IMPACT OF RICE MILL TOWARDS ENVIRONMENTAL, ECONOMIC AND HEALTH STATUS OF WORKERS IN PABNA DISTRICT

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CERTIFICATE

*This is to certify that the thesis entitled "**IMPACT OF RICE MILL TOWARDS ENVIRONMENTAL, ECONOMIC AND HEALTH STATUS OF WORKERS IN PABNA DISTRICT**" submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science in Agroforestry and Environmental Science**, embodies the result of a piece of bona fide research work carried out by **Md. Eunuse Ali Hera**, Registration number: **11-04338** under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this investigation has duly been acknowledged.

Dated: December, 2017
Place: Dhaka, Bangladesh

Dr. Md. Forhad Hossain
Professor
Supervisor

DEDICATED

TO

MY BELOVED PARENTS

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ABSTRACT

The study was conducted in two upazilas namely Pabna sadar and Santhia under Pabna district through a structured questionnaire from 1 August, 2017 to 25 October, 2017 to ascertain the impact of rice mill towards environmental, economic and health status of workers by computing environmental change, changes in income, changes in family assets and changes in health status after involvement with rice mill. About 30 rice mills were selected randomly and 3 workers from each rice mill were taken as population. Findings revealed that about 54.44 percent workers faced medium negative environmental changes, about 56.56 percent workers faced low positive changes in income, about 42.22 percent of the workers could progress their family assets at low scale and about 33.33 percent of the workers faced high negative changes in their health status after involvement with rice mill. Most of the workers employed as seasonal or contract workers and they had no training experience. About 40 percent workers faced high constraints in rice mill. Attempts were also made to describe some of the selected characteristics of the workers and their relationships with the impact of rice mill. Pearson's correlation co-efficient was used to explore the relationship between the variables. Out of nine independent variables: age, family size, experience as rice mill worker, types of employment contracts, professional training experience, knowledge on rice mill, constrains faced by workers in rice mill had a positive significant relationship with the impact of rice mill towards environmental, economic and health status of the workers.

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CHAPTER I

INTRODUCTION

Bangladesh is an agricultural country having 160.8 million populations. Agriculture sector contributes more than 14 percent to the national GDP and provides around 40 percent employment of the population (BER, 2017). Agriculture sector has a particular importance to achieve self-sufficiency in food production, reduce poverty and foster sustainable economic development for this large, ever-growing population. Rice is one of the major crops in Bangladesh. Around 13 million agricultural families grow rice on about 10.5 million hectares land which cover 75 percent of the total cropped land and over 80 percent of the total irrigated area of the country (BBS, 2017). Besides, rice sector contributes one-half of the agricultural GDP and one-sixth of the national income in Bangladesh (BRRI, 2017). Rice is the most important staple food in the world which is eaten by more than half of the world's people every day. Bangladesh is one of the world's top rice-consuming countries having daily per capita consumption 367.19 grams in 2016 (Hossain, 2017).

After harvesting paddy from the crops field, some process is maintained to make it suitable for consumption. Few decades ago, dheki was used to process rice for family level consumption. But the rice processing is becoming modern day by day in Bangladesh. In recent year, machine has replaced dheki for rice processing. Now village rice mill or small husking mill is being used for small scale rice processing and commercial milling is being used for large scale rice processing. Generally, in Bangladesh there are two types of commercial mills. These are modern or automated rice mill and husking or traditional rice mill. In modern or automatic rice mill all activities are done through a mechanical process which includes categorization of rocks and unfilled grains, grain marinating, boiling, drying, milling, polishing and bagging and in traditional commercial mill or husking mill all activities are done though manual process which require more labour then automatic process. In Bangladesh, more than

60 percent of the rice is processed in traditional rice processing system. Approximately 16,400 chatals, 420 semi-automatic rice mills and around 400 fully automatic rice mills are operating in Bangladesh which contributes a major portion of the national income of the country, government earns an amount of BDT 250 crore from the taxes of rice processing industry and 13 million families earn their livelihood directly or indirectly from rice industry (Islam, 2014).

It is obvious that rice industry play an important role in our economy by creating a large scale employment opportunity. But the working environment of rice mill is neither conducive nor favorable to workers health. Rice mill produce a huge amount of smoke and dust which make the working environment polluted. Rice mills may be a source of pollution both on site and in the surrounding locality. Dust release from by-products, high internal or external noise levels, and odor generated from the soaking reservoirs in the parboiling process or soaking water which is not properly treated, runoff surface water which may contain high levels of organic material, effluent produced during cleaning of equipment etc are polluting our environment continuously (Zaman *et al*., 2006). Most of the workers work in a risky environment. As a result several health problem and diseases may occur. Besides, health problem may be occurred due to carrying heavy loads over head, back and shoulder, firing boiler, rice drying, driving huller machine, mechanical and manual separation of husks from head rice (Siddique, 2007). So rice mill has a high impact on our environment and health status.

