warehouses have exposed reinforced bars. The average area exposed is 579 sft. per LSD warehouse, but much higher (1,356 sft.) per CSD warehouse.

3.8 Repair of Warehouse Roofs

Ceiling damage is often indicative of damage to the roof of the warehouse. The major works considerations for warehouse roofs are screeding and lime concrete (LC) removal. Roof screeding refers to the application of concrete without steel reinforcement. Over time, repeated temperature fluctuations can cause cracks to appear in the screeding. LC terracing allows for insulation and waterproofing. The work requirements are reported in Table 3.10.

On average, 25% of roofs at LSD warehouses need 5,105 sft. of screeding work. Although there is not much regional variation, the work requirement per warehouse is highest in Rangpur (6,402 sft.), and lowest in Dhaka (4,417 sft.). Nearly half (45%) of all warehouse roofs require screeding work in Barishal division, compared to just 11% in Rajshahi. At CSDs, 15% of roofs need 6,754 sft. of screeding work on average.

Both the proportion of warehouses and the average work requirement for LC removal follow the trends as seen for screeding, as these works are associated with one another. Overall, 24% of roofs at LSD warehouses need 5,099 sft. of LC removal. At CSDs, 14% of roofs need 6,844 sft. of LC removal work on average.

Table 3.10 Repair of warehouse roofs

Division	Indicator	Screeding (sft.)	Removing LC (sft.)
Barishal	Number	67	64
	Percent	45	43
	Civil works	5,034	4,959
Chattogram	Number	73	69
	Percent	27	25
	Civil works	4,555	4,534
Dhaka	Number	100	98
	Percent	30	30
	Civil works	4,417	4,459
Mymensingh	Number	29	27
	Percent	18	17
	Civil works	5,000	5,173
Khulna	Number	74	71
	Percent	32	31
	Civil works	5,463	5,424
Rajshahi	Number	44	39
	Percent	11	10
	Civil works	5,327	5,370
Rangpur	Number	73	70
	Percent	19	19
	Civil works	6,402	6,354
Sylhet	Number	40	38
	Percent	33	32
	Civil works	4,744	4,764

Division	Indicator	Screeding (sft.)	Removing LC (sft.)
National (LSDs)	Number	500	476
	Percent	25	24
	Civil works	5,105	5,099
National (CSDs)	Number	87	81
	Percent	15	14
	Civil works	6,754	6,844

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.9 Repair of Warehouse Columns

Columns are integral vertical support structures that bear heavy loads at critical junctions through compression. Damage to columns can undermine the entire structure of the warehouse. As was done for ceilings, the survey collected information on plaster works, cracks, exposure of reinforced bars and painting requirements (Table 3.11).

Overall, around 19% of warehouse columns at LSDs and 17% at CSDs require plaster removal of around 80 sft. and 101 sft., respectively. The proportion of LSDs requiring new plaster work is lowest in Mymensingh (2%) and highest in Chattogram (31%). Nationwide, 13% of LSD warehouse columns have cracks, with an average length of 50 ft., compared to 10% of CSD warehouses (68 ft.). Unlike ceilings, however, only 8% of both LSD and CSD warehouses have columns with sections of reinforced bars exposed.

Table 3.11 Repair of warehouse columns

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Crack (ft.)	Painting (sft.)	Rebar exposure (sft.)
Barishal	Number	16	17	20	29	16
	Percent	11	11	13	19	11
	Civil works	204	191	80	964	158
Chattogram	Number	82	85	93	86	48
	Percent	30	31	34	32	18
	Civil works	84	81	42	755	49
Dhaka	Number	30	33	27	64	17
	Percent	9	10	8	19	5
	Civil works	95	92	111	711	242
Mymensingh	Number	3	3	6	15	1
	Percent	2	2	4	9	1
	Civil works	52	52	51	909	5
Khulna	Number	27	29	19	30	19
	Percent	12	13	8	13	8
	Civil works	111	112	119	1,043	114
Rajshahi	Number	128	137	47	140	35
	Percent	33	36	12	37	9
	Civil works	47	47	19	429	67
Rangpur	Number	77	81	54	102	24

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Crack (ft.)	Painting (sft.)	Rebar exposure (sft.)
	Percent	21	22	14	27	6
	Civil works	50	50	24	966	72
	Number	12	13	4	15	4
Sylhet	Percent	10	11	3	13	3
	Civil works	322	299	27	1,140	10
	Number	**375**	**398**	**270**	**481**	**164**
National (LSDs)	**Percent**	**19**	**20**	**13**	**24**	**8**
	Civil works	**80**	**78**	**50**	**746**	**93**
	Number	**98**	**103**	**59**	**262**	**49**
National (CSDs)	**Percent**	**17**	**17**	**10**	**44**	**8**
	Civil works	**101**	**99**	**68**	**948**	**194**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.10 Repair of Warehouse Beams

Like columns, beams bear loads placed on top of them by the warehouse ceiling through bending. As was done for both columns and ceilings, the survey collected information on plaster works, cracks, rebar exposure and painting requirements (Table 3.12).

Around 13% of warehouse beams at LSDs and 9% at CSDs require plaster removal of around 172 sft. and 219 sft., respectively. The proportion of LSDs requiring new plaster work is lowest in Sylhet (4%) and highest in Chattogram (15%). Nationwide, 11% of LSD warehouse beams have cracks with an average length of 132 ft., compared to 7% of CSD warehouses, where the average length is significantly lower (37 ft.). Around 6% of both LSD and CSD warehouses showed rebar exposure. However, the work requirement per CSD warehouse is much higher (901 sft.) when compared to LSD warehouses (243 sft.).

Table 3.12 Repair of warehouse beams

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Crack (ft.)	Painting (sft.)	Rebar exposure (sft.)
	Number	18	19	35	122	26
Barishal	Percent	12	13	23	82	17
	Civil works	638	606	169	1,979	216
	Number	40	42	49	204	25
Chattogram	Percent	15	15	18	75	9
	Civil works	64	105	152	2,137	166
	Number	41	43	27	213	19
Dhaka	Percent	12	13	8	64	6
	Civil works	151	146	114	2,018	247
	Number	10	10	3	101	2
Mymensingh	Percent	6	6	2	64	1
	Civil works	190	190	63	1,934	1,035

Division	Indicator	Plaster removal (sft.)	New plaster (sft.)	Crack (ft.)	Painting (sft.)	Rebar exposure (sft.)
Khulna	Number	29	32	25	199	11
	Percent	13	14	11	86	5
	Civil works	83	83	43	1,996	136
Rajshahi	Number	49	51	39	265	17
	Percent	13	13	10	69	4
	Civil works	91	88	231	2,130	336
Rangpur	Number	75	75	27	251	22
	Percent	20	20	7	67	6
	Civil works	166	166	35	2,445	286
Sylhet	Number	5	6	7	74	2
	Percent	4	5	6	62	2
	Civil works	904	755	50	1,797	64
National (LSDs)	**Number**	**267**	**278**	**212**	**1,429**	**124**
	Percent	**13**	**14**	**11**	**71**	**6**
	Civil works	**172**	**173**	**132**	**2,107**	**243**
National (CSDs)	**Number**	**53**	**56**	**43**	**319**	**33**
	Percent	**9**	**9**	**7**	**54**	**6**
	Civil works	**219**	**210**	**37**	**3,116**	**901**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.11 Repair of Warehouse Loading Docks

Each warehouse contains 2 loading docks, one at the front facing an approach road and one at the rear. These are frequently used and prone to damage from both the elements as well as everyday functions such as loading and unloading of grain sacks onto and from trucks. The repair items assessed during the survey included the condition of the nosing and angle, and plaster removal and replacement requirements. Table 3.13 reports the incidence and the volume of works for loading docks.

