Rice Processing Industry of Bangladesh: An Economic Analysis

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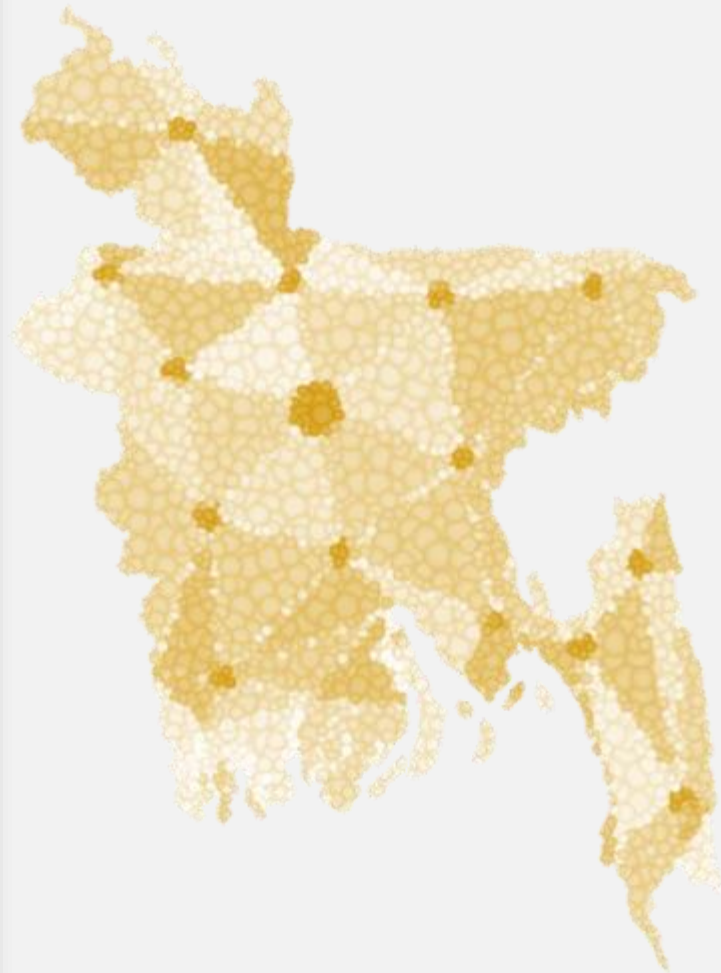EMERGING
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Abstract

This study examines the rice processing industry in detail by dividing rice mills into two categories (Automatic rice mill and Husking mill). First, this study discussed and calculated the establishment and operational costs for the Automatic rice mill and Husking mill. Then discussed the firms' legal issues, production process, by-products, marketing channels, government policies, and problems & prospects of this industry. Besides, this study has separately examined the profitability of the micro, small, medium, and large firms. The data of this study were collected from the ECRL's data bank, which was collected in January-December 2016 for credit rating purposes. This study has selected the 50 best samples from 76 rice mills based on the available information. The data set covered five Divisions of Bangladesh: Chittagong, Dhaka, Khulna, Rajshahi, and Rangpur. This study revealed that the average total revenue for micro firms is Tk.128.38 million, for the small firms is Tk.380.15 million, for the medium firms is Tk.722.73 million and for the large firms is Tk1357.37 million. The benefit-cost ratio is 1.06, 1.06, 1.09, and 1.03 for the micro, small, medium, and large firms, respectively. The average total benefit-cost ratio for the rice processing industry is 1.06. Finally, this study discusses the problems and prospects of this industry.

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1.   Introduction:

Bangladesh is one of the world's top rice-consuming countries. The per capita rice consumption stood at 196.6 kilograms in FY2016 and 196.3 kilograms in FY2017 (The University of Arkansas, 2017). Rice is the most important cereal and staple food, providing more than 70% of the total calorie intake in Bangladesh (Zaman, Mishima, Hisano, & Gergely, 2001). Bangladesh has three seasons of rice production, namely Aus (summer), Aman (winter), and Boro (spring). The aggregated production of Aus (2.6 million MT), Aman (13.2 million MT), and Boro (18.7 million MT) paddies have been estimated to be 34.5 million metric tons (MT) in FY2016 by using a total of 11.77 million hectares (ha) of land (Lagos & Hossain, 2016) which is more than 75% of total cropped land (BARC, 2011).

However, after harvesting paddy from the crop field, it needs to be processed for consumption. There are three rice processing stages: parboiling, drying, and milling. This process can be conducted both at home and at the rice mill. The small-scale paddy processing is conducted at home for non-commercial purposes, precisely for family consumption. Dheki is the main instrument to process paddy after it is parboiled and dried.[1] Another way of small-scale paddy processing is conducted in the village rice mill[2] or small husking mill for family consumption. A small rice husking machine can also be the main instrument to process paddy after being parboiled and dried at home. The large-scale paddy processing is mainly conducted by the rice mill, a commercial milling[3] center. Generally, two commercial mills are available in Bangladesh: a modern or automated rice mill and a husking or traditional rice mill. Modern or automatic rice mills hold out roughly all activities through a mechanical process, including categorization of rocks & unfilled grains, grain marinating, boiling, drying, milling, polishing & bagging.

On the other hand, traditional commercial mills or Husking mill is the oldest processing method of paddy. They are made of wood with few metal components and are often driven by a single power source through a transmission system (Islam, 2014). Therefore, this study mainly focuses on the commercial milling system of Bangladesh.

In the last two decades, the consumption and production of rice increased significantly (Table 1). At the same time, commercial rice mills have also increased. As a result, some traditional (husking) mill owners have replaced their husking mills with modern systems. Thus, the farm owners make a considerable profit despite many problems, influencing people to invest in this business. However, the main objective of this study is to provide a complete picture of the commercial rice milling system.

This study discusses the current scenario of the rice processing industry of Bangladesh, along with the capital required and the rules and regulations to follow to establish and run a rice mill. In addition, this study also accentuates other factors like production process, by-products, seasonal impact, and marketing channels. Along with these, this study analyzes the primary survey data collected from different rice mills. Finally, the problems & prospects of establishing and running a commercial rice mill

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[1] A wooden instrument, 2. 5 - meters long and 20 - cm square, balanced like a seesaw on a bamboo fulcrum. This tool is known as Dheki, used by villagers for husking rice. During the husking process, women push one end with their foot so that the other end, fitted with a wooden peg, rises and falls on the rice grains in a hole scooped in the kitchen's earthen floor. The pounding breaks the outer husks, leaving the inner kernels intact (Zaman, Mishima, Hisano, & Gergely, 2001).

[2] Village - rice mills are used for service milling paddy of farmers for home consumption. It can be found in rural communities.

[3] Commercial milling systems mill the paddy in stages and consequently are called multi-stage or multi-pass rice mills. Commercial rice milling aims to diminish mechanical pressures and heat buildup in the grain, thereby decreasing grain breakage and producing uniformly polished grain (Rice Knowledge Bank, 2017).

have also been discussed. However, this study used primary and secondary data for a significant discussion. Therefore, secondary data has been collected from different sources.

Figure 1: Rice Production and Consumption Trend in Bangladesh

Rice Production and Consumption Trend
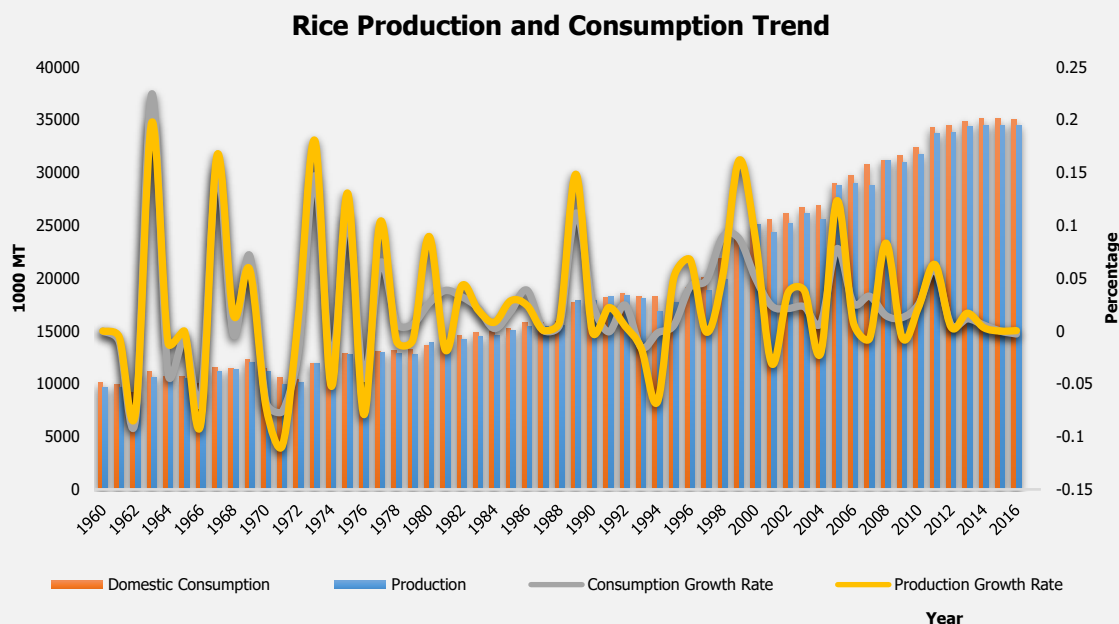
Source: Index Mundi (Index Mundi 2016)

2.   The Present Scenario of the Rice Processing Industry of Bangladesh:

The rice milling or processing sector in Bangladesh is undergoing a revolution. In recent years, significant people are not using Dheki for paddy processing. Instead, machines have occupied this place. However, in recent years, the per capita income of people in Bangladesh has increased significantly. Due to the rise in income levels, people now prefer processed rice, which is less costly, looks glossy, takes less time to cook, is free from stones & dead rice, and has a longer shelf life. As a result, new automatic rice mills are being set up at a mounting rate to match the people's demand, increasing competition for thousands of small and medium husking mills. As a result, automatic rice mills may impact the performance of the rice-selling system.