So, on the above considerations, regarding this present study the following objectives are considered:-

i. To describe the socio-economic characteristic of rice mill workers;
ii. To ascertain the impact of rice mill towards environmental, economic and health status of the mill workers; and
iii. To explore the contributing relationship between the workers' selected predactory variables and impact of rice mill towards environmental, economic and health status of rice mill workers.

1.1 Limitations of the Study

Considering money, times, and other available resources to the researcher and to make the study meaningful and manageable from the practical point of view, the following limitations are listed below:

i. It was very difficult to collect accurate information because most of the workers were illiterate or had only primary education. They did not keep any written records with respect their activities, income or family assets. Therefore, the researcher had to depend on data furnished by the workers.

ii. Characteristics of the workers were many and varied. But only nine characteristics were selected for this study.

iii. The study was confined to only two upazila, namely Pabna sadar and Santhia upazila of Pabna district.

CHAPTER II

REVIEW OF LITERATURE

The purpose of this chapter is to review the previous researches related to impact of rice mill conducted by different researchers. The researcher had reviewed the available literature from home and abroad related to impact of rice mill.

2.1 Rice mill and its present status

According to Dhankar (2014), milling is the process wherein the rice grain is transformed into a suitable form for human consumption where utmost care is taken to prevent breakage of the kernel and improve the recovery. After harvesting and drying, the primary milling operation includes de-husking as well as the removal of bran layers (polishing) is done before consumed it. Rice milling system can be a simple one or two step process, or a multi stage process. In one step milling process, milled or white rice is produced directly out of paddy by removing husk and bran in one pass. In two step process, removing husk or removing bran are done separately where brown rice is produced as an intermediate product. Rice undergoes a number of different processing steps in multistage milling.

The post-harvest activities were traditional and labour intensive in Bangladesh. These activities were manual harvesting, threshing, sun drying, winnowing, parboiling and milling by huller mills or traditional devices. Many of them were done by women in rural areas (Ahmed, 1983).

Rahman *et al.* (2017) observed that after harvesting paddy from the crops field, some process is maintained to make it suitable for consumption. Parboiling, drying, and milling are the main three stages of rice processing. This process can be done both at home and at the rice mill. For non commercial purpose especially for family consumption this processing was done at home. For this processing dheki was used to process paddy after it was parboiled and dried.

But the rice milling or processing is becoming modern day by day in Bangladesh. In recent year, using dheki for the paddy processing is hardly found. Machine has replaced dheki for rice processing. Now village rice mill or small husking mill is a way of small scale paddy processing. For this processing small rice husking machine is used to process paddy after it is parboiled and dried at home. But for large scale of paddy processing commercial milling is used.

In Bangladesh there are two types of commercial mills. These are modern or automated rice mill and husking or traditional rice mill. In modern or automatic rice mills all activities are done through a mechanical process which includes categorization of rocks & unfilled grains, grain marinating, boiling, drying, milling, polishing & bagging. But, traditional commercial mills or husking mill is an old method of paddy processing. This is made of wood with few metal components and is usually driven by a single power source through a system of transmissions. In Bangladesh, most of the rice is processed in the traditional rice processing system. More than 60% of the rice is processed rice in traditional rice processing system in Bangladesh. Approximately 16,400 chatals, 420 semi-automatic rice mills and around 400 fully automatic rice mills are operating in Bangladesh where only 200 semi-automatic and automatic rice mills were in 2004. The number of automated rice mills and semi-automated rice mills are increasing because these can process five times more rice than traditional rice processing mill at a certain time (Islam, 2014).

Caringal *et al*. (2016) observed that there have been numerous techniques to hull rice. Traditionally, it would be pounded using some form of mortar and pestle. An early stage rice pounder was used to do this. Later more efficient machinery was developed to hull and polish rice. Now-a-days, a rice huller or rice husker is used to automate the process of removing the chaff (the outer husks) of grains of rice.

However, the number of rice mill is increasing day by day, but modern technology use is very low. Most of the rice mill has no chimney or other protective measures. No researcher compares the impact between traditional rice mill and auto rice mill towards environmental, economic and health status together. Most of them worked with a single impact.

