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Rice Processing Industry in Bangladesh: An Analysis of Rice Milling




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Abstract

This study presents an in-depth analysis of the rice processing industry in Bangladesh, focusing on rice milling. Three distinct categories of rice mills are identified: Automatic Rice Mills, Semi-Auto Rice Mills, and Traditional Husking Mills. The study examines the establishment and operational costs for each type of mill and the production processes, by-products, and marketing channels involved. Automatic Rice Mills employ advanced machinery and technology, while Semi-Auto Rice Mills have moderate automation, and Traditional Husking Mills rely on manual labor. By-products generated include rice husk, rice bran, and broken rice, each with various uses. The study also delves into the legal considerations required to establish and operate a rice mill. Understanding the complexities of the rice processing industry in Bangladesh is essential for entrepreneurs, policymakers, researchers, and those seeking insights into this vital sector of the country's economy.

1. Introduction:

Rice is the staple food for approximately 135 million individuals in Bangladesh (BRKB 2022). Annually, the country produces about 36 million tons of rice, utilizing 11.5 million hectares of land (USDA 2022). This grain accounts for more than 70% of the country's total calorie intake, with an average per capita consumption of approximately 181.3kg per year, ranking among the highest in the world (The Business Standard 2020; Zaman et al. 2001). Notably, rice cultivation dominates approximately 75% of the total cropped area, with over 80% of the total irrigated area dedicated to rice in Bangladesh (BRKB 2022).

In Bangladesh, three primary types of rice are cultivated, namely Aus (summer), Aman (winter), and Boro (spring). Based on estimates by Bangladesh Bank, during FY2022, the collective production of Aus (3 million metric tons), Aman (14.96 million metric tons), and Boro (20.19 million metric tons) paddies could surpass 38.14 million metric tons, achieved through the cultivation of 28.89 million acres of land (Bangladesh Bank 2023). The significance of rice in Bangladesh's agricultural landscape underscores its crucial role in ensuring food security and sustenance for the nation's population.

Post-harvest, paddy requires essential processing before it becomes consumable as rice. This rice processing procedure encompasses parboiling, drying, and milling, and it can be conducted on a small scale within households or on a larger scale at established rice mills. Household paddy processing, categorized as the non-commercial milling sector, represents one of Bangladesh's oldest and nearly obsolete rice processing methods. This method involves parboiling and drying the paddy, then processing it using a traditional hand-operated device called the Dheki.[1]

In contrast, commercial milling centers, known as rice mills, serve as Bangladesh's primary sites for paddy processing.[2] These mills operate two distinct models: one involves directly purchasing paddy from local marketplaces or intermediaries known as 'hats,' with the finished rice then supplied to wholesalers and assemblers in major cities. The other model entails the milling of paddy, processed at home, into finished rice using small-scale husking machines located in nearby village marketplaces. These village marketplaces also offer husking services to small itinerant traders. Additionally, vendor-husking machines are emerging in rural areas, where vendors travel from house to house in villages, providing husk paddy services at a set price within the farmyards of their customers.

The rice mill industry holds considerable significance in Bangladesh, playing a pivotal role in the nation's economy (Rahman et al. 2017). As one of the world's largest rice-producing countries, Bangladesh relies

[1] The Dheki is a wooden tool, approximately 2.5 meters in length and 20 centimeters in width, that is balanced on a bamboo fulcrum like a seesaw. Villagers widely use it in rice husking. During the process, women push down on one end of the Dheki with their foot, causing the other end, fitted with a wooden peg, to rise and fall on the rice grains placed in a hole scooped out of the earthen floor of the kitchen. This pounding action removes the outer husks, leaving the inner kernels intact (Rahman et al. 2017).
[2] 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).

heavily on the rice mill sector, which provides employment to millions of people, accounting for approximately 48% of rural employment. Over time, there has been a notable rise in the number of commercial rice millers in the country, with mechanical process units gradually supplanting the traditional rice processing methods. These commercial processing units have made substantial contributions to the rice marketing system, becoming an indispensable component of the agricultural sector. Comprising a multitude of small and large rice mills, the industry boasts a considerable scale, with an estimated count of over 18,700 rice mills in the country (IDLC 2021). Despite this abundance, the present study endeavors to offer a comprehensive and in-depth understanding of rice milling practices in Bangladesh.