On the other hand, many husking mills are withdrawing, decreasing the market share for the small millers. Over the previous decade, several hundred automatic and semi-automatic rice mills have been found in different rice-producing regions of Bangladesh. Naogaon, Chapainawabganj, Dinajpur, Kushtia, and Noapara of Jessore are some districts that have involved investment in establishing large automatic rice mills. In addition, more investments are coming up for new auto rice mills (The Daily Star, 2011). In 2005, around 500 automatic and semi-automatic rice mills and 17000 husking mills were also involved in parboiling, drying, and crushing paddy bought from farmers. Of these mills, more than 350 operators have their brand of rice in the market. Bangladesh Auto, semi-auto, and Husking Mills Association has around 17,000 members. These mills process and market at least 60 percent or three crore tons of the five crore tons of paddy produced a year in the country. According to analysts and millers, the farmer keeps the rest of the production for consumption. The rice milling and processing market are around

Taka 50,000 crore (The Daily Star, 2015). According to the provisional data by the Bangladesh Bureau of Statistics (BBS), it has been reported that in FY15, the production of milled rice reached a record high of around 34.708 million tons, a little up from approximately 34.41 million tons in FY14 (Rice Outlook, 2015).

3. Establishment and Operational Cost of a Rice Mill:

The establishment cost of a rice mill is mainly incurred in three areas: land purchasing, building development, and machinery purchase. Nevertheless, the cost will vary depending on the size and types of firms. Therefore, this section mainly focuses on the minimum cost and capital required to establish an automatic and semi-automatic rice mill.

3.1 Automatic Rice Mill:

3.1.1 Establishment Cost

3.1.1.1 Land:

A rice mill requires 100 decimal land to establish a 50-ton production capacity, and for a 100-ton capacity, the rice mill needs 150 decimal land. Additional land leads to more comfortable operation and, thus, more production capacity (CBECL, 2012). However, the price of the land depends on different places and locations.

3.1.1.2 Infrastructure Development:

3.1.1.2.1 Building Structure Development:

An automatic rice mill structure can be established using bricks, steel, and a combination. The established cost of a building mainly depends on raw materials' market price and quality. The cost of establishing a building may vary based on different locations and regions. An entrepreneur must calculate all materials costs before constructing a mill.

3.1.1.2.2 Setup Cost of Machinery:
An auto rice mill plant has four sections: Parboiling Section, Drying Section, Milling Section, and Bagging Section, where different types of machinery are required for different stages of operations. The price of the machines also depends on the different stages of production. Table 1 provides the complete picture of the types of machinery for the different stages of production.

The average price of the standard boiler machine is about Tk.4.8 million to Tk.8.0 million, which has a per day capacity of boiling (assuming 16 hours) 50-ton to 100-ton paddy. Nevertheless, the cost of the Japanese and Chinese brands is lower than the Korean brand. However, almost 90 percent of parboiling rice milling machinery in Bangladesh is generally imported from India (CBECL, 2012), whereas machines from Japan and Germany are better in quality but more expensive than Indian machinery. The average cost of an Indian machine for the parboiling section is about Tk.12 million for 100 tons daily. Another Indian machine for the drying section has an average 100 tons per day capacity costing about Tk.12

million. However, the cost of a Chinese brand is only Tk.4.2 million. However, 90 percent of Milling and Bagging machinery is imported from China. The price of the Chinese milling machine is about Tk.15 million to Tk.20 million for 100 tons per day capacity.

Table 1: Machinery Cost (Taka in a million) of the Automatic Rice Mill

Particular	Japanese Brand	Chinese Brand	Indian Brand	Korean Brand
Boiler	4.8-5.0	4.8-5.0	.	5.0-8.0
Dryer	13.6	4.2	12.0	7.2
Parboiling	15.0-19.0	7.8-9.0	12.0	3.2
Milling	35.0-40.0	15.0-20.0	.	10.0-20.0
Color Sorter	11.0	5.0-6.0	4.5-6.0	7.0
Power station	2.2	2.2	2.2	3.0-4.0
Source: Bangladesh Rice Research Institute and ECRL primary survey (April 2017)				

Similarly, color sorter machines are also costly. The Indian color sorter machine costs around Tk.4.5 million to Tk.6 million. This machine is used for separating black and weak rice. It works with a camera, and the number of cameras depends on the number of channels.

3.1.2 Operational Cost:

3.1.2.1 Labor Cost:

Labor cost is an essential variable cost for an organization. On average, 20-25 workers are required in an automatic rice mill, including permanent (10-15) and temporary (10-12) workers. Moreover, the labor number depends on the firm's size and production capacity. The monthly salary of permanent workers is around Tk.12,000 to Tk.15,000 on average, whereas temporary workers get daily Tk.500 to Tk.700 on average. Usually, it is visible that temporary workers are getting higher wages than permanent workers, but their job is more vulnerable than permanent workers. However, the wage rate of an automatic rice mill varies according to the mill's location, demands, and availability of labor.

3.1.2.2 Utility Cost:
Another essential variable cost is utility, which depends on the production unit. For example, an automatic rice mill's utility cost depends on its monthly production and other related factors, such as electricity, fuel, gas, water, and other bills.

3.2 Husking Mill:

3.2.1 Establishment Cost:
According to the husking mill owners, to establish a husking mill, the capital required, on average, Tk.4.0 million to Tk.5.0 million, and a land of 100 decimals is needed. Most of the land is required for the drying of paddy. The main fixed cost is the land cost and then the machinery cost. This cost will vary depending on different areas and locations. However, the machinery cost of the husking and semi-automated mill is below.

Table 2: Machinery Cost (Taka in a million) of Husking Mill

Particular item	Husking Mill
Saddler	0.1
Rice filter	0.1-0.15
Garden polisher	0.08
Milling	0.15
Power station	0.5-0.7

Source: ECRL primary survey (April 2017)

3.2.2 Operational Cost:

Generally, husking mills are labor-intensive. So the husking mills require more labor compared to the automatic rice mill. On average, 30 workers are required for the husking mill, and their average wage rate per day is TK.500. Thus, the wage rate of the husking mill is very much similar to the automatic rice mill. However, the wage rate also varies according to the mill's location, demands, and workers' availability. On the other hand, the utility cost of the husking mill is lower than the automatic rice mill due to the lower production and mainly for the manual operating system.

4. Legal Issues:

Before setting up a rice mill, the entrepreneur must acquire the necessary approval or licenses required per regulations from the relevant authorities relating to a range of Acts and Rules made thereunder, which gives the clearance of establishing the rice mill.

1. License from the Ministry of Land Office: The initial steps require a permit for establishing the industry.
2. Local Chairman Trade License: Trade license is required before starting any business.
3. Ministry of Food License (Upazila Food Controller, District Food Controller): Rice mill setup requires a license to be acquired for manufacturing rice or food items.
4. Approval from the Ministry of Power: The electricity or power supply is significant in rice manufacturing, especially in auto rice mills. The ministry of power needs to be informed about the quantity, and the power supply required. The ministry would provide the approval and power supply as required.
5. Ministry of Environment and Forests Approval: Rice mill emits husks while manufacturing the rice, which has created a health hazard for the local people living near the mills. So, an environmental certificate must be collected, which requires following some rules or precautions to be taken to reduce the impact. Then, it approves the mill owners to mill the rice.
6. Fire Service: The mill has to meet the safety measures for fire hazards by taking necessary steps or buying fire extinguishing equipment, etc.
7. Ministry of Labor and Employment: Millers have to abide by all the rules or laws of labor.

5.   Production Process:

5.1 Production Process of Automatic Rice Mills:

The modern rice milling facility comes in various configurations, and the milling components vary in design and performance. A modern rice mill has three primary stages- the husking stage, the whitening-polishing stage, and the grading, blending, and packaging stage. In modern rice mills, many adjustments (e.g., rubber roll clearance, separator bed inclination, feed rates) are automated for maximum efficiency and ease of operation. In addition, the whitener-polishers are provided with gauges that sense the current load on the motor drives, indicating the operating pressure on the grain. This provides a more objective means of setting milling pressures on the grain (Rice Knowledge Bank, 2017). However, Table 3 signifies the modern rice milling processes.

Table 3: The Modern Rice Milling Process

Stage	Function
Pre-cleaning	removing all impurities and unfilled grains from the paddy.
Husking	removing the husk from the paddy.
Husk Aspiration	separating the husk from the brown rice/unhusked paddy.
Paddy separation	separating the unhusked paddy from the brown rice.
De-stoning	separating small stones from the brown rice.
Whitening	removing all or part of the bran layer and germ from the brown rice.
Polishing	Improving milled rice's appearance by removing remaining bran particles and polishing the milled kernel's exterior.
Sifting	separating small impurities or chips from the milled rice.
Length grading	separating small and large broken from the head rice.
Blending	mix head rice with a predetermined amount of broken, as the customers require.
Weighing and bagging	preparing milled rice for transport to the customer.