At LSD warehouses, around 21% of loading docks require repair of the nosing and angle (at 32 ft. per dock), 35% require plaster removal (41 sft.) and 36% need plaster replacement (41 sft.). At CSD warehouses, 16% require nosing and angle repair (61 ft.), 16% require plaster removal (48 sft.), and 18% require plaster replacement (45 sft.). On average, warehouses in Barishal have the highest requirement of new plaster work at 130 sft. per dock, compared to 26 sft. in Rajshahi.

Table 3.13 Repair of warehouse loading docks

Division	Indicator	Nosing and angle (ft.)	Plaster removal (sft.)	New plaster (sft.)
Barishal	Number of docks	63	42	46
	Percent of docks	23	15	16
	Civil works per dock	41	133	130
Chattogram	Number of docks	124	201	206
	Percent of docks	23	38	39

Division	Indicator	Nosing and angle (ft.)	Plaster removal (sft.)	New plaster (sft.)
	Civil works per dock	40	33	33
	Number of docks	172	182	196
Dhaka	Percent of docks	28	29	32
	Civil works per dock	32	54	53
	Number of docks	50	60	66
Mymensingh	Percent of docks	17	20	22
	Civil works per dock	29	40	40
	Number of docks	87	103	108
Khulna	Percent of docks	20	24	25
	Civil works per dock	25	44	43
	Number of docks	121	335	345
Rajshahi	Percent of docks	16	45	47
	Civil works per dock	28	26	26
	Number of docks	134	338	342
Rangpur	Percent of docks	19	47	47
	Civil works per dock	33	35	35
	Number of docks	63	76	76
Sylhet	Percent of docks	27	33	33
	Civil works per dock	28	51	51
	Number of docks	**814**	**1,337**	**1,385**
National (LSDs)	**Percent of docks**	**21**	**35**	**36**
	Civil works per dock	**32**	**41**	**41**
	Number of docks	**177**	**176**	**191**
National (CSDs)	**Percent of docks**	**16**	**16**	**18**
	Civil works per dock	**61**	**48**	**45**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per loading dock.

3.12 Repair of Warehouse Canopies

Each loading dock also has a canopy constructed above it (for a total of 2 canopies per warehouse), to minimize direct rainfall damage to the dock's platform. Covering the top of the canopy is a layer of patent stone, which is typically constructed from a mix of stone chips and fragments embedded in mortar, cement or plaster. As is the case for roofs, canopy repair also involves removal of LC. The other main work considerations are plaster replacement and new plaster with neat cement finishing (NCF) (Table 3.14).

Table 3.14 Repair of warehouse canopies

Division	Indicator	Patent stone (sft.)	LC removal (sft.)	Plaster (sft.)	Plaster with NCF (sft.)
	Number of canopies	133	126	148	130
Barishal	Percent of canopies	48	45	53	46
	Civil works per canopy	114	98	84	114

Division	Indicator	Patent stone (sft.)	LC removal (sft.)	Plaster (sft.)	Plaster with NCF (sft.)
Chattogram	Number of canopies	127	125	150	122
	Percent of canopies	24	24	28	23
	Civil works per canopy	76	75	47	73
Dhaka	Number of canopies	130	129	218	126
	Percent of canopies	21	21	35	20
	Civil works per canopy	69	69	54	126
Mymensingh	Number of canopies	34	32	53	32
	Percent of canopies	12	11	18	11
	Civil works per canopy	64	68	36	68
Khulna	Number of canopies	129	126	200	126
	Percent of canopies	30	29	46	29
	Civil works per canopy	103	104	94	104
Rajshahi	Number of canopies	75	71	248	69
	Percent of canopies	10	10	34	9
	Civil works per canopy	47	47	37	49
Rangpur	Number of canopies	75	68	297	54
	Percent of canopies	10	9	41	7
	Civil works per canopy	78	65	29	62
Sylhet	Number of canopies	71	70	56	70
	Percent of canopies	31	30	24	30
	Civil works per canopy	57	57	32	57
National (LSDs)	**Number of canopies**	**774**	**747**	**1,370**	**729**
	Percent of canopies	**20**	**19**	**36**	**19**
	Civil works per canopy	**79**	**76**	**52**	**89**
National (CSDs)	**Number of canopies**	**72**	**69**	**162**	**69**
	Percent of canopies	**7**	**6**	**15**	**6**
	Civil works per canopy	**74**	**75**	**45**	**77**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per canopy.

At LSD warehouses, around 20% of canopies require patent stone repair (at 79 sft. per canopy), 19% require removal of LC (76 sft.), 36% require plaster replacement (52 sft.), and 19% require plaster with NCF (89 sft.). At CSD warehouses, 7% of canopies need patent stone repair (74 sft.), 6% require LC removal (75 sft.), 15% require plaster replacement (45 sft.), and 6% require plaster with NCF (77 sft.).

3.13 Repair and Construction of Warehouse Drains

Apart from a common drain which runs through the entire storage facility, each warehouse has a drain surrounding it that connects to the main drain. Drains are prone to regular wear and tear over time, new drains may need to be constructed, or extensions may need to be made to existing drains. The repair works under consideration were broken and worn out areas, plaster removal and new construction (Table 3.15).

Overall, around 28% of warehouse drains at LSDs were broken (at 65 sft. per warehouse), 25% and 24% were worn out and required plaster removal respectively (77 sft.), and new construction work was needed at 16% of warehouses (194 sft.). At CSDs, 12% of warehouse drains were broken (49 sft.), 15% were worn out and required plaster removal (41 sft.), and only 1% required new construction (67 sft.).

Table 3.15 Repair and construction of warehouse drains

Division	Indicator	Broken (sft.)	Worn out (sft.)	Plaster removal (sft.)	Construction (sft.)
Barishal	Number	48	29	29	18
	Percent	32	19	19	12
	Civil works	97	89	89	166
Chattogram	Number	109	85	85	61
	Percent	40	31	31	22
	Civil works	68	41	41	128
Dhaka	Number	87	85	84	53
	Percent	26	26	25	16
	Civil works	67	147	144	247
Mymensingh	Number	50	52	51	9
	Percent	31	33	32	6
	Civil works	55	63	64	139
Khulna	Number	52	64	61	59
	Percent	23	28	26	26
	Civil works	43	68	69	215
Rajshahi	Number	107	80	78	38
	Percent	28	21	20	10
	Civil works	62	48	50	229
Rangpur	Number	59	75	76	85
	Percent	16	20	20	23
	Civil works	82	96	95	159
Sylhet	Number	55	30	29	9
	Percent	46	25	24	8
	Civil works	50	48	49	504
National (LSDs)	**Number**	**567**	**500**	**493**	**332**
	Percent	**28**	**25**	**24**	**16**
	Civil works	**65**	**77**	**77**	**194**
National (CSDs)	**Number**	**70**	**89**	**89**	**3**
	Percent	**12**	**15**	**15**	**1**
	Civil works	**49**	**41**	**41**	**67**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.14 Repair and Construction of Warehouse Aprons

Accompanying each warehouse drain is an adjacent area referred to as the apron, designed to allow easy flow of water into the drain. Like drains, data were collected on broken and worn out areas, plaster removal and new construction requirements (Table 3.16).