2. Types of Rice Mills:

In Bangladesh, rice mills are classified based on their manufacturing processes into three primary types: Automatic Rice Mills, Semi-Auto Rice Mills, and Traditional husking mills. This categorization is contingent on the degree of automation and mechanization applied during the rice milling procedure. Automatic Rice Mills leverage cutting-edge machinery and technology to process paddy efficiently. The process commences with paddy preparation and soaking in hot water, followed by parboiling through steam pressure. Subsequently, the steamed paddy undergoes drying in a specialized dryer and husking using a rubber roll or disc huller. A paddy separator is employed to segregate unhusked paddy from the brown rice, with the latter being recycled back to the huller for further processing. Brown rice is then meticulously polished utilizing a Cone and an Engleberg roller polisher. The entire process is fully automated, employing advanced equipment to ensure optimal and high-quality rice production.

2.1 Automatic Rice Mill:

An Automatic Rice Mill incorporates state-of-the-art technology to process paddy. The procedure begins with preparing paddy and its immersion in hot water, followed by pressurized parboiling through steam. Subsequently, the steamed paddy is dried using a specialized dryer and husked using a rubber roll or disc huller. A paddy separator segregates unhusked paddy from the brown rice, which is then cycled back into the huller for further processing. Further refinement of the brown rice is achieved through polishing with a Cone and an Engleberg roller polisher. This entire process is automated, using advanced machinery and equipment to ensure efficiency and rice production with high-quality standards.

2.2 Semi-Automatic Rice Mill:

A Semi-Automatic Rice Mill operates with mechanical processes and omits the drying step. In this type of mill, parboiled paddy is manually dried on the floor under sunlight, involving spreading and stirring, before being fed into the mill. The process encompasses paddy storage, cleaning, parboiling, natural drying, milling using a rubber-roll huller, rubber polishing, paddy separation, stone separation, black rice sorting, cracked and discolored grain sorting, sifting for broken rice, aerating, bagging, and weighing.

The outcome is high-quality rice that undergoes precise grading. Additionally, the process yields separate husk and bran, which can be utilized for producing briquette rice husk and extracting edible oil from bran, exemplifying a resourceful approach. Despite being Semi-Automatic, the process integrates modern machinery to achieve efficient rice production with consistent quality.

2.3 Husking Mill:

The Husking Rice Mill adheres to traditional rice milling methods, wherein rice is manually boiled and dried, similar to the Semi-Automatic approach. In Husking Rice Mills, some polishing is performed in addition to husking, generally accomplished by passing the rice through hullers multiple times to remove some of the bran after husking. These mills typically produce four products: milled rice, broken rice, rice bran, and husks. Although the process is manual and traditional, it still yields usable rice products with varying degrees of polishing and bran content.

3. Establishment and Operational Cost of a Rice Mill:

The section examines the capital investment and operational expenses of setting up and running an Automatic and Semi-Automatic Rice Mill. The establishment costs encompass land acquisition, construction of buildings, and procurement of machinery, with the total expenditure varying based on the scale and nature of the mill.

3.1 Automatic Rice Mill:

3.1.1 Establishment Cost:

3.1.1.1 Land:

Establishing a rice mill with a production capacity of 50 tons necessitates a land area of 100 decimal, while a production capacity of 100 tons requires a land area of 150 decimal. Expanding the land area may enhance operational efficiency, thereby increasing production capacity (CBECL 2012). However, the cost of land acquisition may fluctuate depending on location and other pertinent factors.

3.1.1.2 Infrastructure Development:

3.1.1.2.1 Building Structure Development:

An Automatic Rice Mill structure can be constructed using materials such as bricks, steel, or a combination thereof, employing automated methods. Prevailing market prices and the quality of the raw materials employed predominantly influence the overall construction cost. Moreover, the cost of establishing the structure may vary based on geographical location and regional factors. Consequently, meticulous calculation of all material expenses beforehand is imperative for entrepreneurs initiating the

rice mill construction. A comprehensive analysis of raw material costs is also essential for effective planning and proficient execution of the mill construction project.

3.1.1.2.2 Setup Cost of Machinery:

An Automatic Rice Mill plant consists of four distinct sections: the Parboiling Section, Drying Section, Milling Section, and Bagging Section. Each of these sections necessitates specific types of machinery customized to perform their respective stages of operation. Moreover, the cost of these machines is contingent upon the particular stages of production for which they are intended. A comprehensive overview of the machinery types associated with each production stage is presented in Table 1.