2.2 Environmental impact

According to Zaman *et al.* (2006), rice mills may be a source of pollution both on site and in the surrounding locality. The sources of this pollution are dust release from handling or processing of the paddy or its by-products, high internal or external noise levels, noise from mechanical devices which is not maintained properly, odor generated from the soaking reservoirs in the parboiling process, soaking water which is not properly treated, runoff surface water which may contain high levels of organic material, effluent produced during cleaning of equipment. To minimize water pollution, water and effluent should be treated before discharge and arsenic contaminated water must not be used for soaking. The disposal of solid waste, which includes the husk from the paddy as well as other waste generated from the cleaning process is another major source of environmental pollution. Pollution risks to water and soil may arise from spillage and leakage of solid fuels and burnt husks stored on the mill site.

Ekwe (2012) observed that the by-products include both the solid and liquid waste such as the rice husk, bran, and effluents from fuel and used water pollute the environment. The husks are dumped indiscriminately around the rice mills and they accumulate due to the numerous rice milling machines located in the area.

Kumar *et al.* (2008) conducted a survey in the workrooms of eight renowned rice mills of the north-eastern region of India established during the period between 1980 and 1985 and stated that the sound-pressure level (SPL) in the workrooms of the rice mill varied from 78 to 92 dB. The paddy cleaner, rubber

roll sheller, compartment separator, rice cleaner, auxiliary sieve shaker and an electric motor without enclosure were found to be the predominant noise sources in the workrooms of the rice mill. The causes of high noise in the rice mills may be attributed to the use of a long flat belt drive, crank-and-pitman mechanism, absence of an electric motor enclosure, poor machine maintenance and inadequate acoustic design of the workroom of the rice mill. About 26% of the total labourers were found to be exposed to higher levels of noise than 85 dB. Subjective response indicated that about 26% of the total labourers felt noise interferes in their work and about 49% labourers felt noise interferes with their conversation.

Njoku *et al. (*2011) studied on Effect of Rice Mill Wastes Application on Selected Soil Physical Properties and Maize Yield (*Zea mays l.*) on an Ultisol in Abakaliki Southeastern Nigeria and observed that noise of different decibels is generated from the rice milling operations and heat of high temperature comes from the parboiling operations. Most of the by-products are abandoned in the husk dumps. They are occasionally set ablaze. Moreover, there is usually smoke emitted from the rice mill continually into the surrounding communities.

Nunes *et al.* (2004) observed that dust from rice mill affect the photosynthesis of the trees around the rice mill by dust deposition on leaves. The dust deposition on the foliar surface affects mainly the reflectance of light. The increasing deposition levels may decrease light absorbance by the leaves. As a result, the energy balance of the leaves and net photosynthesis become altered and reduce the productivity of the affected vegetation.

However, Most of the researcher showed that rice mill pollutes our environment. Dust contamination, excessive sound, odor from mill etc are the common problem around rice mill. Most of the rice mill has no chimney as a result surrounding air is being polluted by ashes from rice mill. But compare and relationship between environmental impact and economic and/or health

status of the workers is very rare among the research works. Most of them showed either environmental impact or health impact.

2.3 Socio-economic impact

According to Zaman *et al.* (2006), the main socio-economic problems were – the absence of society of workers to protect their rights and no allowances were paid other than the salary. Second ranking problems were – no salary/wage when in leave, no security for the job, no over time, no insurance for casualties during work, and no financial help for sick worker. Other problems include – no loan and no bonus for festivals; very low salary/wages compared to wages in other occupations and no advance against salary/wage given to the workers. Monthly wages of male labourers ranged from 900 to 3000 Taka (US$ 15 to 50) and of female labourers from 600 to 1200 Taka (US$ 10 to 20). The wage earners particularly the females were unable to maintain their livelihood with this small amount of money. As a result they were always in extreme poverty and mentally disturbed.

Siddique (2007) observed that average duration of the work per day was 9, 8 and 9 hrs and average income of worker was 2960, 2660 and 2950 tk per month in Dhaka, Mymensingh and Manikgang, respectively. Among the workers 52.55% were middle age, 32.4% were illiterate, and 43.33% had primary level education. About 53.33% workers had middle size family and 10% had large size family.

Most of the traditional and semi-modern rice mills had 2 or 3 permanent staff to perform all types of managerial and processing tasks year round. They employed 8 to 18 seasonal male and female workers to complete their work according to the capacity of the mill (Farouq and Islam, 1995)

According to Farukh *et al.* (2005), about 67% mill workers belong to middle age of 14-35 years in selected rice mills. Among them major were illiterate, 37.5% had primary level education and 12.5% in secondary level of education.