Overall, around 34% of warehouse aprons at LSDs were broken (at 111 sft. per warehouse), 43% were worn out (156 sft.), 42% required plaster removal (155 sft.), and new construction work was needed at 7% of warehouses (368 sft.). At CSDs, 11% of warehouse aprons were broken (74 sft.), 21% were worn out (113 sft.), 20% required plaster removal (115 sft.), and 5% required new construction (311 sft.).

Table 3.16 Repair and construction of warehouse aprons

Division	Indicator	Broken (sft.)	Worn out (sft.)	Plaster removal (sft.)	Construction (sft.)
Barishal	Number	41	34	32	5
	Percent	28	23	21	3
	Civil works	160	204	191	227
Chattogram	Number	99	134	130	27
	Percent	36	49	48	10
	Civil works	118	102	103	248
Dhaka	Number	74	139	136	39
	Percent	22	42	41	12
	Civil works	92	213	212	424
Mymensingh	Number	28	69	69	8
	Percent	18	43	43	5
	Civil works	103	152	152	382
Khulna	Number	70	93	90	13
	Percent	30	40	39	6
	Civil works	157	130	130	266
Rajshahi	Number	187	197	192	25
	Percent	49	51	50	7
	Civil works	88	80	81	481
Rangpur	Number	118	140	137	13
	Percent	31	37	37	3
	Civil works	99	268	269	198
Sylhet	Number	66	58	57	8
	Percent	55	48	48	7
	Civil works	135	147	142	656
National (LSDs)	**Number**	**683**	**864**	**843**	**138**
	Percent	**34**	**43**	**42**	**7**
	Civil works	**111**	**156**	**155**	**368**
National (CSDs)	**Number**	**64**	**122**	**117**	**28**
	Percent	**11**	**21**	**20**	**5**
	Civil works	**74**	**113**	**115**	**311**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.15 Repair and Construction of Warehouse Doors

Every warehouse has 2 sets of sliding and security doors constructed from steel that act as entry points and barriers. This survey assessed the overall door area for repair per warehouse, new materials requirements, and new construction works. For sliding doors, material requirements include a mild steel (MS) section, MS sheets, ball bearings and enamel painting. The works estimations are reported in Table 3.17.

Table 3.17 Repair and construction of warehouse sliding doors

Division	Indicator	Repair (sft.)	New materials				Construction (sft.)
			MS Section (kg)	MS Sheet (kg)	Ball bearings (set)	Enamel paint (sft.)	
Barishal	Number	83	7	1	78	129	-
	Percent	56	5	1	52	87	-
	Civil works	217	44	4	4	598	-
Chattogram	Number	101	23	11	99	211	3
	Percent	37	8	4	36	78	1
	Civil works	229	50	52	4	645	169
Dhaka	Number	139	44	19	161	261	6
	Percent	42	13	6	48	79	2
	Civil works	178	18	23	3	601	200
Mymensingh	Number	48	27	11	45	114	-
	Percent	30	17	7	28	72	-
	Civil works	123	10	3	2	580	-
Khulna	Number	112	40	15	110	203	-
	Percent	48	17	6	48	88	-
	Civil works	214	98	54	4	613	-
Rajshahi	Number	152	16	46	165	295	7
	Percent	40	4	12	43	77	2
	Civil works	216	27	38	4	625	169
Rangpur	Number	171	126	58	155	259	4
	Percent	46	34	15	41	69	1
	Civil works	202	51	42	3	747	222
Sylhet	Number	37	15	12	41	107	-
	Percent	31	13	10	34	89	-
	Civil works	167	39	59	3	582	-
National (LSDs)	**Number**	**843**	**298**	**173**	**854**	**1,579**	**20**
	Percent	**42**	**15**	**9**	**42**	**78**	**1**
	Civil works	**201**	**47**	**39**	**3**	**634**	**189**
National (CSDs)	**Number**	**204**	**100**	**67**	**219**	**414**	**3**
	Percent	**34**	**17**	**11**	**37**	**70**	**1**
	Civil works	**262**	**75**	**51**	**5**	**1,022**	**133**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

Overall, around 42% of warehouses at LSDs needed to repair sliding doors (at 201 sft. per warehouse), compared to 34% of warehouses at CSDs (262 sft.). The proportion of warehouses with sliding doors requiring repair was highest in Barishal (56%) and lowest in Mymensingh (30%). Enamel painting is needed at 78% of LSD warehouses and 70% of CSD warehouses. On the other hand, new sliding doors need to be constructed at relatively few warehouses (1%), with an average works requirement of 189 sft. and 133 sft. at LSDs and CSDs, respectively.

For security doors, material requirements include an MS section, a galvanized iron (GI) net to prevent insects from entering and allow aeration, ball bearings and enamel painting. The work estimations are reported in Table 3.18.

Overall, around 27% of warehouses at LSDs needed to repair sliding doors (at 183 sft. per warehouse), compared to 21% of warehouses at CSDs (230 sft.). The proportion of warehouses with sliding doors requiring repair was highest in Barishal (54%) and lowest in Khulna (10%). Enamel painting is needed at 77% of LSD warehouses (507 sft. per warehouse) and 69% of CSD warehouses (819 sft. per warehouse).

Similar to sliding doors, only 2% of LSD warehouses and 1% of CSD warehouses require new security door construction work, with average requirements at 144 sft. and 150 sft., respectively.

Table 3.18 Repair and construction of warehouse security doors

Division	Indicator	Repair (sft.)	New materials				Construction (sft.)
			MS Section (kg)	GI Net (sft.)	Ball bearings (set)	Enamel paint (sft.)	
Barishal	Number	81	6	29	43	129	-
	Percent	54	4	19	29	87	-
	Civil works	210	58	200	4	481	-
Chattogram	Number	104	10	14	94	211	2
	Percent	38	4	5	35	78	1
	Civil works	218	35	113	4	518	121
Dhaka	Number	75	20	9	98	263	6
	Percent	23	6	3	30	79	2
	Civil works	159	21	50	3	487	200
Mymensingh	Number	30	7	6	27	114	-
	Percent	19	4	4	17	72	-
	Civil works	103	3	4	2	464	-
Khulna	Number	22	-	14	13	197	6
	Percent	10	-	6	6	85	3
	Civil works	178	-	77	4	492	90
Rajshahi	Number	77	16	19	71	282	22
	Percent	20	4	5	19	74	6
	Civil works	194	44	40	3	494	144
Rangpur	Number	117	82	62	72	263	2
	Percent	31	22	17	19	70	1
	Civil works	174	45	38	2	591	155
Sylhet	Number	33	4	16	34	106	-
	Percent	28	3	13	28	88	-
	Civil works	151	15	64	3	466	-

Division	Indicator	Repair (sft.)	New materials				Construction (sft.)
			MS Section (kg)	GI Net (sft.)	Ball bearings (set)	Enamel paint (sft.)	
National (LSDs)	**Number**	**539**	**145**	**169**	**452**	**1,565**	**38**
	Percent	**27**	**7**	**8**	**22**	**77**	**2**
	Civil works	**183**	**38**	**77**	**3**	**507**	**144**
National (CSDs)	**Number**	**127**	**27**	**31**	**129**	**410**	**4**
	Percent	**21**	**5**	**5**	**22**	**69**	**1**
	Civil works	**230**	**48**	**40**	**4**	**819**	**150**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse.