The standard boiler machine used in the rice mill plant has an average price range varying from BDT 6.3 million to BDT 10.5 million, with a daily capacity of boiling 50 tons to 100 tons of paddy for approximately 16 hours. It is noteworthy that Japanese and Chinese brands are relatively more affordable than Korean ones. Consequently, most (around 90 percent) of Bangladesh's parboiling rice milling machinery is imported from India (CBECL 2012). While machinery from Japan and Germany is renowned for its higher quality, it also comes with a higher price tag than Indian machinery. For instance, the average cost of an Indian machine designed for the parboiling section is approximately BDT 15.7 million, with a daily capacity of 100 tons.

In contrast, the drying section machine from India, with the same capacity, is also priced at BDT 15.7 million, while a Chinese brand costs only BDT 5.5 million. Additionally, 90 percent of the milling and bagging machinery in Bangladesh is imported from China, with the price of a Chinese milling machine ranging from BDT 20 million to BDT 26 million for a daily capacity of 100 tons. Furthermore, the color sorter machines are considered expensive as well. The Indian color sorter machine is priced between BDT 6.55 million to BDT 7.86 million, and it is primarily employed to separate black and weak rice. This machine operates with the assistance of cameras, and the number of cameras required depends on the number of channels employed.

Table 1. Machinery Cost (Taka in a Million) of the Automatic Rice Mill

Particular	Japanese Brand	Chinese Brand	Indian Brand	Korean Brand
Boiler	6.29-6.55	6.29-6.55	0	6.6-10.5
Dryer	17.83	5.5	15.7	9.4
Parboiling	19.66-24.90	10.22-11.8	15.7	4.2
Milling	45.87-52.43	19.66-26.11		13.1-26.2
Color Sorter	14.42	6.55-7.86	5.9-7.9	9.2
Power station	2.88	2.88	2.9	3.9-5.2

Source: Bangladesh Rice Research Institute and ECRL primary survey (April 2023)

3.1.1.3 Operational Cost:

3.1.1.3.1 Labor Cost:

The labor cost constitutes a pivotal element of variable expenses within an organization. In a typical Automatic Rice Mill, the required workforce consists of approximately 20 to 25 individuals, encompassing both Permanent (10 to 15) and Temporary (10 to 12) employees. The exact number of laborers necessary is contingent upon the size and production capacity of the mill. Permanent workers are remunerated with a monthly salary ranging from BDT 15,000 to BDT 20,000, while temporary workers receive an average daily wage ranging from approximately BDT 500 to BDT 700. Notably, temporary workers may earn higher daily wages than permanent workers but encounter relatively less job security. It is essential to acknowledge that wage rates in an Automatic Rice Mill vary based on diverse factors, such as the mill's geographical location, prevailing labor demand, and laborer availability.

3.1.1.3.2 Utility Cost:

The utility cost constitutes an essential variable expense that is contingent upon the production unit's operations. Specifically, in the case of an Automatic Rice Mill, the utility cost is influenced by the monthly production volume and other related factors, encompassing expenditures associated with electricity, fuel, gas, water, and various utility bills.

3.2 Husking and Semi-Automatic Rice Mills:

3.2.1 Establishment Cost:

As per the statements provided by Husking Mill proprietors, establishing such mills entails a mean capital investment ranging from BDT 5.0 million to BDT 7.0 million, alongside the necessity of 100-decimal land. A significant portion of this land is allocated for the paddy drying process. Conversely, the cost of setting up a Semi-Automatic Rice Mill in Bangladesh varies based on location, mill size, and machinery quality, typically demanding an investment exceeding BDT 7.0 million. The land area requirements depend on the production capacity, ranging from 100 to 150 decimals for small-scale mills and up to 300 decimals for larger mills.

The primary fixed costs are the land and machinery costs for Husking and Semi-Automatic Mills. The machinery cost varies depending on the location and region. In the context of a Semi-Automatic Rice Mill, the requisite machinery includes a paddy cleaner, de-stoner, husker, separator, polisher, color sorter, and packaging machine, with the average machinery costs ranging from BDT 3.0 million to BDT 4.0 million. Further information on the prices of Husking and Semi-Automatic Mills' machinery is provided in Table (2).