Most of the workers were landless. They had average cultivable land of 17.15 decimal and a homestead area of 4.85 decimal only. Average earning of the mill workers were 22,750 taka per annum against yearly expenditure 22,185 taka. They intake average 3520 kcal (90.26%) as against the recommendation of 3900 kcal having the average caloric deficiency of 677 kcal. Average 40 g protein was intake against recommended intake of 45g.

Rahman *et al.* (2016) measured the contribution of rural women in rice farming by analyzing the average time allocation (hours spent/day) by male and female on agricultural activities. The analysis showed that comparatively male workers were less involved in post-harvest operations than female members. Beside household activities, women were engaged in almost all agricultural activities like seedling nursing, weeding, threshing, cleaning and sorting of grain, boiling of grain, drying of straw and rice storing. Traditionally rice processing and other post-harvest operations were performed by two classes of women, i.e. family farm women and wage labor women. In Nilphamari region, it was found that male workers spent 228.2 hours per season compare to female workers 174.5 hours per season. In Mymensingh region, male workers spent 270 hours per season compare to female workers 197.3 hours per season. It was identified that the male workers were not much involved in post-harvest operations, but still they got higher wages for their job than their female counterpart. There was a significant difference between the wages paid to male and female workers. The aggregate average wage rate was BDT 265/day for male workers whereas it was BDT 233/day for female.

However, from the above study it is revealed that salary of the workers are not sufficient, there was no job security, bonus or others economic support. No labour organization was found in any rice mill. Economic progression is very low. All the research was done on the basis of economic condition of the workers. But economic has a relationship with health status as well as environmental effect.

2.4 Impact on health status

According to Siddique (2007), health problem occurred due to carrying heavy loads over head, back and shoulder, firing boiler, rice drying, driving huller machine, mechanical and manual separation of husks from head rice. He observed that 88% of his studied workers had pain in leg, neck and back, 74% stiffness in lumbo-sacral joint, 45.33% heaviness in the chest, 60.66% numbness of body and leg and 56% neck rigidity. He also observed that 92% reported worker had heat exhaustion, 68% excessive sweating, 62% frequent urge of drinking water, 48% heat cramp, 43.33% burning sensation and painful micturation, 44% high coloured urine, 54.66% eye irritation, 41.33% burning of hair follicle, 37.33% sudden blackout and 50.66% foreign body sensation in the eye.

Yasmin (2002) observed that acidic gases and black smoke with bad smell were discharged from factories and furnaces. These materials were very harmful to human health. Rice mill workers and surrounding people were suffering from throat diseases that caused fever especially in children.

High noise and dust levels may endanger rice mill workers and employees' health and safety. The Karnataka State Pollution Control Board (KSPCB) prescribed limit of 55 decibel of noise limit in the rice mills. Bangladesh has no such standard. Besides major health-related work environment problems were – no health checkup facility provided by the mill; no physician appointed for medical advice to workers; huller driver was over stressed due to restless work even in the night; excessive workload for other workers; no shifting duty; no recreation facilities; no sanitary latrines; no protective device against dusts and other pollutants and no first-aid box available in the mills for instantaneous first hand treatment for injuries (Zaman *et al.*, 2006)

According to Dasai and Ghosh (2003), the rice mill workers in Bawla town were occupationally illuminated to airborne aflatoxin producing strains of *Aspergillus Flavus*. The workers required protective mask for their safety but

that were not available in all rice mill. They observed that highly significant total and respirable dust concentration was found in work place of the rice mill ($P<0.01$) and the total dust concentration was significantly higher than the control site.

Eshwaramma *et al.*, (2016) showed that the rice mills subjects the respiratory system to many different exposures such as dusts, bacteria, endotoxins, spores, chemicals etc in work place. The study confirmed the findings and suggests that rice mill environmental dust adversely affects lung function parameters and causes restrictive and obstructive patterns of lung function impairment which is associated with dose-effect of years of exposure to rice mill dust. The study showed that the prevalence of respiratory morbidity was high among the employees who were involved in sweeping &cleaning the rice mill (87.5%) followed by people dealing with milling (71.42%), filling the grains and packing (60%) and pouring the rice grains in to the machine (50%). In the study 88.89% of the rice millers were having irritant cough with expectoration, followed by chronic cough >2yrs (83.33%), rashes (66.67%) and chest tightness 66.67%).