3.16 Repair and Construction of Warehouse Ventilators

The final feature considered under repair estimation is the ventilator, located in the upper portion of each warehouse. Ventilators allow air to pass through the warehouse, preventing mold buildup. They are essentially small windows with a glass panel and steel sections that can be opened and closed as required. The survey collected information on repair and new construction estimates, as well as new material requirements. Like sliding and security doors, these include an MS section, MS sheets, GI nets, glass pane replacement, and enamel painting. The works estimations are reported in Table 3.19.

Table 3.19 Repair and construction of warehouse ventilators

Division	Indicator	Repair (sft.)	New materials					Construction (sft.)
			MS Section (kg)	MS Sheet (kg)	GI Net (sft.)	Glass (sft.)	Enamel paint (sft.)	
Barishal	Number	76	35	-	55	34	128	-
	Percent	51	23	-	37	23	86	-
	Civil works	61	120	-	52	70	135	-
Chattogram	Number	21	20	4	-	2	201	-
	Percent	8	7	1	-	1	74	-
	Civil works	50	46	51	-	35	135	-
Dhaka	Number	17	7	-	10	14	247	-
	Percent	5	2	-	3	4	74	-
	Civil works	64	36	-	55	81	135	-
Mymensingh	Number	1	-	-	-	-	114	-
	Percent	1	-	-	-	-	72	-
	Civil works	6	-	-	-	-	135	-
Khulna	Number	5	2	1	2	2	191	-
	Percent	2	1	0*	1	1	83	-
	Civil works	20	33	30	15	20	135	-
Rajshahi	Number	38	84	6	-	37	277	1
	Percent	10	22	2	-	10	72	0*
	Civil works	17	111	40	-	20	136	135
Rangpur	Number	74	61	34	8	5	253	-

Division	Indicator	Repair (sft.)	New materials					Construction (sft.)
			MS Section (kg)	MS Sheet (kg)	GI Net (sft.)	Glass (sft.)	Enamel paint (sft.)	
	Percent	20	16	9	2	1	67	-
	Civil works	54	166	67	29	25	136	-
	Number	17	15	7	-	1	101	-
Sylhet	Percent	14	13	6	-	1	84	-
	Civil works	44	156	35	-	33	135	-
National (LSDs)	**Number**	**249**	**224**	**52**	**75**	**95**	**1,512**	**1**
	Percent	**12**	**11**	**3**	**4**	**5**	**75**	**0***
	Civil works	**49**	**122**	**58**	**49**	**48**	**135**	**135**
National (CSDs)	**Number**	**13**	**24**	**2**	**7**	**39**	**358**	**2**
	Percent	**2**	**4**	**0***	**1**	**7**	**60**	**0***
	Civil works	**33**	**64**	**43**	**36**	**49**	**136**	**135**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse. Percentage values marked (*) are reported as zero due to rounding error.

Unlike the case for doors, relatively few warehouses (12% at LSDs, 2% at CSDs) required ventilator repair. Around 51% of LSD warehouses in Barishal require ventilator repair, compared to just 1% in Mymensingh. The average area requiring repair is 49 sft. per LSD warehouse and 33 sft. per CSD warehouse. Only a handful of warehouses required new ventilators to be constructed. However, a large proportion of warehouses required enamel painting for ventilators (75% at LSDs, 60% at CSDs), with the average work requirement of 135 sft. at LSDs and 136 sft. at CSDs.

3.17 Additional Warehouse Repair Considerations

Apart from repair of structural features at each warehouse, there are a couple of additional repair considerations for each warehouse. These include painting works for skirting and dado areas, the addition of colored corrugated iron (CI) sheets, and enamel painting of these sheets as required. Overall, 81% of LSD warehouses and 63% of CSD warehouses required skirting and dado painting, with the average area per warehouse estimated at 1,879 sft. for LSDs and 2,110 sft. for CSDs. A very small number (less than 1%) of LSD warehouses required CI sheets, at 332 sft. per warehouse. Only around 1% of CSD warehouses required CI sheets, at 72 sft. per warehouse. No CSD warehouses needed enamel painting for CI sheets, while less than 1% of LSD warehouses needed this work (1,211 sft.). These additional repair estimates are reported in Table 3.20.

Table 3.20 Additional warehouse repair items

Division	Indicator	Skirting and dado painting (sft.)	CI colored sheet (sft.)	Enamel paint for CI sheet (sft.)
Barishal	Number	129	-	-
	Percent	87	-	-
	Civil works	1,861	-	-
Chattogram	Number	226	1	4
	Percent	83	0*	1
	Civil works	1,901	596	1,275
Dhaka	Number	252	-	3
	Percent	76	-	1
	Civil works	1,853	-	1,800
Mymensingh	Number	105	-	-
	Percent	66	-	-
	Civil works	1,854	-	-
Khulna	Number	202	-	-
	Percent	87	-	-
	Mean work	1,869	-	-
Rajshahi	Number	338	2	2
	Percent	88	1	1
	Civil works	1,831	200	200
Rangpur	Number	284	-	-
	Percent	76	-	-
	Civil works	1,988	-	-
Sylhet	Number	110	-	-
	Percent	92	-	-
	Civil works	1,827	-	-
National (LSDs)	**Number**	**1,646**	**3**	**9**
	Percent	**81**	**0***	**0***
	Civil works	**1,879**	**332**	**1,211**
National (CSDs)	**Number**	**370**	**5**	**-**
	Percent	**63**	**1**	**-**
	Civil works	**2,110**	**72**	**-**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Civil works estimates are reported as mean work per warehouse. Percentage values marked (*) are reported as zero due to rounding error.

CHAPTER 4. FACILITIES AND WAREHOUSES BY LEVELS OF REPAIRS REQUIRED

This Chapter focuses on distilling the repair estimates detailed in **Chapter 3** in terms of repair categories that are distinct but easily understood. It is an important step, as it allows for more streamlined discussions about further decisions that can be made both at the facility and warehouse levels. Specifically, **at the warehouse level**, the following seven categories are delineated:

1. No repair required
2. Minor repair required
3. Moderate repair required
4. Major repair required
5. To be dismantled
6. Under construction
7. At non-functional facilities

At the storage facility level, the following five categories are delineated:

1. No repair required
2. Minor repair required
3. Moderate repair required
4. Major repair required
5. Non-functional facilities

It may be noted these delineations are not based on any engineering taxonomy. Instead, the delineation of each category was based entirely on the level of repair required, as evidenced by the available repair estimates collected at storage facility and warehouse levels. Despite void of engineering taxonomy, these delineations would help policy makers in making informed decisions about the priorities in the face of financial resource constraints.

4.1 Warehouses by Repair Categories

Based on the aforementioned categories, data from the census was used to group all surveyed warehouses. The division-wise distributions can be found in Table 4.1.

The census identified a total of 2,123 LSD warehouses and 620 CSD warehouses across functional and non-functional storage facilities in the country. As mentioned earlier, 2,023 warehouses (95%) were located at the functional LSDs, with another 592 (95%) at the functional CSDs. Nationally, 1,926 LSD warehouses (95%) and 537 CSD warehouses (91%) were functional at the time of the census.