Table 2. Machinery Cost (Taka in a Million) of Husking and Semi-Automatic Rice Mills

Particular item	Price
Saddler	0.13
Rice filter	0.13-.2
Garden polisher	0.1
Milling	0.2
Power station	0.65-0.91

Source: ECRL primary survey (April 2023)

3.2.2 Operational Cost:

In general, Husking Mills exhibit a labor-intensive nature, signifying their reliance on a larger workforce than Automatic and Semi-Automatic Rice Mills. Precisely, an average of 30 workers is essential for the functioning of a Husking Mill, with the corresponding daily wage rate averaging BDT 500. It is worth noting that the wage rate for Husking Mills closely aligns with that of Automatic Rice Mills, although variations may arise based on factors such as geographical location, market demands, and the availability of laborers.

In contrast, Semi-Automatic Mills require a reduced workforce compared to traditional mills, with small-scale operations typically employing 5 to 10 permanent laborers, while larger mills necessitate 10 to 20 permanent laborers. Additionally, Husking Mills enjoy lower utility costs relative to Automatic Rice Mills due to their lower production output, primarily attributed to the manual operating system.

4. Production Process:

4.1 Production Process of Automatic Rice Mills:

The contemporary rice milling facility is available in various configurations, characterized by diverse designs and performance capabilities of the milling components. A modern rice mill typically consists of three primary stages: the husking stage, the whitening-polishing stage, and the grading, blending, and packaging stage. Modern rice mills employ automated adjustments such as rubber roll clearance, separator bed inclination, and feed rates to achieve maximum efficiency and facilitate ease of operation. Furthermore, whitener polishers are equipped with gauges that assess the current load on the motor drives, providing valuable insights into the grain's operating pressure. This integration of gauges offers a more objective approach to setting milling pressures on the grain, as detailed in the Rice Knowledge Bank (2017). A comprehensive overview of the various processes involved in modern rice milling is provided in Table 3.

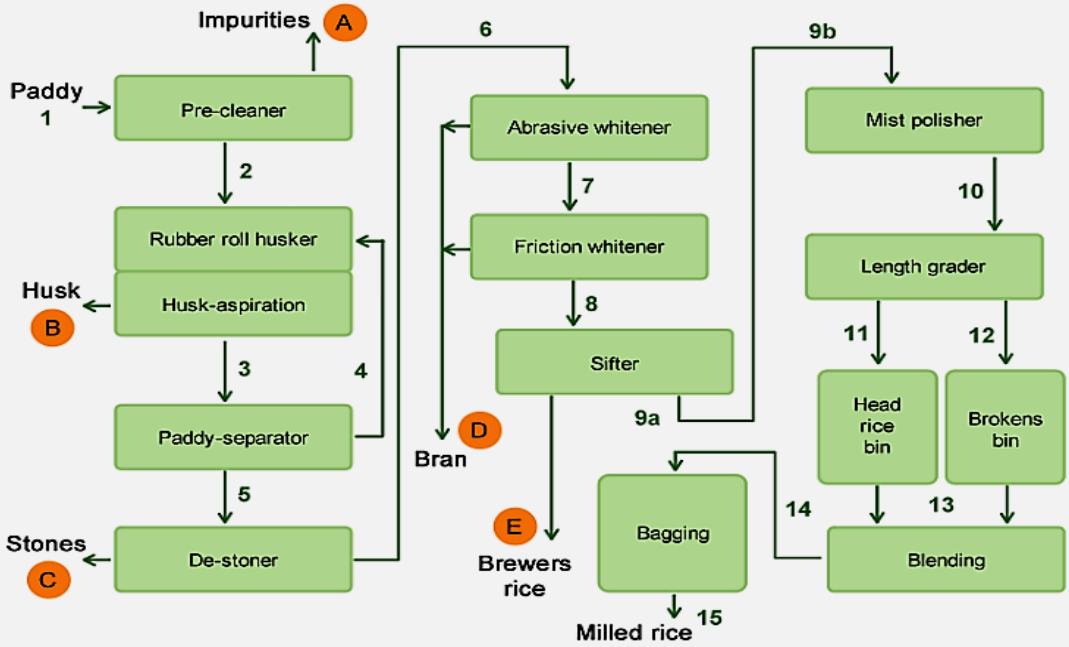
Table 3. The Modern Rice Milling Process

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

A diverse range of configurations is employed in the production process of modern rice mills. The layout and flow of a typical modern rice mill can be visualized through the flow diagram presented in Figure 1.