However, from the above information it can be said that most of the workers are affected by sever disease. Skin disease and respiratory problem, eye irritation, body weight loss etc are very common among the workers group. There is no relationship or compare with the health status and economic and/or environmental impact among the above research.

2.5 By-product utilization

According to Wilson *et al.* (2002), most of the rice by-products, including rice **husk a**nd rice bran, are used as animal feeds. Brewer's rice, which is a mixture of broken rice, rice bran and rice germ, is also used almost exclusively in the production of beer. In recent years, rice by-products have received increased attention as functional foods due to their phenolic base compounds,

in addition to having high amounts of vitamins, minerals and fibre, which can help to lower cholesterol and enact anti-atherogenic activity.

Ullah (1983) observed that different wastes from rice processing mill might be used for different purpose: husk as a fuel source, black ash of husk to manufacture brick, fine bran as a source of crude oil production etc.

Esa *et al.* (2013) studied a literature associated with rice by-products and main components, especially those intended to combat cancer, improve plasma lipid levels or control the blood glucose levels. Rice byproducts, such as rice straw, rice husks, rice bran, rice germ and broken rice, are extensively abundant agricultural wastes from the rice industry, and the percentage of their production depends on the milling rate and type of rice. Among all rice by-products, rice bran has been extensively studied. It contains phytochemicals such as γ-oryzanol, vitamin E, mainly tocotrienols and dietary fibre. They focused not only on the role of rice bran but also on the roles of other rice by-products, such as rice germ and rice husk, in the management of the diseases, investigating their various potential uses in the food industry and all possible properties that may contribute to these effects.

Triratanasirichai *et al.* (2017) observed that by-products from the rice milling process have high amounts of nutrients when compared to white rice itself. Rice straw, rice hull, broken rice, rice germ, rice bran, rice bran oil and wax are the by-products from the rice industry. These by-products usually have basic applications in their original form, but now can be used as raw materials for different value-added research or in food applications with functional properties. Rice by-products not only contain various types of functional components, but also contain dietary fiber. The fiber can be mostly found in rice hull and the types of fiber present include cellulose, hemicellulose, lignin and hydrated silica. Because of the high fiber content in rice hull and rice bran, they are used as ingredients by the bakery industries to increase the fiber content and improve the nutrition of bakery products.

However, from the above review of literatures, it may be revealed that rice mill by-product has some economic as well as medicinal importance. Rice mill by-product is also a major source of environmental pollution. If the by-product is used properly they may reduce environmental pollution.

Rice mill has a great impact towards environmental, economic and health status of the workers. Most of the research has been done on the basis of single factor, either environmental impact or health impact. The contributing relationship between the workers' characteristics and impact of rice mill towards environmental, economic and health status was not determined. In most of the research the gap was- no researcher ascertain the impact of rice mill towards environmental, economic and health status of the workers together.