Source: Rice Knowledge Bank

The production process of a modern rice mill follows different shapes. The flow diagram below (Figure 2) represents the configuration and flow in a typical modern rice mill.

Figure 2: Auto Rice Milling Flow Chart
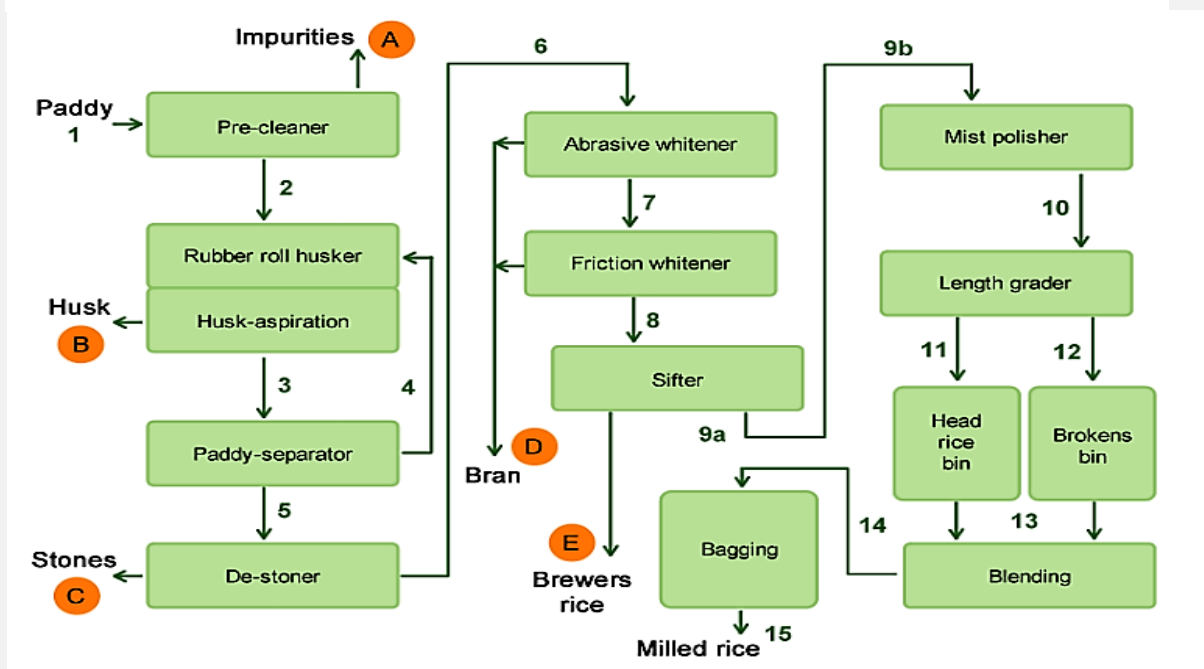
Source: Rice Knowledge Bank

According to the Rice Knowledge Bank, the description of the flow of materials and processes is given below:

1 - paddy is dumped in the intake pit feeding the pre-cleaner
A - straw, chaff, and empty grains are removed
2 - pre-cleaned paddy moves to the rubber roll husker:
B - husk removed by the aspirator
3 - a mixture of brown rice and unhusked paddy moves to the separator
4 - unhusked paddy is separated and returned to the rubber roll husker
5 - brown rice moves to the de-stoner
C - small stones, mud balls, etc. removed by de-stoner
6 - de-stoned, brown rice moves to the 1st stage (abrasive) whitener
7 - partially milled rice moves to the 2nd stage (friction) whitener
D - Coarse (from the first whitener) and fine (from the second whitener) bran removed from the rice grain during the whitening process
8 - milled rice moves to the sifter
E - Small broken/brewer's rice removed by the sifter
9a - (for simple rice mill) ungraded, milled rice moves to the bagging station
9b - (for more sophisticated mill) milled rice moves to the polisher1
10 - Polished rice, will move to length grader
11 - Head rice moves to head rice bin
12 - Broken rice move to broken rice bin

13 - The pre-selected amount of head rice and broken rice move to the blending station
14 - Custom-made blend of head rice and broken rice moves to the bagging station
15 - Bagged Rice moves to the market

5.2 Production process of Husking Mills:

The production process of a husking mill also follows different stages, like an automatic rice mill, and most of the work of a husking mill is conducted manually. Figure 3 shows the flow diagram of a typical husking mill.

Figure 3: Husking Mill Flow Chart
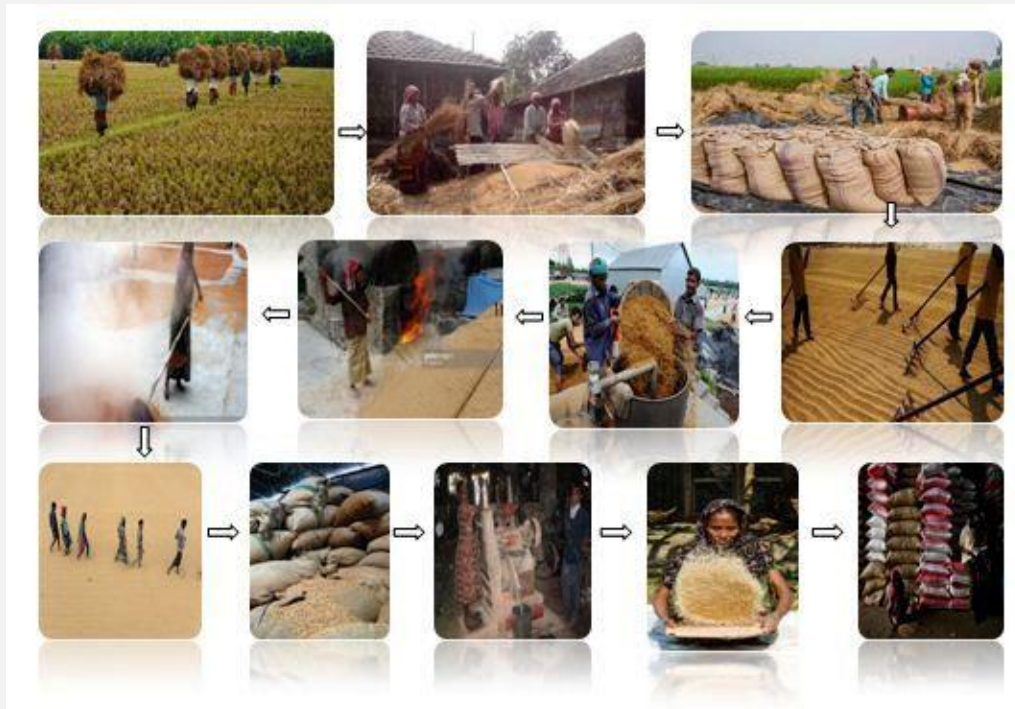
After harvesting, the crops are brought for threshing to separate the grains from the straws. It can be done through machines or manually by farmers. The next step is cleaning. Cleaning grains after harvesting is essential as it removes unwanted materials from the grains. Drying rice grains as soon as possible after cleaning (ideally within 24 hours) (RKB) is vital. Farmers dry grains manually under the sun in the Chatal or open field. Then, farmers boil rice grain. Then again, the farmers dry the boiled grains under the sun. The last process includes milling, sorting (de-stoning), and packaging the milled rice.

6.   Difference between Traditional and Modern Mill:

The milling process of traditional and automatic mills significantly differs. These are explicated below.

Table 4: Major Differences between Husking and Automatic Rice Mill

Types of Mill	Major Components	Capacity of Production	Power Requirement	Hulling/ Polishing	Bran Separation and Grading
Husking	Soaking Tank Steam Parboiled Drying Floor Engle berg Huller	0.6 to 1 ton/hour	30-40 HP	2 to 3 operations	Manually
Automatic	Pre-cleaner Soaking Tank Boiler, Steam Pressure Parboiled Dryer, Rubber Roll Sheller, Paddy Separator Polisher, Bran Separator, etc.	2 ton/hour	65-100 HP	Separately by different devices	All Activities Mechanically
Source: Zaman, Mishima, Hisano, and Gergely (2001)					

Compared to the traditional rice mill, the automated rice mill is the cleanest and finest system for rice processing. Automated processing involves fewer stones than traditional processing. Automatic rice processing mills can supply more than twice as much processed rice as conventional mills. Automated rice mills can produce more than 2 tons of rice per hour, whereas traditional or husking mills can produce 0.6 to 1 ton of rice per hour. Traditional rice processing mill requires 30-40 horsepower, whereas automated rice mills need 65-100 horsepower.

Moreover, traditional rice mills need 2 to 3 operations to cut and dry the processed rice, whereas automated rice processing mills complete these in only one process. In husking mills, grading and brand separation are done manually, but the automatic mills grading and brand separation are automated (Table-4). Automatic rice mills can cut the rice into different sizes, like Miniket, Najir Shail, Pajam, Katari Bhog, Chinigura, etc., whereas traditional rice mills cannot cut the rice into different sizes. It requires 12-15 minutes to cook the rice, which has been milled in automatic machines, whereas 20-25 minutes is traditionally required for rice milled. In an automated rice mill, by-products come after the number of processing because of that bran oil can be produced, and the by-product is also good poultry feed, whereas the by-product of traditional rice mills can only be used for poultry feed (Zaman, Mishima, Hisano, & Gergely, 2001).