Figure 1. Flow Chart of Auto Rice Milling



Source: Rice Knowledge Bank

According to the Rice Knowledge Bank (2017), 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 the 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

4.2 Production Process of Husking Mills:

Like an Automatic Rice Mill, a Husking Mill's production process comprises various stages. However, unlike an Automatic Rice Mill, most of the work involved in a Husking Mill is carried out manually. A typical flow diagram of the stages involved in a Husking Mill's production process is depicted in Figure 2.

Figure 2. Husking Mill Flow Chart

Source: ECRL Primary Survey (Rahman et al. 2017)

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.

5. Difference between Traditional and Modern Mill:

The milling process in traditional and Automatic Rice Mills exhibits significant differences, as outlined in Table 4. Comparatively, the Automatic Rice Mill system surpasses the traditional method regarding rice processing efficiency, cleanliness, and overall output quality. The automated process involves fewer impurities, such as stones, than the traditional process. Additionally, Automatic Rice Processing Mills can produce more than twice the amount of processed rice compared to conventional mills, processing over 2 tons per hour, while traditional mills are limited to 0.6 to 1 ton per hour. However, it is worth noting that Automatic Rice Mills require higher power consumption, typically ranging from 65 to 100 horsepower, while traditional mills suffice with 30 to 40 horsepower.

Moreover, traditional rice mills necessitate separate operations for cutting and drying processed rice, whereas Automatic Rice Processing Mills can accomplish these tasks in a single integrated process. In Husking Mills, grading and brand separation are manually performed, whereas in Automatic Mills, these processes are automated (Table 4). Furthermore, Automatic Rice Mills offer the advantage of cutting rice

into various sizes, such as Miniket, Najir Shail, Pajam, Katari Bhog, Chinigura, etc., which is not feasible with traditional rice mills. The cooking time for rice milled in automated machines is significantly reduced to 12-15 minutes, whereas traditionally, milled rice takes 20-25 minutes to cook. Additionally, by-products from the Automatic Rice Mill, such as bran and oil, are generated after processing and can be utilized for poultry feed, whereas traditional rice mills produce by-products suitable solely for poultry feed (Zaman et al. 2001).

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 tons/hour	65-100 HP	Separately by different devices	All Activities Mechanically

Source: The Review of Agricultural Economics (Zaman et al. 2001)

6. By Product Generation:

Rice mills can yield three main by-products: husk, bran, and broken rice. The proportions of head rice, rice husk, rice bran, and broken rice vary depending on the mill type. As per the survey findings, the average output of head rice, rice husk, rice bran, and broken rice from the examined Automatic Rice Mills accounts for approximately 65.0%, 22.75%, 8.25%, and 5.0%, respectively. In contrast, Husking Mills produces fewer quantities of these by-products than Automatic Rice Mills (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 (62.5)	9.3 (23.25)	3.5 (8.75)	2.2 (5.5)
Automatic	26 (65.0)	8.7 (22.75)	3.3 (8.25)	2 (5.0)

Source: ECRL Primary Survey (Rahman et al. 2017)

Nonetheless, the prices of these by-products are detailed in Table 6. Additionally, it is worth noting that the by-products from an Automatic Rice Mill are generally in greater demand due to their superior quality. Consequently, the number of by-products and raw products generated by a rice mill, along with their market demand, can significantly impact the profit margin of the millers.

Table 6. By-product Selling Prices for both Husking, Semi-Automatic, and Automatic Rice Mills

Particular	Husk	Rice Bran	Broken Rice	
	(per kg)	**(per kg)**	**(per kg)**	
			Medium	**Small**
Selling price	BDT 39	BDT 35	BDT 37-39	BDT 32

Source: ECRL primary survey (April 2023)

All the by-products produced by rice mills offer alternative uses. For instance, rice bran and broken rice are valuable feed sources for cattle, poultry, and fish, while rice bran is further utilized to produce natural oil. Rice husks, on the other hand, serve as fuel for millers and the rural community, and their ash finds application in cement factories as silica. In the case of Husking Mill owners, they commonly employ husks as fuel for the boiling process. A miller typically requires approximately 7200 kg of husks to boil 40,000 kg of paddy (Zaman et al. 2001). Millers often acquire husks from other millers or the market, transform them into charcoal sticks, and subsequently sell them for various purposes.