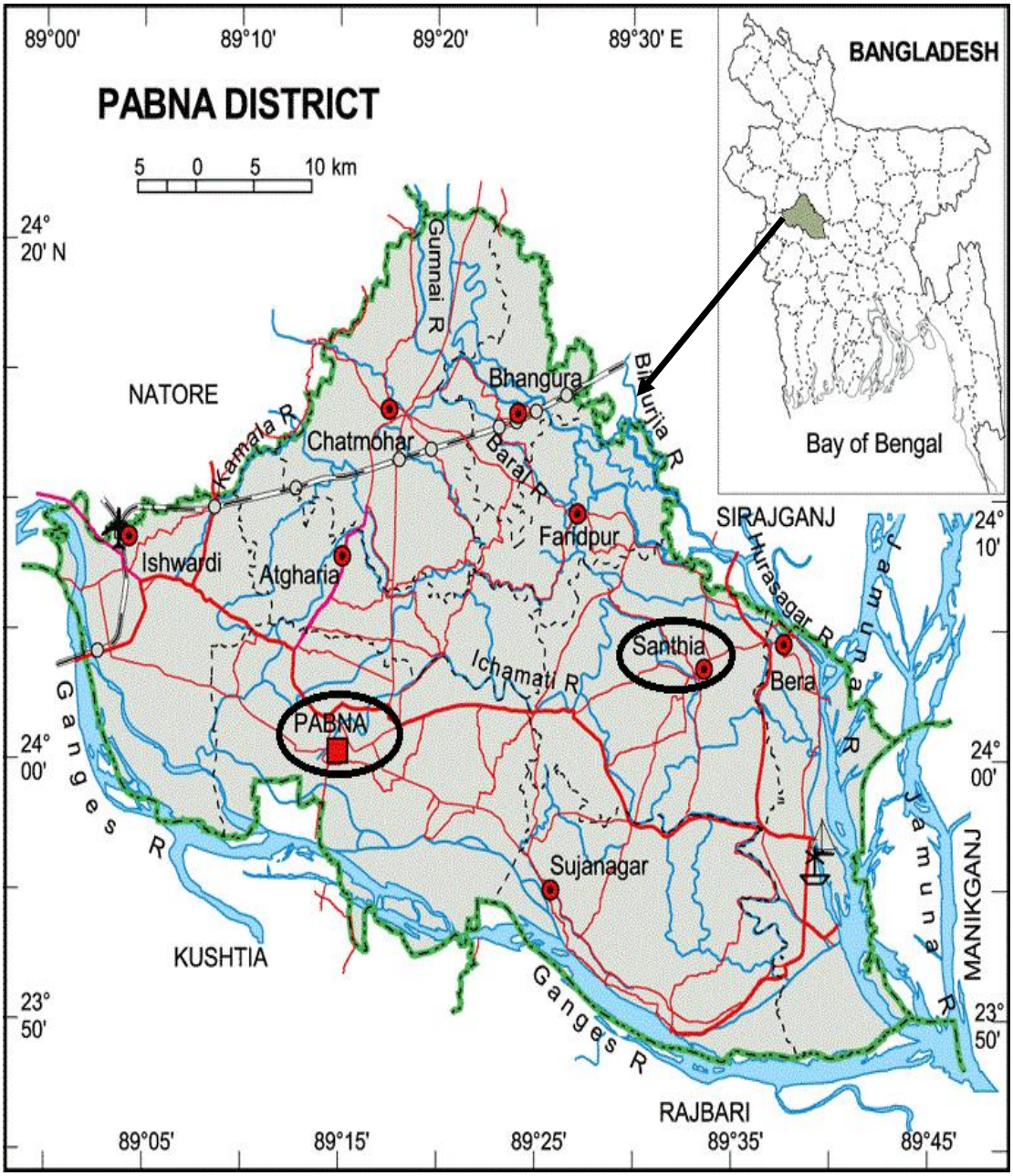
CHAPTER III

MATERIALS AND METHODS

Selecting proper methods and procedures for data collection and analysis are very important for any research. An appropriate methodology helps the researcher to collect necessary data and analyze them in an appropriate way. The purpose of this chapter is to discuss the method and procedure used in the study. The study was a field survey using structured interview schedule.

3.1 The locale of the study

Pabna District consists of 9 upazila named Pabna sadar, Atgharia, Bera, Bhangura, Chatmohar, Ishwardi, Santhia and Sujanagar. Out of them two upazilas namely Pabna sadar and Santhia were purposively selected as the locale of the study. The map of Pabna district showing the locale of the study, the map of Pabna sadar upazila and the map of Santhia upazila have been presented in Figure 3.1, Figure 3.2 and Figure 3.3, respectively.