7.   By Product Generation:

Rice mills can produce three varieties of by-products: rice husk, rice bran, and broken rice. The percentage of head rice, rice husk, rice bran, and broken rice varies according to mill types. On average, the surveyed automatic rice mills could generate 65.0, 22.75, 8.25, and 5.0 percent of head rice, rice husk, rice bran, and broken rice, respectively, while the husking mill produces less compared to automatic (Table 5).

Table 5: Milling Outturn and Production of By-Products for 40 KG Paddy

Mill Type	Milling Outturn (Kg)	Husk (Kg)	Rice Bran (kg)	Broken Rice (Kg)
Husky	25	9.3	3.5	2.2
	(62.5)	(23.25)	(8.75)	(5.5)
Automatic	26	8.7	3.3	2
	(65.0)	(22.75)	(8.25)	(5.0)
Source: ECRL primary survey (April 2017)				

However, the prices of these by-products are given below in Table 6. Furthermore, the by-product of auto rice mill has higher market demand because of good quality. Therefore, the number of by-products and raw products produced by a rice mill and their market demand could influence the margin of the millers.

Table 6: By-product Selling Price for both Husking and Automatic Rice Mills

Particular	Husk	Rice Bran	Broken Rice	
	(per kg)	(per kg)	(per kg)	
			Medium	Small
Selling price	Tk.24 TK.	Tk.22	Tk.23-Tk.24	Tk.20
Source: ECRL primary survey (April 2017)				

All the by-products that rice mills produce have alternative uses, such as bran and broken rice are helpful to feed for cattle, poultry, fish, and rice bran which is again used to produce natural oil, while rice husks are utilized as fuel for millers and rural community and ash of husk is used in cement factory as a silica. Husking mill owners generally use husks as fuel for boiling. A miller needs roughly 7200kg husks to boil 40000kg of paddy (Zaman, Mishima, Hisano, & Gergely, 2001). Most of the time, millers, who purchase husks from other millers or the market, make charcoal sticks and sell them.

8.   Marketing Channel:

A marketing or distribution channel is a set of interdependent groups that help transfer the ownership of goods or services from the producer to the consumers. For example, agricultural products move from farmers to ultimate customers through market intermediaries operating in the marketing system and efficiency.

The marketing channels of the rice mills are delineated in Figure 4. Generally, four groups are involved in the marketing channel: rice producers, aratdar/ bazaar, mill, and wholesalers/ retailers. First, paddy producers sell their paddy to nearby bazaars or hats. Then local aratdar purchases the paddy from bazaar or hat. Sometimes local aratdar also buys paddy from the producers and sells it to the millers. The rice millers can also buy paddy directly from producers. Then millers process the paddy; after processing, they sell it to wholesalers or retailers and sometimes to consumers. Finally, the retailers buy rice from wholesalers or directly from the mill and sell it to final consumers.

Figure 4: Marketing Channel of Rice Processing Industry
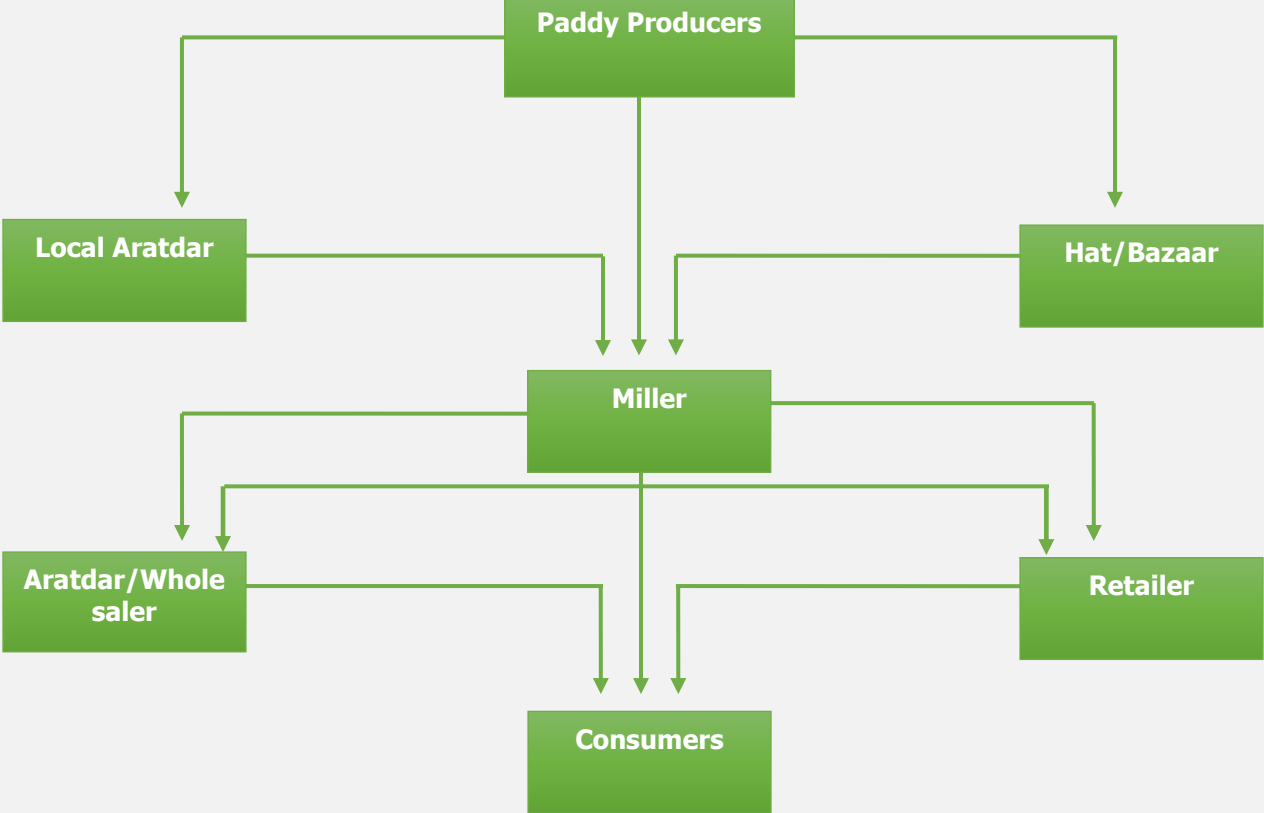
Source: ECRL primary survey (April 2017)

9. Government Policies:

Many government policies are in effect to support the rice industry and contribute to its growth. The regulations in the domestic rice industry support farmers and rice manufacturers in terms of paddy prices and rice release mechanisms (CRISIL Research, 2016).

The Government of Bangladesh (GoB) adopted the Seventh Five Year Plan (7FYP/SFYP 2016-2020), accepted by the end of 2015, which focuses on raising rural income and generating employment opportunities for rural people by developing the crop sub-sector. In addition, the 7FYP aims to diversify climate-resilient agricultural production with increased commercialization and income improvement

through technological innovations and usage and connect the farming community nationally and internationally (FAO, 2016).

The Government of Bangladesh (GoB) directly assists farmers by enhancing inputs, increasing credit facilities, and guaranteeing support prices through public procurement. The government is helping by increasing fertilizer subsidies, credit provisions to smallholder farmers, continual price stabilization, domestic procurement, promoting food and agricultural diversification, etc. (FAO, 2016). This might positively impact the price of paddy, making the price cheaper for the millers.

Although the Government of Bangladesh (GoB) is providing subsidies for various inputs such as seed and fertilizer (20 kg of urea, 10 kg of Di-Ammonium Phosphate, and 10 kg of Muriate of Potash) to incentivize farmers to grow more Aus rice, many farmers prefer to grow jute because of higher profit margins (Lagos & Hossain, 2016). Therefore, this might lower the amount of paddy supplied to the millers.

During a natural calamity, like a flood, the paddy prices rise, making it expensive for the millers, again increasing the price of the rice. Thus, it harms the millers as well as the consumers. During the flood in 2016, the Ministry of Agriculture reported 0.75 million hectares (ha) of waterlogged cropland and damaged cropland of 1.6 million hectares (ha). Later in the season, the Aman rice crop was recovered through replanting, but the Aus rice affected by flooding was destroyed. The government of Bangladesh supported farmers by spending BDT 421 million ($5.32 million) on an agriculture rehabilitation and incentive program for the Kharif-2 (autumn) and Robi (winter) seasons. The government distributed rice seeds, rice seedlings, and fertilizer to 0.75 million lower-income farmers to make up for lost crops and boost production (Hossain & K.Singh, 2016). This government incentive is needed as a shortage of paddy will cause a rise in the price of paddy.

Additionally, the imposing tariff on imported rice also supports the millers of Bangladesh. The tariff has been raised, and other taxes have been added to stop cheaper Indian rice imports, which constitute the largest import market share. The GoB imposed a 20 percent import tariff, on December 8 (2015), on husked (brown) rice, fortified rice kernels, and other semi-milled or wholly milled rice to prevent less expensive imports from competing with domestic rice (Lagos & Hossain, 2016).

As of June 2, 2016, the tariffs have been increased by GoB, amounting from 10 to 25 percent, and a 10 percent regulatory duty on rice imports has been removed. The GoB also imposed a value-added tax (VAT) of 15 percent in addition to an advance income tax (AIT) of five percent and an additional advanced trade VAT (ATV) of four percent. As a result, rice imports have been lowered to 0.22 MMT for the marketing year (MY) 2015/16 based on the latest customs data (Hossain & K.Singh, 2016). On its annual budget for FY 2016/17, GoB imposed 25 percent import tariffs on husked (brown) rice, fortified ice kernels, and other semi-milled or wholly milled rice to protect domestic rice producers. Slowed imports likely will result in lower ending stocks (Hossain, Bangladesh: Grain and Feed Annual, 2017).