7. The Rice Supply Chain:

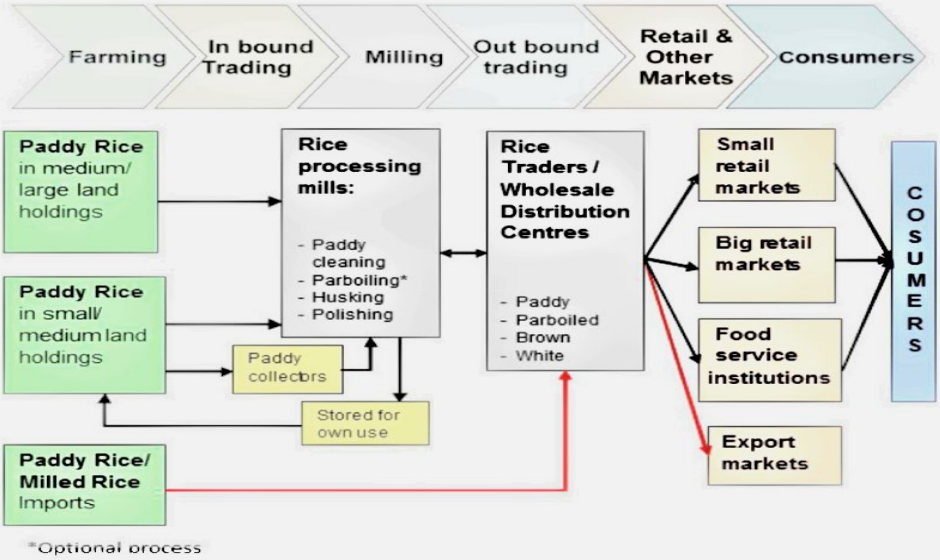
In a particular country, a customary rice supply chain is a complex system of public and private entities that interconnect rice producers, such as farmers, rice millers, collectors, traders, wholesalers, retailers, and food processors, with the ultimate consumers (as depicted in Figure 3). The supply chain also includes other key stakeholders such as transporters, entities providing seeds, agrochemicals, and agricultural equipment, irrigation companies, inspection agencies, and various government departments, including those for commerce, tax, and agriculture. Additionally, other state agencies regulate the prices of paddy by governmental policies.

Small land-holding farmers residing in villages can produce sufficient rice to meet their yearly consumption needs. Typically, the village miller will process the small quantity of paddy rice without charge in exchange for the rice bran. As a result of the limited working capital and capacity of the mill, this activity represents a relatively small enterprise. Farmers with medium-sized holdings with access to local mills generally sell their rice directly to those mills. However, if transportation costs are high or road conditions are poor, access to mills may be limited, and farmers may be compelled to sell their crops to paddy collectors or traders at market prices. The collectors or traders then profit by selling the paddy to the millers or the export market. In many countries, fair trade programs have been established to connect farmers with consumers willing to pay a premium that covers production and investment expenses. These programs have successfully improved the lives of small-scale farmers. Large land-holding farmers, on the other hand, usually supply their paddy rice directly to rice-processing mills, thereby eliminating the middlemen and increasing their earnings. Rice-processing companies also benefit from sourcing directly from farmers, lowering procurement, logistics, and other intermediary and supply-chain expenses. Medium and large-scale rice-processing mills are increasingly located in large rice-

producing regions, and they perform two primary functions: (1) cleaning, de-husking, and polishing rice, and (2) supplying rice (parboiled, brown, or milled white) to markets where demand is high and where rice can be sold at better prices, specifically urban and densely populated areas. Both paddy and milled rice are directly exported to neighboring countries during and after the harvesting season. Private rice companies are becoming more involved in the rice market by procuring paddy, processing, milling, and storage, and establishing retail outlets (Muthayya et al. 2014).

However, the rice supply chain trends are shifting, with small farmers increasingly selling their cultivated rice for higher prices. This has been facilitated through various government initiatives, including schemes that assist farmers, an increase in contract farming that promotes the consolidation of grain production, the adoption of the farm-to-fork concept in emerging corporate farms, and the integration of better traceability and control of operations into the rice supply chain. The forward linkages in the supply chain, which involve the relationships that move rice toward end consumers, are also anticipated to become more efficient, with greater organization in the retailing and branding processes leading to the consolidation of the volume of rice traded. In countries where the government subsidizes rice production, there is improved regulation and influence to support farmers and provide consumers with a low-cost purchasing option (Muthayya et al. 2014).