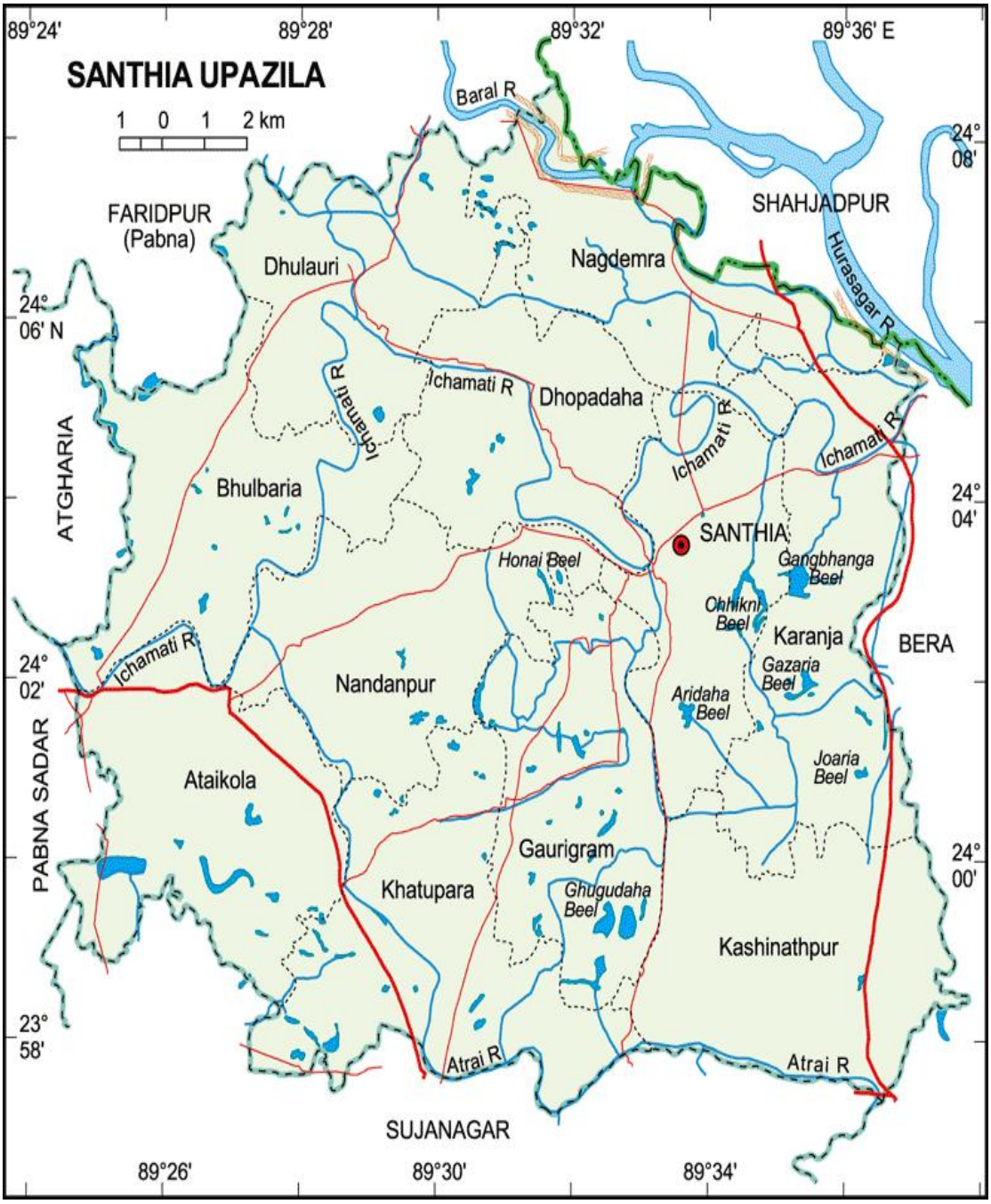


Source: Banglapedia

Figure 3.1: Map of Pabna district showing Pabna sadar and Santhia upazila

Source: Banglapedia

Figure 3.2: Map of Pabna sadar upazila under Pabna district



Source: Banglapedia

Figure 3.3: Map of Santhia upazila under Pabna district

3.2 Population and sample of the study

An updated list of rice mill of the selected two upazilas was collected from the Upazila Food Controller Office. There were 301 rice mills in those two upazilas. Those rice mill workers constituted the population of the study. About 30 rice mills were selected randomly from the two upazilas by use the formula:

$n= Z^2P(1-P)N/Z^2P(1-P)+Ne^2$ (Yamane's formula,1967)

Where;

- N= Population Size
- n= Sample Size
- e= The Level of Precision
- Z= The value of standard normal variable at the chosen confidence level
- P= The proportion or degree of variability

From each rice mill 3 workers were selected randomly to collect data. Total 90 workers were selected as the sample of the study. A reserve list of 5 rice mills was made so that data would be collected from those in case of any problems of the main sample. The distribution of the rice mills, number of workers and a reserve list has been shown in Table 3.1.

Table 3.1 Distribution of the rice mills, number of workers and a reserve list

Sl. No.	Name of Upazilas	No. of total rice mills	Number of rice mills	Number of workers	Number of mills in the reserve List
1.	Pabna Sadar	212	20	60	3
2.	Santhia	89	10	30	2
	Total	301	30	90	5

3.3 Research instrument

An interview schedule was prepared for collection of data from rice mill workers keeping the objectives and variables of the study in mind. The questions and statements contained in the schedule were simple, direct, relevant to the title and easily understandable by the workers. The draft schedule having both open and closed form of questions was prepared in english with the help of the supervisor. An english version of the schedule has been presented in Appendix-I. Before final data collection, the completely developed interview schedule was pre-tested among 10 respondents of the study area. Based on the pre-test experience, corrections, alterations and rearrangements were done in the schedule and thus complete schedule was prepared for final data collection.