10.   Economic Analysis:

The dataset used for this analysis was collected from the emerging Credit Rating Ltd's primary survey. The rating department conducted this survey for ratings in the fiscal year 2016. This study has selected the 50 best samples from 76 rice mills based on available information. The samples have been collected from five Divisions of Bangladesh: Chittagong, Dhaka, Khulna, Rajshahi, and Rangpur (Figure-5). However, all firms are locally owned, 84 percent are solely owned, and the rest comprise partnership businesses and private limited companies (Figure-6). The size of the firms is divided into four categories: Micro, Small, Medium, and Large (Figure-7). This classification has been made based on the number of employees[4]. However, this study has considered contingency tables, summary statistics, and Benefit-Cost Ratio (BCR) to analyze the Rice Mill Industry.

Figure 5: Distribution of Firms by Division

■Chittagong ■Dhaka ■Khulna ■Rajshahi ■Rangpur
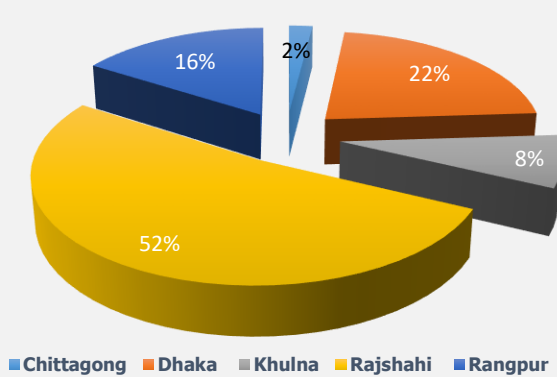
Figure 6: Distribution of Firms by Types of the Organization

■Sole Ownership ■Partnership ■Private Ltd.
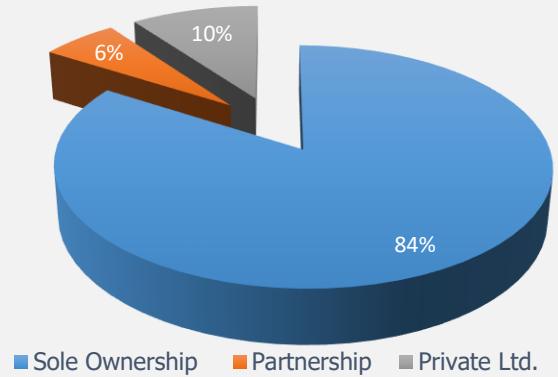
Figure 7: Distribution of Firms by the size of the organization
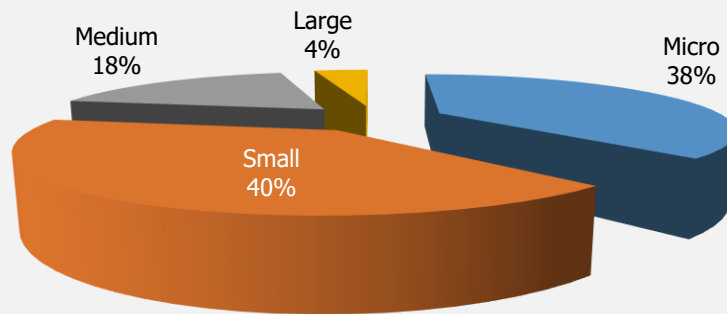
The contingency tables[5] (Tables 9 to 12) of the firms represent the relationship between total cost, total revenue, total current asset, total fixed asset, total production, the total capacity of production, total insurance amount, total mortgage amount, and total loan amount with the size of the organizations,

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[4]The classifications have been made taking a range of 10 to 24 employees for Micro Firm, 25 to 99 employees for Small Firm, 100 to 250 employees for Medium Firm and above 250 employees for Large Firm (BBS 2013).

[5] A contingency table (also known as a cross-tabulation or two-way table) is a type of table in a matrix format that displays the (multivariate) frequency distribution. They provide a basic picture of the interrelation between two variables and can help find interactions between them. More specifically, it shows how one variable differs based on another variable.

division, types of the organization and total capacity utilization of machines which analyzes and compares the results for one variable with the result of another variable. However, to generate the contingency table, this study has divided the values of total cost, total revenue, total current asset, total fixed asset, total production, total capacity of production, total insurance amount, total mortgage amount, and total loan amount into four quartiles[6].

Table 9 of the appendix provides a picture of organizations' size (Micro, Small, Medium, Large) by the total cost, total revenue, total current asset, total fixed asset, total production, total capacity, total insurance, total mortgage, and total loan. The table represents the positive relationship between the firm's size and the different ranges of the particular variables[7]. For example, as per the range of different variables, except for the total fixed asset and total mortgage amount, maximum micro firms are located in the first and second quartile (Q1 and Q2), which is around 70 percent, and the rest of the firms are situated in the third and fourth quartile (Q3 and Q4) Similarly, small firms are located in every quartile of the variables. However, most are situated in the first to the third quartile except for the total insurance amount. Moreover, around 70 percent of medium firms fall in the third and fourth quarters, whereas all large firms are situated in the fourth quarter of variables. So the table provides a clear picture of the positive relationship between two variables suggesting that a change in the firm's size, from micro to large, leads to a change in the position from lower quarter to upper quarter.

Table 10 shows the relationship between Divisions (Chittagong, Dhaka, Khulna, Rajshahi, and Rangpur) and particular variables like assets, loans, production, capacity, revenues, cost, etc. The table demonstrates that more than 65 percent of firms in the Dhaka Division and 55 percent in the Rajshahi Division are located in the third and fourth quartiles. On the other hand, in Rangpur Division, more than 60 percent of firms are situated in the first two quartiles except for total production, the total capacity of production, and total insurance amount, suggesting that the capacity and production are high with low cost and loan even though insurance cost is high. However, in Khulna Division, firms are scattered in different quartiles. So it can be concluded from the table that the top firms of the Dhaka and Rajshahi Divisions belong to the upper quartile, which signifies that the mills in these two Divisions have the highest range of costs, revenues, production capacity, assets, and loans.

Another contingency table (Table 11) of the appendix provides a picture of the organization's types (Sole Ownership, Partnership, and Private Ltd.) by particular variables. The table shows that the top firms are sole proprietorship businesses, and the firms are scattered in every quartile, but a different scenario is noticeable for the partnership business and private limited companies. The firms of the partnership business are located within the first and third quartiles, except for the total insurance amount. On the other hand, on average, 80 percent of the private limited companies are staying firmly in the third and fourth quartile. However, more than 90 percent of the firm's production capacity utilization varies between 75 percent to 100 percent and is situated in different quantiles of the variables (Table 12).

Table 7 provides summary statistics by the organization's size for the different variables of interest. The total cost of the firms includes all types of fixed and variable costs of a rice mill. On average, the yearly total cost of micro firms is Tk.122.52 million, whereas small firms spend Tk.342.15 million, medium firms Tk.667.56 million, and large firms Tk.1317.22 million. However, Table 5 of the appendix represents the

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[6] The first quartile is considered 0.25 quantile or 25 percentiles, the second quartile is 0.5 quantile or 50 percentiles, and the third quartile is 0.75 or 75 percentiles. Finally, the fourth quartile considers as 1 quantile or 100 percentiles.
[7] Variables are the total cost, total revenue, total current asset, total fixed asset, total production, the total capacity of production, total insurance amount, total mortgage amount, and total loan amount.

segregation summary statistics of the total cost, where the cost of goods sold is the main cost of a rice mill which is more than 90 percent of the total cost. The average yearly cost of micro firms for goods sold is Tk.118.28 million; small firms spend Tk.316.85 million, medium firms Tk.628.26 million, and large firms Tk.1257.54 million. The second essential cost is financial services (bank charges and transaction fees), where the average yearly cost of micro firms is Tk.1.79 million, small firms Tk.9.40 million, medium firms Tk.19.26 million, and the large firms Tk.23.28 million.

Moreover, the wages seem to be another highest cost of the rice mill, where the lowest cost (Tk.1.31 million) belongs to micro firms, and the highest cost (Tk.11.89 million) belongs to medium firms. However, on average, micro-firms earned total yearly revenue of Tk.128.38 million, small firms earned Tk.380.15 million, medium firms earned Tk.722.73 million, and large firms earned Tk.1357.37 million (Table 7). So the average yearly net profit of the micro firms totaled Tk.5.86 million, whereas small firms earned Tk.38 million, and the large firm earned Tk.40.15 million, but the medium firms earned the highest amount of profit which is Tk.55.17 million (Table 13).

Table 7 also represents the summary statistics of total current and total fixed assets, where the total current and fixed assets are higher for the large firms (Tk.347.73 million and Tk.337.01 million) and lower for the micro firms (Tk.40.72 million and Tk.40.8 million). A similar trend has also been seen in total insurance value, mortgage amount, and loan amount. However, Table 14 of the appendix signifies that the main fixed assets for all firms are land and building and then machines and vehicles. Another table in the appendix (Table 15) explains the classified summary statistics of current assets, where closing inventories are the main current assets and, secondly, A/C receivables. In addition, large firms also have the average amount of loans with mortgage and insurance compared to any organization size. As the firms grow more significantly, the revenue, assets, and cost amount increases even though the average number of years of business is comparatively low (Table 7).