A total of 1,827 warehouses at LSDs (86%) and 479 warehouses at CSDs (86%) required some level of repair; only 97 LSD warehouses (5%) and 58 CSD warehouses (9%) were identified that required no repair. At LSDs, 30% of warehouses required minor, 26% required moderate, and another 30% required major repair work. A total of 85 warehouses (4%) needed to be dismantled, 14 (1%) were under construction, and another 100 (5%) were located at non-functional LSDs. Across divisions, Barishal had the highest proportion of LSD warehouses requiring major repair (41%), while Mymensingh had the lowest at 18%. Barishal division is also home to the majority of warehouses at non-functional facilities – 43 warehouses (22%) in this division are located at non-functional LSDs for reasons not fully understood through engineering assessment. Interestingly, Mymensingh division has the highest proportion of LSD warehouses that need to be dismantled (7%). At CSDs, 22% of the warehouses required minor, 33% required moderate, and 22% required major repairs. In total, 58 CSD

warehouses (9%) needed to be dismantled, and a further 28 warehouses (5%) were located at a non-functional CSD (i.e., Barishal Sadar CSD).

Table 4.1 Distribution of warehouses by repair category

Division	No repair needed	Require repair			Dismantle	Under construction	At non-functional facilities	Total
		Minor	Moderate	Major				
Barishal	4	27	31	78	9	-	43	192
Row Percent	2	14	16	41	5	-	22	100
Chattogram	9	84	81	90	8	1	22	295
Row Percent	3	29	28	31	3	0*	8	100
Dhaka	26	95	73	116	23	-	7	340
Row Percent	8	28	21	34	7	-	2	100
Mymensingh	22	68	28	29	12	-	3	162
Row Percent	14	42	17	18	7	-	2	100
Khulna	12	43	74	88	3	11	9	240
Row Percent	5	18	31	37	1	5	4	100
Rajshahi	3	154	132	80	14	-	4	387
Row Percent	1	40	34	21	4	-	1	100
Rangpur	18	122	113	108	12	2	-	375
Row Percent	5	33	30	29	3	1	-	100
Sylhet	3	38	30	45	4	-	12	132
Row Percent	3	29	23	34	2	-	9	100
National (LSDs) (%)	**97** **5**	**631** **30**	**562** **26**	**634** **30**	**85** **4**	**14** **1**	**100** **5**	**2,123** **100**
National (CSDs) (%)	**58** **9**	**138** **22**	**207** **33**	**134** **22**	**55** **9**	**-** **-**	**28** **5**	**620** **100**

Source: IFPRI-BIDS-UIUC Survey, 2017

Note: Percentage values marked (*) are reported as zero due to rounding error.

4.2 Storage Facilities by Repair Category

Taking into consideration the overall level of repairs across warehouses and common structures, each storage facility was also grouped according to the categories mentioned earlier. The division-wise distributions can be found in Table 4.2.

As mentioned earlier, the census identified a total of 633 LSDs, 13 CSDs and 6 silos. Of these, 575 LSDs (91%), 11 CSDs (85%) and 5 silos (83%) were found to be functional. Consequently, 58 LSDs (9%), 2 CSDs (15%) and 1 silo (17%) were identified as being non-functional at the time of the census. The proportion of non-functional LSDs was by far the highest in Barishal division (36%). In contrast, there is no non-functional LSD in Rangpur division.

A total of 568 LSDs (90%), 11 CSDs (85%) and 4 silos (67%) required some level of repair; 7 LSDs (1%) and 1 silo (17%) required no repair. Among LSDs, 31% required minor, 30% required moderate, and another 29% required major repair work. Across divisions, Khulna had the highest proportion of LSDs requiring major repair (35%), while Barishal and Chattogram had the lowest at 23% each. Among CSDs, 11 out of 13 (85%) required major repair, while 2 out of 6 silos (33%) also required major repair.

Table 4.2 Distribution of storage facilities by repair category

Division	Indicator	No repair needed	Require repair			Non-functional facilities	Total
			Minor	Moderate	Major		
Barishal	Number	1	14	13	16	25	69
	Percent	2	20	19	23	36	100
Chattogram	Number	2	34	42	27	10	115
	Percent	2	30	37	23	9	100
Dhaka	Number	2	24	32	31	4	93
	Percent	2	26	34	33	4	100
Mymensingh	Number	-	22	9	13	3	47
	Percent	-	47	19	28	6	100
Khulna	Number	1	18	25	26	5	75
	Percent	1	24	33	35	7	100
Rajshahi	Number	-	42	24	26	2	94
	Percent	-	45	26	28	2	100
Rangpur	Number	-	22	36	30	-	88
	Percent	-	25	41	34	-	100
Sylhet	Number	1	19	12	13	7	52
	Percent	2	37	23	25	13	100
National (LSDs)	**Number**	**7**	**195**	**193**	**182**	**56**	**633**
	Percent	**1**	**31**	**30**	**29**	**9**	**100**
National (CSDs)	**Number**	**-**	**-**	**-**	**11**	**2**	**13**
	Percent	**-**	**-**	**-**	**85**	**15**	**100**
National (Silos)	**Number**	**1**	**-**	**2**	**2**	**1**	**6**
	Percent	**17**	**-**	**33**	**33**	**17**	**100**

Source: IFPRI-BIDS-UIUC Survey, 2017

CHAPTER 5. INFRASTRUCTURE CONDITIONS AND RECOMMENDATIONS FOR DISMANTLING THE NON-FUNCTIONAL FACILITIES

5.1 Current Conditions of Non-functional Facilities

Nationally, the census found a total of 59 non-functional facilities throughout the country, comprising of 56 LSDs, 2 CSDs and 1 silo (Table 5.1). These facilities are distributed across 27 districts in 7 divisions; 11 of them (19%) are in Patuakhali district alone. Across divisions, 25 (36%) LSDs are non-functional in Barishal, followed by 10 (9%) in Chattogram and 7 (13%) in Sylhet. There are no non-functional facilities in Rangpur.

In total, non-functional LSDs occupy more than 71 acres of land across the country and house 56,500 MT of non-functional storage capacity. Nearly half (24,000 MT, 42%) of this non-functional capacity is in Barishal division. Non-functional LSDs are also home to 100 warehouses. Likewise, the 2 non-functional CSDs (Barishal Sadar CSD and Dhaka CSD) have a total land area of 29 acres and 30,280 MT of non-functional capacity. There are 28 warehouses at Barishal Sadar CSD. For Dhaka CSD, warehouse information is currently unavailable, given that this CSD is already in the process of being dismantled.

Table 5.1 Land area, storage capacity and warehouses at non-functional facilities

Division	Total land area (acres)	Total capacity (MT)	Indicator	Non-functional facilities	Warehouses/bins at non-functional facilities
Barishal	26.20	24,000	Number	25	43
			Percent	36	22
Chattogram	13.75	12,000	Number	10	22
			Percent	9	8
Dhaka	5.69	4,000	Number	4	7
			Percent	4	2
Mymensingh	4.73	2,000	Number	3	3
			Percent	6	2
Khulna	6.04	6,500	Number	5	9
			Percent	7	4
Rajshahi	3.43	2,000	Number	2	4
			Percent	2	1
Sylhet	11.26	6,000	Number	7	12
			Percent	13	9
National (LSDs)	**71.10**	**56,500**	**Number**	**56**	**100**
			Percent	**9**	**5**
National (CSDs)*	**28.60**	**30,280**	**Number**	**2**	**28**
			Percent	**15**	**5**
National (Silo)	**2.50**	**800**	**Number**	**1**	**1**
			Percent	**17**	**0****

Source: IFPRI-BIDS-UIUC Survey, 2017

Notes: (i) Warehouse information for Dhaka CSD was not available. (ii) Percentage values marked (**) are reported as zero due to rounding error.