Figure 3. Conceptual diagram of the rice supply chain in a rice-growing country.



Source: The New York Academy of Sciences (Muthayya et al. 2014)

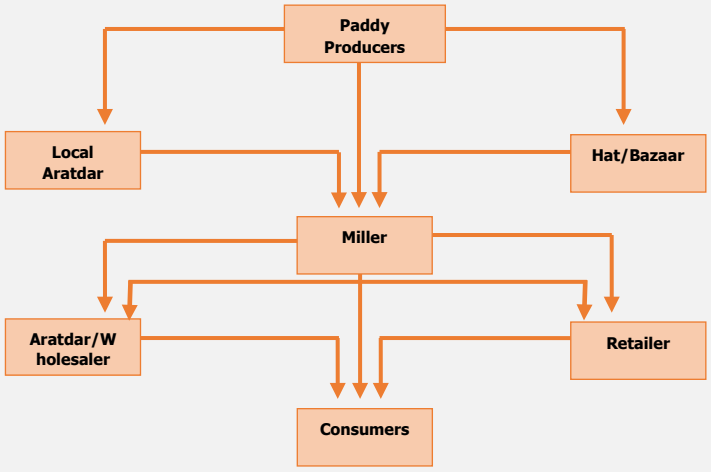
8. Marketing Channel of Rice in Bangladesh:

A marketing or distribution channel refers to a group of interdependent entities that work together to facilitate the transfer of ownership of goods or services from the producer to the ultimate consumer. In

the case of agricultural products, intermediaries within the marketing system ensure the efficient movement of goods from farmers to end customers.

The marketing channels utilized by rice mills are depicted in Figure 4. The channel involves four primary groups: rice producers, aratdar/bazaar, mills, and wholesalers/retailers. Initially, paddy producers sell their harvest to nearby bazaars or hats. Local aratdar then purchase the paddy from the bazaar or hat, and occasionally from the producers before selling it to the millers. The rice millers may also purchase paddy directly from the producers. After processing the paddy, the millers sell the resulting rice to wholesalers or retailers and sometimes to consumers. Finally, retailers purchase rice from wholesalers or directly from the mill and sell it to end consumers.

Figure 4. Marketing Channel of Rice Processing Industry



Source: ECRL Primary Survey (Rahman et al. 2017)

9. Legal Issues:

Before establishing a rice mill, the entrepreneur must obtain the requisite approvals and licenses from relevant authorities per various Acts and Rules. These authorizations grant clearance to establish the rice mill. The following licenses and approvals are required (Rahman et al. 2017):

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): The 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 required quantity and power supply. The ministry would provide the approval and power supply as required.

5. Ministry of Environment and Forests Approval: The 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.

10. Conclusion:

This comprehensive analysis sheds light on the intricate dynamics of the rice processing industry in Bangladesh, with a specific focus on rice milling. The study highlights three distinct categories of rice mills in the country, each employing different levels of automation and technology. Examining establishment and operational costs reveals crucial insights for potential entrepreneurs, enabling informed decision-making in setting up rice mills.

The investigation into the production processes of Automatic and Husking Mills underscores the significant advancements made in modern rice milling technology, leading to higher efficiency and productivity. The generation and utilization of by-products, such as rice husk, rice bran, and broken rice, also emerge as essential aspects contributing to the economic sustainability of the rice mill industry. Furthermore, the study delves into the marketing channels of rice in Bangladesh, elucidating the intricate network of intermediaries involved in the smooth transfer of rice from producers to consumers. Understanding this aspect facilitates a better grasp of the rice supply chain, which is pivotal in the country's food security and economic stability. Finally, exploring legal considerations highlights the regulatory framework and approvals required for establishing and operating rice mills in compliance with governmental norms. This aspect is crucial for ensuring the smooth functioning of rice mills while adhering to environmental and labor standards.

This study serves as a valuable resource for a diverse range of stakeholders, including potential investors, policymakers, researchers, and industry participants. By providing a comprehensive understanding of the rice processing industry in Bangladesh, this analysis lays a strong foundation for informed decision-making, policy formulation, and future research endeavors to foster the growth and sustainability of this vital sector in the nation's economy.

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About ECRL

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 Berhard.

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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