Table 7: Summary Statistics

Variables	Micro		Small		Medium		Large	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD.
Total Cost (Million, Taka)	122.52	118.34	342.15	544.36	667.56	573.46	1317.22	897.35
Total Revenue (Million, Taka)	128.38	123.16	380.15	635.34	722.73	628.90	1357.37	926.15
Total Current Asset (Million, Taka)	40.72	43.53	151.85	261.49	293.21	287.54	347.73	120.49
Total Fixed Asset (Million, Taka)	40.80	50.02	118.14	95.51	240.86	118.91	337.01	171.01
Total Years of Business	16.21	10.22	12.85	8.22	18.56	13.27	9.00	7.07
Total Insurance (Million, Taka)	14.04	16.45	24.13	14.14	62.07	40.28	147.52	75.68
Total Mortgage (Million, Taka)	39.58	37.39	109.75	142.31	284.62	180.50	291.66	139.28
Total Loan (Million, Taka)	25.95	38.27	77.80	109.66	212.26	210.82	247.17	110.67

Table 8 represents the Benefit-Cost Ratio (BCR) by the organization's size. The BCR is higher for medium firms (Tk.1.09) and lower for large firms (Tk.1.03). The average total BCR is Tk.1.06, which means that a firm has received a return of Tk.1.06 for every Tk.1.00 investment. However, Table 16 of the appendix shows the BCR for individual firms. Finally, it can be concluded that a firm can earn a profit by spending each taka.

Table 8: Benefit-Cost Ratio (BCR) by the Size of the Organization.

Micro	Small	Medium	Large	Total
1.06	1.06	1.09	1.03	1.06

11.   Problems and Prospects:

11.1 Prospects:
Bangladesh is the world's sixth-largest producer of rice (CRI, 2014). The demand for rice is inelastic as it is the primary food grain of Bangladesh (Alam, 2010-2011). The demand does not change significantly with price, and low sales uncertainties as all rice products are saleable:
- Stone-feed
- Rice-plain
- Bran-Oil
- Tush-Mill
- Broken Rice-poor people buy them and are also used as feed

Moreover, auto rice mills are entitled to rice allotment or incentives from the government (Bangladesh Grain and Feed Annual, 2013), and even banks provide financial support to the mills through overdraft limits, working capital limits, etc. (IFIC Bank & ICB, 2017). Moreover, demand for rice increases with the population; the income is fixed with low leverage risk. All these and other factors make the rice mill industry an area of possibility and future investments. Other factors that can enhance the possibilities for this industry include:[8]
- Reducing middlemen's cost: Removing intermediary or middlemen's commission cost.
- Low monitoring cost and low cost of labor: Machine-intensive mills can reduce the cost of labor, mainly for husking mills.
- Export permission: It could be an opportunity for the manufacturers as there are surplus productions of rice.
- A good relationship with the suppliers means that supply chain management is flexible and robust.
- Converting to auto rice mill: Automating the production process to ensure market survival and credibility.
- Climate: For auto rice mills, the climate factors are omitted in the rice processing.
- Experience: The vast experience of the proprietor can create a strong presence in the local area to maintain the fixed market share.
- Labor advantage: Labor or technician availability according to area or location.

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[8] Information was gathered based on interviews with Financial Analysts of Emerging Credit Rating Limited and rice mill owners during surveys. Moreover, analysis had been further conducted by the Research Department of Emerging Credit Rating Limited.

- Good marketing strategy: Small packaging makes storage easier for consumers. So they would buy in small quantities as storage is easy and buy again when needed.

11.2 Problems:

Generally, there is always the threat of intense competition, which might create a problem for small firms. Moreover, the difference in the mill types can be a problem. For instance, the process of husking rice mills is lengthy and labor-intensive. Even the drying process takes longer than the automated rice mills. Other factors which can raise a problem include:[9]

- Technology: Technology can be a threat as labor is reduced every time specialized machinery is improved or developed.
- By-products not produced by all mills: Husking mill does not have bran.
- Government incentives and tax: There is a lack of incentives for the millers and tax rate, which could have helped boost this industry.
- The price of paddy: The price volatility of paddy occurred due to damage to crops, lower production of rice, import impact, etc.
- Environmental hazard: 'Tush' in the air creates breathing problems for people in that area. For instance, a similar case happened in Dinajpur. Therefore, an 'Environment Clearance Certificate is required for production.
- Syndicate: Political syndicate influencing the distributional cost.
- Climate issue: When there is a flood, it might destroy the paddy, which is a risk for the rice millers as it might raise the price of the paddy.
- Management and maintenance problem: There might be management issues if the managers' goal is not aligned with the firm's goals. Moreover, there can also be a maintenance issue if the technician is not skilled or trained to operate the machines.
- Farmers switching to other grains: Farmers switching to more profitable crops like maize, potato, jute, pulses, and oilseeds might increase paddy prices.

The rice mill owners have been interviewed, and they informed that their frequency of load shedding is quite a lot, and there are also shortages of labor supply which hurt the production. Selling in due is another problem of marketing and distribution. Besides, setting the price floor and ceiling by the government while purchasing paddy from the farmers and selling rice to the wholesalers and distributors, with a deposit of 4000-5000 tons of rice per year to the government warehouse, will reduce the revenue generated from sales. Furthermore, the recent damage in the Haor region is creating negative vibes among rice manufacturers. The rice manufacturers are skeptical about the price of paddy, which they fear will rise in the future due to the loss of paddy in Haor.

12.   Conclusion:

The demand for rice will always be there. As demand grows, the need to boost the production and milling process also grows. Increased business efficiency and productivity can be traced to the automation of processes. As per the analysis of this study, it is evident that the revenue, cost, assets, loans, and production capacity will increase with firm size and types of organization. These factors will vary Division

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[9] Information was gathered based on interviews with Financial Analysts of Emerging Credit Rating Limited and rice mill owners during surveys. Moreover, analysis had been further conducted by the Research Department of Emerging Credit Rating Limited.

wise though the maximum range has been seen in Dhaka and Rajshahi divisions. According to the data, small and medium firms have more cash in hand and bank than micro and large firms. The net profit, on average, is highest for medium firms. Even the average wages are higher for small and medium firms suggesting that they are primarily husking mills. Although this analysis is based on a primary survey of 50 samples with a disproportionate number of each firm type, it can give an insight into the revenue, cost, assets, loans, and production capacity of different rice mills.

However, modern mills are efficient and less time-consuming than traditional mills, though modern mills consume significant energy. Different types of machinery of different brands for different stages of rice processing are available. Modern types of machinery can produce twice the output of traditional ones. Even the wage cost is lower in automated mills as the rice manufacturing process is fully machine-based.

Even if the analysis suggests that rice manufacturing has a profit margin while setting up a rice mill, it is imperative to be aware of the seasonal impact and impact of other issues, including tariffs, policies, and so on, which might create challenges in the production process. There are pros and cons to be considered before making any rational decisions. The government can play an essential role in this agricultural sector by supporting the farmers and millers to face and overcome these challenges.

Unfortunately, the recent flash flood, rainfall, disease attacks on standing paddy, and depleting stocks create a challenging situation for the agricultural sector. The damage to Boro paddy was caused by the flood in the haor region (northeast region), and recent rainfalls came as a blow to the market. As a result, there is a shortage of paddy, which might increase the price, thus affecting poor people (Parvez, 2017). The government needs to take the initiative to help and support the farmers and the local millers to cope with the situation and stabilize the market.

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Appendix:

Table 9: Size of the Organization by Total Cost, Total Revenue, Total Current Asset, Total Fixed Asset, Total Production, Total Capacity, Total Insurance, Total Mortgage, Total Loan.