Most non-functional LSDs have remained unused for a long time (Table 5.2). On average, they have been non-functional for more than 22 years. Prior to becoming non-functional, these facilities had been in use for an

average of 18 years. The divisions with the highest duration of usage were Chattogram (28 years) and Rajshahi (26 years), while non-functional LSDs in Mymensingh were functional for only 13 years on average.

Table 5.2 Duration of usage of non-functional LSDs

Division	Age (years)	Years non-functional	Duration of usage (years)
Barishal	37	22	14
Chattogram	50	22	28
Dhaka	41	22	19
Mymensingh	36	21	13
Khulna	36	20	14
Rajshahi	47	21	26
Sylhet	45	27	18
National (LSDs)	**41**	**22**	**18**

Source: IFPRI-BIDS-UIUC Survey, 2017

Table 5.3 provides an overview of the overall condition of existing physical structures at these non-functional facilities. Of the total 100 warehouses at these LSDs, 54 (54%) are still usable if these facilities were to be reinstated. The division with the highest number of still usable warehouses is Barishal (32), which accounts for 74% of all non-functional warehouses in the division. All 7 warehouses in Dhaka and all 3 warehouses in Mymensingh divisions are in usable condition. By contrast, only 1 warehouse (5%) was deemed usable in Chattogram division.

Table 5.3 Condition of physical structures at non-functional LSDs

Division	Indicator	Total usable warehouses	Ancillary structures in good/fair condition			Overall physical condition		
			O/C LSD's quarters	Staff quarters	Guard shed	Good	Fair	Poor
Barishal	Number	32	3	2	2	-	11	12
	Percent	74	12	8	8	-	44	48
Chattogram	Number	1	1	1	1	-	4	6
	Percent	5	10	10	10	-	40	60
Dhaka	Number	7	-	-	1	-	1	3
	Percent	100	-	-	25	-	25	75
Mymensingh	Number	3	-	-	-	-	-	3
	Percent	100	-	-	-	-	-	100
Khulna	Number	3	-	-	1	2	-	3
	Percent	33	-	-	20	40	-	60

Division	Indicator	Total usable warehouses	Ancillary structures in good/fair condition			Overall physical condition		
			O/C LSD's quarters	Staff quarters	Guard shed	Good	Fair	Poor
Rajshahi	Number	1	1	1	-	1	-	1
	Percent	25	50	50	-	50	-	50
Sylhet	Number	7	2	1	1	-	3	4
	Percent	58	29	14	14	-	43	57
National (LSDs)	**Number**	**54**	**7**	**5**	**6**	**3**	**19**	**32**
	Percent	**54**	**13**	**9**	**11**	**5**	**34**	**57**

Source: IFPRI-BIDS-UIUC Survey, 2017

In addition to storage functions, these facilities also require renovation of ancillary structures necessary for everyday operations, such as the quarters of the officer-in-charge of the LSD (O/C LSD), staff quarters, and guard shed. The census identified a total of 7 (13%) LSDs with usable quarters for the O/C LSD, 5 (9%) LSDs with usable staff quarters, and 6 (11%) LSDs with usable guard sheds. Overall, there are 3 (5%) non-functional LSDs reporting the overall condition of their physical structures as being good, 19 (34%) as being fair, and 32 (57%) as being poor.

In addition to these storage structures, one also must take into consideration the condition of associated access infrastructures. Specifically, the census collected information on the condition of road and waterway connectivity wherever applicable, and availability of electricity for each facility (Table 5.4).

Table 5.4 Condition of facilitating infrastructures and utilities at non-functional LSDs

Division	Indicator	With road connectivity				With waterway connectivity					With electricity
		Good	Fair	Poor	None	Good	Fair	Poor	None	N/A	
Barishal	Number	3	13	2	5	5	6	5	2	7	2
	Percent	12	52	8	20	20	24	20	8	28	8
Chattogram	Number	4	3	2	1	-	1	2	1	6	2
	Percent	40	30	20	10	-	10	20	10	60	20
Dhaka	Number	1	1	1	1	2	-	-	1	1	1
	Percent	25	25	25	25	50	-	-	25	25	25
Mymensingh	Number	2	-	-	1	1	-	-	-	2	1
	Percent	67	-	-	33	33	-	-	-	67	33
Khulna	Number	2	3	-	-	-	-	1	-	4	3
	Percent	40	60	-	-	-	-	20	-	80	60
Rajshahi	Number	1	-	1	-	-	1	-	1	-	1
	Percent	50	-	50	-	-	50	-	50	-	50
Sylhet	Number	4	-	2	1	2	1	-	-	4	1
	Percent	57	-	29	14	29	14	-	-	57	14
National (LSDs)	**Number**	**17**	**20**	**8**	**9**	**10**	**9**	**8**	**5**	**24**	**11**
	Percent	**30**	**36**	**14**	**16**	**18**	**16**	**14**	**9**	**43**	**20**

Source: IFPRI-BIDS-UIUC Survey, 2017

The census found that a total of 17 (30%) LSDs have good connectivity to road networks, 20 (36%) have fair connectivity, and 8 (14%) have poor road connectivity. Ten (18%) non-functional LSDs have good connectivity to waterways, 9 (16%) have fair connectivity, and 8 (14%) have poor connectivity. Despite no operations, about a fifth of all non-functional LSDs still have electricity connections.

Table 5.5 Perceived demand in the catchment area of non-functional LSDs

Division	Indicator	LSDs in areas where demand is met by other facilities	LSDs in areas where no demand exists
Barishal	Number	24*	-
	Percent	96	-
Chattogram	Number	8	2
	Percent	80	20
Dhaka	Number	4	-
	Percent	100	-
Mymensingh	Number	3	-
	Percent	100	-
Khulna	Number	4	1
	Percent	80	20
Rajshahi	Number	2	-
	Percent	100	-
Sylhet	Number	7	-
	Percent	100	-
National (LSDs)	**Number**	**52**	**3**
	Percent	**93**	**5**

Source: IFPRI-BIDS-UIUC Survey, 2017

***Note:** One non-functional LSD in Barishal division has been eroded away by the river.

Further, the census also collected information on the perceived food demand in the localities covered by these non-functional facilities (Table 5.5). Not surprisingly, the majority of non-functional LSDs (93%) reported being located in areas where the existing food demand is already met by other LSDs in the area. Curiously, the remaining 3 non-functional LSDs (5%) are located in areas where there is no perceived demand for food storage.

5.2 Recommendations Regarding the Dismantling of Non-Functional Storage Facilities

Based on the perceived demand and condition of physical and access infrastructures, information and insights were collected from relevant Food officials on whether each non-functional facility should indeed be dismantled. If a facility needs to be dismantled, information was also collected on whether it needs to be rebuilt. Finally, views from the relevant Food officials behind their recommendations were collected why certain non-functional facilities are not recommended to be dismantled. The recommendations regarding their dismantling are summarized in Table 5.6.