Particular	Range	Size of the Organization				Particular	Range	Size of the Organization				Particular	Range	Size of the Organization			
		Micro	Small	Medium	Large			Micro	Small	Medium	Large			Micro	Small	Medium	Large
Total Cost (Million)	<=72 (Q1)	8 (42.11%)	5 (25.00%)	-	-	**Total Revenue (Million)**	<=76 (Q1)	8 (42.11%)	4 (20.00%)	-	-	**Total Current Asset (Million)**	<=30 (Q1)	10 (52.36%)	3 (15.00%)	-	-
	73-190 (Q2)	7 (36.84%)	4 (20.00%)	1 (11.11%)	-		76-200 (Q2)	7 (36.84%)	5 (25.00%)	1 (11.11%)	-		31-55 (Q2)	6 (31.58%)	5 (25.00%)	2 (22.22%)	-
	191-410 (Q3)	3 (15.79%)	7 (35.00%)	3 (33.33%)	-		201-425 (Q3)	3 (15.79%)	7 (35.00%)	3 (33.33%)	-		56-150 (Q3)	2 (10.53%)	8 (40.00%)	2 (22.22%)	-
	>=411 (Q4)	1 (5.26%)	4 (20.00%)	5 (55.56%)	2 (100%)		>=426 (Q4)	1 (5.26%)	4 (20.00%)	5 (55.56%)	2 (100%)		>=151 (Q4)	1 (5.26%)	4 (20.00%)	5 (55.56%)	2 (100%)
Total Fixed Asset (Million)	<=30 (Q1)	11 (57.89%)	2 (10.00%)	-	-	**Total Production (MT)**	<=8000 (Q1)	7 (36.84%)	4 (20.00%)	-	-	**Total Capacity (MT)**	<=12000 (Q1)	7 (36.84%)	7 (35.00%)	-	-
	30-75 (Q2)	4 (21.05%)	7 (35.00%)	1 (11.11%)	-		8001-15000 (Q2)	6 (31.58%)	5 (25.00%)	1 (11.11%)	-		12001-23000 (Q2)	4 (21.05%)	3 (15.00%)	1 (11.11%)	-
	76-191 (Q3)	4 (21.05%)	7 (35.00%)	2 (22.22%)	-		15001-33000 (Q3)	1 (5.26%)	7 (35.00%)	2 (22.22%)	-		23001-60500 (Q3)	2 (10.53%)	7 (35.00%)	1 (11.11%)	-
	>=192 (Q4)	-	4 (20.00%)	6 (66.67%)	2 (100%)		>=33001 (Q4)	5 (26.32%)	4 (20.00%)	6 (66.67%)	2 (100%)		>=60501 (Q4)	6 (31.58%)	3 (15.00%)	7 (77.78%)	2 (100%)
Total Insurance (Million)	<=7 (Q1)	8 (42.11%)	1 (5.00%)	-	-	**Total Mortgage (Million)**	<=21 (Q1)	8 (42.11%)	4 (20.00%)	-	-	**Total Loan (Million)**	<=11 (Q1)	6 (31.58%)	5 (25.00%)	-	-
	8-17 (Q2)	3 (15.79%)	2 (10.00%)	1 (11.11%)	-		22-80 (Q2)	7 (36.84%)	5 (25.00%)	-	-		12-33 (Q2)	9 (47.37%)	2 (10.00%)	2 (22.22%)	-
	18-45 (Q3)	2 (10.53%)	5 (25.00%)	1 (11.11%)	-		81-135 (Q3)	4 (21.05%)	6 (30.00%)	2 (22.22%)	-		34-85 (Q3)	2 (10.53%)	8 (40.00%)	2 (22.22%)	-
	>=46 (Q4)	6 (31.58%)	12 (60.00%)	7 (77.78%)	2 (100%)		>=136 (Q4)	-	5 (25.00%)	7 (77.78%)	2 (100%)		>= 86 (Q4)	2 (10.53%)	5 (25.00%)	5 (55.56%)	2 (100%)

Table 10: Division by Total Cost, Total Revenue, Total Current Asset, Total Fixed Asset, Total Production, Total Capacity, Total Insurance, Total Mortgage, Total Loan.

Particular	Range	Division				
		Chittagong	Dhaka	Khulna	Rajshahi	Rangpur
Total Cost (Million)	<=72	-	3 (27.27%)	-	8 (30.77%)	2 (25.00%)
	73-190	1 (100%)	1 (9.09%)	2 (50.00%)	4 (15.38%)	4 (50.00%)
	191-410	-	3 (27.27%)	1 (25.00%)	7 (26.92%)	2 (25.00%)
	>=411	-	4 (36.36%)	1 (25.00%)	7 (26.92%)	-
Total Fixed Asset (Million)	<=30	-	-	2 (50.00%)	8 (30.77%)	3 (37.50%)
	30-75	1 (100%)	4 (36.36%)	1 (25.00%)	3 (11.54%)	3 (37.50%)
	76-191	-	4 (36.36%)	-	7 (26.92%)	2 (25.00%)
	>=192	-	3 (27.27%)	1 (25.00%)	8 (30.77%)	-
Total Insurance (Million)	<=7	-	-	-	8 (30.77%)	1 (12.50%)
	8 - 17	1 (100%)	1 (9.09%)	3 (75.00%)	1 (3.85%)	-
	18 - 45	-	2 (18.18%)	1 (25.00%)	2 (7.69%)	3 (37.50%)
	>=46	-	8 (72.73%)	-	15 (57.69%)	4 (50.00%)

Particular	Range	Division				
		Chittagong	Dhaka	Khulna	Rajshahi	Rangpur
Total Revenue (Million)	<=76	-	2 (18.18%)	-	8 (30.77%)	2 (25.00%)
	76-200	1 (100%)	2 (18.18%)	2 (50.00%)	4 (15.38%)	4 (50.00%)
	201-425	-	3 (27.27%)	1 (25.00%)	7 (26.92%)	2 (25.00%)
	>=426	-	4 (36.36%)	1 (25.00%)	7 (26.92%)	-
Total Production (MT)	<=8000	1 (100%)	-	1 (25.00%)	7 (26.92%)	2 (25.00%)
	8001-15000	-	4 (36.36%)	2 (50.00%)	5 (19.23%)	1 (12.50%)
	15001-33000	-	4 (36.36%)	-	4 (15.38%)	2 (25.00%)
	>=33001	-	3 (27.27%)	1 (25.00%)	10 (38.46%)	3 (37.50%)
Total Mortgage (Million)	<=21	1 (100%)	2 (18.18%)	-	8 (30.77%)	1 (12.50%)
	22 - 80	-	2 (18.18%)	3 (75.00%)	3 (11.54%)	4 (50.00%)
	81 - 135	-	4 (36.36%)	-	7 (26.92%)	1 (12.50%)
	>=136	-	3 (27.27%)	1 (25.00%)	8 (30.77%)	2 (25.00%)

Particular	Range	Division				
		Chittagong	Dhaka	Khulna	Rajshahi	Rangpur
Total Current Asset (Million)	<=30	-	2 (18.18%)	1 (25.00%)	8 (30.77%)	2 (25.00%)
	31-55	1 (100%)	2 (18.18%)	2 (50.00%)	5 (19.23%)	3 (37.50%)
	56-150	-	5 (45.45%)	-	6 (23.08%)	1 (12.50%)
	>=151	-	2 (18.18%)	1 (25.00%)	7 (26.92%)	2 (25.00%)
Total Capacity (MT)	<=12000	-	3 (27.27%)	2 (50.00%)	7 (26.92%)	2 (25.00%)
	12001-23000	-	2 (18.18%)	-	4 (15.38%)	2 (25.00%)
	23001-60500	-	2 (18.18%)	-	6 (23.08%)	2 (25.00%)
	>=60501	1 (100%)	4 (36.36%)	2 (50.00%)	9 (34.62%)	2 (25.00%)
Total Loan (Million)	<=11	-	2 (18.18%)	-	7 (26.92%)	2 (25.00%)
	12 - 33	-	1 (9.09%)	3 (75.00%)	6 (23.08%)	3 (37.50%)
	34 - 85	-	5 (45.45%)	-	6 (23.08%)	1 (12.50%)
	>= 86	1 (100%)	3 (27.27%)	1 (25.00%)	7 (26.92%)	2 (25.00%)

Table 11: Types of the Organization by Total Cost, Total Revenue, Total Current Asset, Total Fixed Asset, Total Production, Total Capacity, Total Insurance, Total Mortgage, Total Loan.

Particular	Range	Sole Ownership	Partnership	Private Ltd.	Particular	Range	Sole Ownership	Partnership	Private Ltd.	Particular	Range	Sole Ownership	Partnership	Private Ltd.
Total Cost (Million)	<=72	11 (26.19%)	1 (33.33%)	1 (20.00%)	Total Revenue (Million)	<=76	11 (26.19%)	-	1 (20.00%)	Total Current Asset (Million)	<=30	12 (28.57%)	1 (33.33%)	-
	73-190	11 (26.19%)	1 (33.33%)	-		76-200	11 (26.19%)	2 (66.67%)	-		31-55	10 (23.81%)	1 (33.33%)	2 (40.00%)
	191-410	10 (23.81%)	1 (33.33%)	2 (40.00%)		201-425	10 (23.81%)	1 (33.33%)	2 (40.00%)		56-150	10 (23.81%)	1 (33.33)	1 (20.00%)
	>=411	10 (23.81%)	-	2 (40.00%)		>=426	10 (23.81%)	-	2 (40.00%)		>=151	10 (23.81%)	-	2 (40.00%)
Total Fixed Asset (Million)	<=30	13 (30.95%)	-	-	Total Production (MT)	<=8000	10 (23.81%)	1 (33.33%)	-	Total Capacity (Million)	<=12000	13 (30.95%)	1 (33.33%)	-
	30-75	9 (21.43%)	1 (33.33%)	2 (40.00%)		8001-15000	10 (23.81%)	1 (33.33%)	1 (20.00%)		12001-23000	6 (14.29%)	1 (33.33%)	1 (20.00%)
	76-191	10 (23.81%)	2 (66.67%)	1 (20.00%)		15001-33000	8 (19.05%)	1 (33.33%)	1 (20.00%)		23001-60500	7 (16.67%)	1 (33.33%)	2 (40.00%)
	>=192	10 (23.81%)	-	2 (40.00%)		>=33001	14 (33.33%)	-	3 (60.00%)		>=60501	16 (38.10%)	-	2 (40.00%)
Total Insurance (Million)	<=7	8 (19.05%)	1 (33.33%)	-	Total Mortgage (Million)	<=21	10 (23.81%)	2 (66.67%)	-	Total Loan (Million)	<=11	11 (26.29%)	-	-
	8 - 17	6 (14.29%)	-	-		22 - 80	11 (26.19%)	-	1 (20.00%)		12 - 33	12 (28.57%)	1 (33.33%)	-
	18 - 45	5 (11.90%)	-	3 (60.00%)		81 - 135	9 (21.43%)	1 (33.33%)	2 (40.00%)		34 - 85	7 (16.67%)	2 (66.67%)	3 (60.00%)
	>=46	23 (54.76%)	2 (66.67%)	2 (40.00%)		>=136	12 (28.57%)	-	2 (40.00%)		>= 86	12 (28.57%)	-	2 (40.00%)

Table 12: Capacity Utilization by Total Cost, Total Revenue, Total Current Asset, Total Fixed Asset, Total Production, Total Capacity, Total Insurance, Total Mortgage, Total Loan.