Table 5.6 Recommendations regarding the dismantling of non-functional storage facilities

Division	Indicator	Recommended to be dismantled	Not recommended to be dismantled
Barishal	Number	-	23*
	Percent	-	92
Chattogram	Number	6	4
	Percent	60	40
Dhaka	Number	-	4
	Percent	-	100
Mymensingh	Number	-	3
	Percent	-	100
Khulna	Number	3	2
	Percent	60	40
Rajshahi	Number	-	2
	Percent	-	100
Sylhet	Number	-	7
	Percent	-	100
National (LSDs)	**Number**	**9**	**45**
	Percent	**16**	**80**
National (CSDs)	**Number**	**2**	**-**
	Percent	**100**	**-**
National (Silos)	**Number**	**1**	**-**
	Percent	**100**	**-**

Source: IFPRI-BIDS-UIUC Survey, 2017

***Note:** Two non-functional LSDs in Barishal division are not applicable for dismantling recommendations. One has recently been made functional (after completion of the census), and the other has been eroded away by the river.

It should be noted that even prior to this survey, DG Food had already decided that both the non-functional CSDs as well as the non-functional Khulna Steel Silo need to be dismantled. The process of dismantling has already started to varying degrees at each of these three facilities. At Barishal Sadar CSD, a large portion of the storage area has been brought under the premises of a new modern steel silo that will soon be constructed. There are a few warehouses at this facility currently under use as storage for Barishal Sadar LSD. It is expected that following the construction of the silo, these warehouses will once again operate under the auspices of Barishal Sadar CSD, even though the CSD will remain non-functional. In the case of Dhaka CSD, all structures have already been demolished. Finally, the entire Khulna Steel Silo complex is expected to be demolished soon as well. Consequently, this report does not provide any recommendations with regard to these three facilities. However, salient information regarding these facilities can be found in **Appendix - A** (Table A.1 and Table A.2).

Nationally, the census identified a total of 9 (16%) non-functional LSDs that require dismantling. Chattogram and Khulna are the only divisions with any non-functional LSDs that need to be dismantled (60%). Across divisions, 45 (80%) LSDs are not recommended to be dismantled.

In total, 39 (70%) LSDs were identified as being repairable, and 1 (2%) reported that all its structures were in good condition. Further, the relevant Food officials in 17 LSDs (30%) claimed that reinstating these LSDs would ease the storage burden on existing facilities, 12 (21%) reported being located near important procurement

and/or distribution hubs, and 4 (7%) reported increasing local food demand as reasons why they should not be dismantled. These and other mentioned reasons against dismantling are summarized in Table 5.7.

Table 5.7 Stated reasons against dismantling of some non-functional LSDs

Division	Indicator	Can be repaired	All structures in good condition	Ease burden on existing facilities	Close to procurement/ distribution hub	Increasing local food demand	Other reason*
Barishal	Number	20	-	5	11	1	3
	Percent	80	-	20	44	4	12
Chattogram	Number	3	-	1	-	2	2
	Percent	30	-	10	-	20	20
Dhaka	Number	4	-	4	-	-	-
	Percent	100	-	100	-	-	-
Mymensingh	Number	3	-	2	-	-	-
	Percent	100	-	67	-	-	-
Khulna	Number	1	1	-	-	-	-
	Percent	20	20	-	-	-	-
Rajshahi	Number	1	-	-	1	-	-
	Percent	50	-	-	50	-	-
Sylhet	Number	7	-	5	-	1	-
	Percent	100	-	71	-	14	-
National (LSDs)	**Number**	**39**	**1**	**17**	**12**	**4**	**5**
	Percent	**70**	**2**	**30**	**21**	**7**	**9**

Source: IFPRI-BIDS-UIUC Survey, 2017

***Note:** Of the 5 LSDs reporting "Other" reasons, 3 are located in Barishal division. One was recently made functional (after completion of the census), one is in the process of being made functional, and another has been eroded by the river. Two LSDs in Chattogram division are recommended to be auctioned off without dismantling any structure.

Basis on these discussions, this study has identified 11 non-functional LSDs for which decisions can be made regarding dismantling and/or divestment (Table 5.8). Eight of these are located in Chattogram division, and 3 in Khulna division. A total of 7 LSDs (5 in Chattogram and 2 in Khulna) need to be rebuilt following dismantlement. Two LSDs (Saldanadi LSD in Brahman Para upazila, Cumilla; and Dingedaha LSD in Chuadanga Sadar upazila, Chuadanga) do not need to be rebuilt, nor was any advice provided regarding their divestment. Finally, the census identified 2 LSDs in Chattogram division (Baishari LSD in Naikhongchhari upazila, Bandarban, and Chandraghona LSD in Kaptai upazila, Rangamati) regarding which the relevant authorities recommended they be auctioned off.

Table 5.8 List of non-functional LSDs recommended for dismantling and/or divestment

Division	District	Upazila	LSD Name	Local demand exists	Needs to be dismantled	Needs to be rebuilt	Can be sold
Chattogram	Bandarban	Naikhongchhari	Baishari LSD	Yes	No	-	Yes
	Cumilla	Brahman Para	Saldanadi LSD	No	Yes	No	-
	Cumilla	Chauddagram	Gunabati LSD	Yes	Yes	Yes	-
	Cumilla	Debidwar	Companiganj LSD	No	Yes	Yes	-
	Lakshmipur	Kamalnagar	Monoharpur LSD	Yes	Yes	Yes	-
	Noakhali	Hatiya	Tamaruddin LSD	Yes	Yes	Yes	-
	Noakhali	Hatiya	Jahajmara LSD	Yes	Yes	Yes	-
	Rangamati	Kaptai	Chandraghona LSD	Yes	No	-	Yes
Khulna	Chuadanga	Chuadanga Sadar	Dingedaha LSD	No	Yes	No	-
	Satkhira	Shyamnagar	Bhetkhali LSD	Yes	Yes	Yes	-
	Satkhira	Shyamnagar	Harinagar LSD	Yes	Yes	Yes	-

Source: IFPRI-BIDS-UIUC Survey, 2017

CHAPTER 6. KEY FINDINGS AND THEIR IMPLICATIONS

This report has presented the results of a very detailed census of public warehouses in Bangladesh. The questionnaire modules included physical conditions of the facilities, itemized data on needed repairs, as well as the perspective of the relevant Food officials on the challenges and usefulness of the facilities. In addition to this report, the survey data have also been used to produce a user-friendly GIS database that includes mapping of all storage facilities, with key attributes and summary statistics from the survey.[16] This product—a password protected GIS tool—can be used to review a host of different indicators such as geo-spatial locations, functionality, and facility- and warehouse-level physical conditions. In addition, two comprehensive datasets – one at the facility level and another at the warehouse level – will be shared with relevant stakeholders. These can be updated as required and used by DG Food to periodically record the condition of their storage structures. To the best of our knowledge, this is the most comprehensive study of its kind and this report, along with the accompanying GIS tool, can serve as the basis for many important strategic policy decisions related to public storage facilities. This section provides a summary of key findings and their implications.

6.1 Key Findings

This report provides evidence on various aspects of the state of public warehouses in Bangladesh. While all of those aspects are discussed in the report, a few of them appear to carry strategic significances. The following observations stand out:

a. **It is a big and important asset.** For a land scarce country like Bangladesh, public warehouses represent big and important assets. They occupy over 1,000 acres of land, a significant portion of them in prime locations throughout the country. Only about a quarter of the land is used for warehouse infrastructures. As the economy transforms, and food policy architecture changes, this presents an opportunity for the government to enhance efficiency through redesign and downsizing.

b. **There exists a gap between rated and functional capacities.** The functional / useable capacity of the entire storage system is about 10% lower than what is written in the book. According to official statistics, the country has a total capacity of 2.1 million MT, but our study suggest that available useable space can store only 1.9 million MT. Given the DG Food definition of functionality, only 91% of LSDs (577 out of 633), 85% of CSDs (11 out of 13), and 83% of the silos (5 out of 6) are found to be functional.

c. **The public storage infrastructure is old.** While there are some exceptions, public warehouses in Bangladesh are old. On the average, warehouses at LSDs and CSDs are 37 years old. Nearly half of the warehouses at LSDs are between 21-40 years old, compared to 28% of in case of CSDs. About 7% of the warehouses are older than 60 years; the proportion of over 60 years old storage facilities are higher for warehouses at CSDs (19%) than those at LSDs (3%). The older warehouses at LSDs are concentrated in Dhaka, Chattogram and Sylhet (42 years), and the newer ones in Rangpur (28 years).

d. **The majority of non-functional facilities are not recommended to be dismantled, despite being in relatively poor condition.** Based on the census findings, as well as detailed discussions with relevant DG Food officials, 45 out of the total 56 non-functional LSDs are not recommended for dismantlement or divestment for a myriad of reasons. The primary reason noted is that many of these are repairable,

[16] This GIS tool can be accessed online at: https://bifprp.shinyapps.io/StorageFacilityMap/.

and if sold, would result in the loss of public land. Further, several Food officials felt that reinstating these LSDs would help ease the procurement and distribution burden on the currently functional facilities, a burden that is perceived to only increase with time.

e. **In total, 9 LSDs have to be dismantled.** Of these, 7 need to be rebuilt. The 2 remaining LSDs were identified as not needing to be rebuilt. Finally, only 2 LSDs in Chattogram division were identified with the potential for divestment or rental to a third party; these LSDs do not need to be dismantled prior to divestment.

6.2 Implications

What implications do these results have? If the objective is to get estimates and do the repairs, the answer is obvious. However, if the objective is to make strategic policy decisions, these findings should be taken as the basis for thinking through evolving food policy challenges and alternative investment options.

Three considerations, not mutually exclusive, have relevance in this context. *First*, for many old storage facilities, it might not be worth investing in repairs and renovations. One reason is because the food policy context has changed—infrastructure has improved, poverty has declined, and the economy has experienced sustained growth for decades. So, this might be time for GoB to think about new ways of doing food grain management with fewer warehouses. At the same time, rather than investing in extensive repeated repairs of existing functional but worn-out facilities, it may be worth it to make certain non-functional facilities serviceable, provided that the cost of reinstating is less than that of repairing worn-out facilities. This would also help ease the storage burden in some areas, as is indicated in our findings.

Second is the strategic issue to consider whether to invest in repairs and renovations or modernize the traditional warehouses—the way China and Indonesia are doing—so that shelf life can be increased, and food safety ensured. In addition, modernizing warehouses can help improve tracking and minimize unnecessary movement of grains, which consequently results in better stock management and reduces transaction costs. An example of this is the Multistoried Modern Warehouse complex in Santahar, which can house a large quantity of food grain, maintain ideal temperature and moisture settings, and effectively bar infestation from insects and rodents, increasing the shelf life of food grains stored. While the initial setup costs may be high, investing in modern storage facilities could potentially greatly reduce the myriad long-run transactions and operations costs incurred through damaged food storage facilities and unnecessary movement at traditional facilities.

Finally, with regard to divestment options, given the paucity of non-functional LSDs identified through the census that could potentially be divested, it would be a futile exercise to extensively explore the role of the private sector in handling food storage operations. For one, it is currently not possible to divest non-functional warehouses at functional facilities, so partial ownership and maintenance of these warehouses by the private sector is not operationally feasible. Rather, it is the view of the relevant authorities at DG Food that these warehouses either be renovated or dismantled without replacement. For the two facilities that have been identified for divestment, it can be recommended that DG Food take requisite action as per existing protocols. However, it is true that the roles of the private sector in the grain economy have expanded rapidly over the past two decades. For some commodities, they are now investing in modern warehouses and developing more efficient value chains. Therefore, if the trend continues, the grain economy in Bangladesh will also undergo modernization and, like industrialized countries, these private actors can potentially form partnerships with the government to carry out many functions that the government has traditionally performed—such as holding strategic grain reserves for the government. This is an avenue that can be explored further in the IFPRP

Deliverable 1.1.3, where an economic feasibility analysis for private investments in modern food storage will be conducted, and potential public-sector roles in promoting such investments will be investigated.

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APPENDIX - A. SUPPLEMENTARY TABLES

Table A.1 Non-functional CSDs

Sl. No.	Division	District	Upazila	Name	Number of warehouses	Remarks
1	Barishal	Barishal	Barishal Sadar (Kotwali)	Barishal Sadar CSD	28	Much of the storage area has been brought under the premises of a new Modern Steel Silo that will soon be constructed. Ten 1000-MT warehouses, one 500-MT warehouse and two 640-MT Tin Shed warehouses are being dismantled to make way for the Silo. There are a few warehouses at this facility presently under use as storage for Barishal Sadar LSD. Following the construction of the Silo, these warehouses will again operate under the auspices of Barishal Sadar CSD, even though the CSD will remain non-functional. Around 3 warehouses have been rented out to TCB.
2	Dhaka	Dhaka	Sutrapur	Dhaka CSD	-	This CSD has been non-functional since 2015. All warehouses have already been dismantled. As of 2015, the land occupied by this CSD has come into the auspices of the Modern Steel Rice Silo project, which will be constructed in its stead.

Source: IFPRI-BIDS-UIUC Survey, 2017

Table A.2 Non-functional Silo

Sl. No.	Division	District	Upazila	Name	Number of bins	Remarks
1	Khulna	Khulna	Khulna Sadar	Khulna Steel Silo	-	This Silo is to be demolished. Many parts of the Silo are unusable.

Source: IFPRI-BIDS-UIUC Survey, 2017

Table A.3 Future modern Silo sites

Sl. No.	Site	Latitude	Longitude	No. of bins	Per bin size (sq. ft.)	Per bin capacity (MT)	Total capacity (MT)	Grain type	Rationale	Region
1	Barishal	22.68083	90.36416	16	2,400	3,000	48,000	Rice	Disaster relief: Cyclones	South central
2	Narayanganj	23.62101	90.51045	16	2,400	3,000	48,000	Rice	Disaster relief: Flooding	Central and south
3	Dhaka	23.69830	90.42004	16	2,400	3,000	48,000	Rice	High consumption and food deficit area	Central
4	Ashuganj	24.03893	90.99693	35	2,400	3,000	105,000	Rice	Processing and logistics hub	Northeast
5	Mymensingh	24.44351	90.36303	16	2,400	3,000	48,000	Rice	Surplus production	North
6	Maheshwarpasha	22.83796	89.54356	6	7,020	12,700	76,200	Wheat	Disaster relief: Cyclones	South central
7	Chattogram	22.27575	91.79581	9	7,020	12,700	114,300	Wheat	Import and supply to all parts of the country	Southeast
8	Madhupur	24.62952	90.06441	16	2,400	3,000	48,000	Rice	Surplus production	North

Source: MFSP, 2017

APPENDIX - B. MAP OF PUBLIC STORAGE FACILITIES IN BANGLADESH



APPENDIX - C. MAP OF NON-FUNCTIONAL STORAGE FACILITIES IN BANGLADESH



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