Particular	Range	Capacity Utilization		Particular	Range	Capacity Utilization		Particular	Range	Capacity Utilization	
		50% to 75%	75% to 100%			50% to 75%	75% to 100%			50% to 75%	75% to 100%
Total Cost (Million)	<=72	-	12 (27.27%)	Total Revenue (Million)	<=76	-	11 (25.00%)	Total Current Asset (Million)	<=30	-	12 (27.27%)
	73-190	2 (66.67%)	8 (18.18%)		76-200	2 (66.67%)	9 (20.45%)		31-55	2 (66.67%)	10 (22.73%)
	191-410	1 (33.33%)	12 (27.27%)		201-425	1 (33.33%)	12 (27.27%)		56-150	1 (33.33%)	10 (22.73%)
	>=411	-	12 (27.27%)		>=426	-	12 (27.27%)		>=151	-	12 (27.27%)
Total Fixed Asset (Million)	<=30	-	12 (27.27%)	Total Production (MT)	<=8000	-	11 (25.00%)	Total Capacity (Million)	<=12000	1 (33.33%)	13 (29.79%)
	30-75	2 (66.67%)	10 (22.73%)		8001-15000	3 (100%)	9 (20.45%)		12001-23000	2 (66.67%)	6 (13.64%)
	76-191	1 (33.33%)	10 (22.73%)		15001-33000	-	10 (22.73%)		23001-60500	-	10 (22.73%)
	>=192	-	12 (27.27%)		>=33001	-	14 (31.82%)		>=60501	-	15 (34.09%)
Total Insurance (Million)	<=7	1 (33.33%)	7 (15.91%)	Total Mortgage (Million)	<=21	1 (33.33%)	10 (22.73%)	Total Loan (Million)	<=11	-	11 (25.00%)
	8 - 17	1 (33.33%)	5 (11.36%)		22 - 80	1 (33.33%)	11 (25.00%)		12 - 33	2 (66.67%)	9 (20.45%)
	18 - 45	-	8 (18.18%)		81 - 135	1 (33.33%)	10 (22.73%)		34 - 85	1 (33.33%)	11 (25.00%)
	>=46	1 (33.33%)	24 (54.55%)		>=136	-	13 (29.55%)		>= 86	-	13 (29.55%)

Table 13: Net Profit by Size of the Organization.

Variables	Micro		Small		Medium		Large	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Total Cost of Goods Sold	118.28	115.22	316.85	474.22	628.26	545.64	1257.54	841.46
Total expenditures on wages in the last 12 months	1.31	2.10	7.84	23.42	11.89	18.35	5.23	5.06
Professional and business fees	0.04	0.09	0.02	0.01	0.04	0.00	0.01	-
Utilities	0.04	0.03	0.06	0.07	2.21	4.98	0.46	0.59
Office and computer related expenses	0.06	0.07	0.09	0.07	0.13	0.11	7.63	10.60
Telephone, Internet and other telecommunication	0.04	0.02	0.05	0.01	0.08	0.03	0.18	0.19
Business taxes, licenses and permits	0.02	0.02	12.20	37.31	9.51	13.28	-	-
Rental and leasing	0.20	0.14	0.04	0.01	0.07	0.07	0.47	0.60
Repair and maintenance	0.11	0.08	0.17	0.13	0.13	0.05	0.56	0.65
Amortization and depreciation	1.76	1.57	4.09	4.87	5.74	9.85	19.30	16.85
Insurance	0.06	0.06	0.11	0.08	0.25	0.29	0.76	0.91
Advertising, marketing, promotion, meals and entertainment	0.07	0.09	0.21	0.29	0.12	0.12	0.93	-
Travel, meetings and conventions	0.08	0.07	0.11	0.08	0.16	0.08	0.55	0.38
Financial services	1.79	2.22	9.40	26.12	19.26	27.48	23.28	18.42
Interest expense	2.30	-	0.54	0.70	-	-	-	-
Other non-production-related costs and expenses	0.49	0.93	0.11	0.07	0.15	-	0.24	0.19
All other cost and expenses	0.37	0.46	2.89	6.93	3.96	6.08	1.14	-
Total Expenses	**122.52**	**118.34**	**342.15**	**544.36**	**667.56**	**573.46**	**1317.22**	**897.35**
Total Revenue	**128.38**	**123.16**	**380.15**	**635.34**	**722.73**	**628.90**	**1357.37**	**926.15**
Net Profit	**5.86**	**4.82**	**38.00**	**90.98**	**55.17**	**55.44**	**40.15**	**28.80**

Table 14: Breakdown of the Fixed Assets by Size of the Organization.

<div align="right">In Million BDT</div>

Fixed Assets	Micro Firm		Small Firm		Medium Firm		Large Firm	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Land and Building	39.01	47.42	103.73	69.98	198.50	68.47	191.26	29.92
Machine and Vehicles	5.05	7.68	25.40	38.32	96.84	110.83	137.24	130.67
Office Equipment	0.54	0.48	-	-	-	-	-	-
Electric Goods and Fittings	-	-	4.02	5.10	0.39	0.27	-	-
Others Fixed Assets	0.63	0.69	4.82	14.12	0.41	0.23	0.87	-
Total Fixed Assets	40.80	50.02	118.14	95.51	240.86	118.91	337.01	171.01

Table 15: Breakdown of the Current Assets by Size of the Organization.

<div align="right">In Million BDT</div>

Current Assets	Micro Firm		Small Firm		Medium Firm		Large Firm	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Inventories/ Stock (Closing)	31.03	37.22	86.81	120.70	198.38	171.33	285.50	177.68
Cash in Hand	0.91	1.19	5.65	11.58	3.63	6.39	0.83	0.47
Cash at Bank	0.65	0.86	16.87	56.99	3.55	7.53	0.37	0.22
A/C Receivables	7.72	9.50	39.96	68.24	67.74	97.55	59.73	56.35
Advance, Deposit, and Repayments	1.22	0.86	9.58	20.67	41.15	92.13	1.30	0.59
Total Current Assets	40.72	43.53	151.85	261.49	293.21	287.54	347.73	120.49

Table 16: Benefit-Cost Ratio of the Individual Organization.

No.	Size of the Organization	Benefit Cost Ratio (BCR)
1	Micro	1.05
2	Micro	1.03
3	Micro	1.05
4	Micro	1.04
5	Micro	1.05
6	Micro	1.02
7	Micro	1.06
8	Micro	1.06
9	Micro	1.07
10	Micro	1.16
11	Micro	1.11
12	Micro	1.07
13	Micro	1.10
14	Micro	1.05
15	Micro	1.03
16	Micro	1.05
17	Micro	1.03
18	Micro	1.08
19	Micro	1.03
	Average Micro	**1.06**
20	Small	1.11
21	Small	1.03
22	Small	1.07
23	Small	1.05
24	Small	1.05
25	Small	1.08
26	Small	1.06
27	Small	1.16
28	Small	1.04
29	Small	1.03
30	Small	1.07
31	Small	1.03
32	Small	1.28
33	Small	1.04
34	Small	1.03
35	Small	1.07
36	Small	0.74
37	Small	1.17
38	Small	1.06
39	Small	1.05
	Average Small	**1.06**
40	Medium	1.22
41	Medium	1.13
42	Medium	1.11
43	Medium	1.05
44	Medium	1.07
45	Medium	1.06
46	Medium	1.02
47	Medium	1.04
48	Medium	1.09
	Average Medium	**1.09**
49	Large	1.03
50	Large	1.03
	Average Large	**1.03**
	Total Average	**1.06**

About us

Emerging Credit Rating Limited (hereinafter referred to as ECRL) began its journey in the year 2009 with the motive to deliver credible superior & quality credit rating opinion in various industry segments around Bangladesh. ECRL obtained credit rating license from Bangladesh Securities and Exchange Commission (BSEC) in June 2010 as per Credit Rating Companies Rules 1996 and also received Bangladesh Bank Recognition as an External Credit Assessment Institutions (ECAI) in October 2010 to do the rating of Banks, Financial Institutions and their borrowers and also from Insurance Development & Regulatory Authority (IDRA) in 2015 to do the rating of Insurance Companies & affiliated with Malaysian Rating Corporation Berhad.

Emerging Credit Rating Limited's team is oriented towards the continuous improvement of processes, striving for an important role in the leadership of the business world. Every individual in ECRL is committed to providing topmost ingenious Credit Rating Services and Comprehensive Research Services in Bangladesh. ECRL's rating services and solutions reflect independence, professional, transparency and impartial opinions, which assist businesses in enhancing the quality of their decisions and helping issuers access a broader investor base and even smaller known companies approach the money and capital markets. The Credit Rating process is an informed, well-researched and intended opinion of rating agencies on the creditworthiness of issuers or issues in terms of their/ its ability and willingness of discharging its financial obligations in a timely manner. Issuers, lenders, fixed-income investors use these risk assessments for the purpose of lending to or investment in a corporation (such as a financial institution, an insurance company, a non-banking corporation or a corporate entity) as well as evaluating the risk of default of an organization's financial obligations in terms of loan or debt.

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