3.4 Data collection

Data were collected by the researcher himself through personal interviewing from the randomly selected respondents with the help of an interview schedule. Prior to data collection, the researcher went to Upazila Food Controller Office and requested them to provide necessary help and co-operation for data collection. In every rice mill the researcher had to manage the owner or manager of the mill first for getting permission of taking interview among the workers. All possible efforts were made to explain the purpose of the study to the owners or manager and to the respondents. After establishing proper rapport, the researcher asked the workers different question basis on the interview schedule and recorded their answers sincerely. The data were collected from 1 August, 2017 to 25 October, 2017. The researcher also took help from the local leaders, Food Inspector, Food Sub Inspector and local peoples. Some photographs at the time of interviewing with rice mill workers in study area have been showed in Plate 3.1.

Plate 1: Photographs shows the interviewing with rice mill workers in study area

3.5 Data coding and tabulation

After collecting the data, the researcher coded the data into a coding sheet. The collected data were then compiled, tabulated and analyzed in accordance with the objectives of the study by using Microsoft excel and SPSS program. The researcher converted all qualitative data into quantitative form by means of suitable scoring techniques for the purpose of analysis.

3.6 Selections of the variables of the study

In any scientific research, the success of a research depends on the exact selection of the variables.

Ahmed *et al*. (2004) defined variables as measurable characteristics of a population that may vary from element to element either in magnitude or in quality. Dependent variable and independent variable are the two types of variable used in this study. Townsend (1953) defined that an independent variable is the factor that is manipulated by the researcher to ascertain its relationship to an observed phenomenon. He also defined that dependent variable is the factor that appears, disappears or varies as the researcher introduces, removes or varies the independent variable.

3.7 Measurement of the variables

In any scientific research, measurements of variables constitute an important task. In this section procedures of measuring independent variables and dependent variables of the study have been described.

3.7.1 Measurement of independent variables

The independent variables of this study were nine selected characteristics of rice mill workers of Pabna sadar upazila and Santhia upazila under Pabna District. These were age, level of education, family size, types of employment contracts of workers, experience as rice mill workers, professional training experience, knowledge on rice mill, attitude towards rice mill and constraints

faced by workers in rice mill. The measuring procedures of independent variables have been discussed below:

3.7.1.1 Age

The age of a worker was measured in terms of actual years from his/her birth to the time of interview on the basis of his/her response. A score of one (1) was assigned for each year of age. For example, if any respondent's age was 28 years then he/she was given a score of 28.

3.7.1.2 Level of education

Education of a worker was measured in terms of classes he/she passed in formal education system. If a respondent passed the final examination of class two in the school, a score of two (2) was taken for calculating his/her education score. In case of education outside the school the level of education was converted into class and scored according to the class scoring system. A score of 0.5 was given to the respondents who could sign only and the respondents who could not read and write were given zero (0) as an education score.

3.7.1.3 Family size

Family size of a worker was determined in term of actual number of members in his/her family including himself/herself, his wife/her husband, his/her sons, daughters, brothers, sisters, parents and any other person(s) who depend on the worker's income. A score of one (1) was assigned for each member of the family. For example, if a respondent mentioned that he had 3 members in his/her family then his/her family size was 3.

3.7.1.4 Types of employment contracts

The workers of rice mill were categories into 3 groups on the basis on their employment contract. These were permanent, seasonal and contract workers. Permanents workers were those who worked in rice mill year round, rice mill was the main source of their income. Seasonal workers were those who worked

in rice mill in a fixed period in the year and then involved with other works. Finally, contract workers were those who worked at a fix period in a day in rice mill and also involved with other activities in same day. A score three (3) was given for permanent workers, two (2) for seasonal workers and one (1) for contract workers in a rice mill.

3.7.1.5 Experience as rice mill worker

Experience as rice mill worker was determined by total numbers of years him/her involvement with rice mill from the first day of his/her join in rice mill as a permanent/ seasonal/ contract worker. A score of one (1) was assigned for each year of experience as rice mill worker.

3.7.1.6 Professional training experience

Professional training experience was determined by total number of days of training received by the respondents which was related to his/her job in his/her entire lifetime from any organization. A score of one (1) was assigned for each day of received training and zero (0) was assigned for no training.

3.7.1.7 Knowledge on rice mill

For measuring the knowledge on rice mill of a worker, a knowledge scale was developed. For this, each worker was asked 10 questions covering the different aspects of rice mill. Score of each question was 2, and the total score was 20. For correct responses to all the 10 questions, a worker could secure a total score of 20. Thus the total score could be 0 to 20. The total score indicated the knowledge of the worker on rice mill where zero (0) indicate no knowledge and 20 indicate very high knowledge on rice mill of a worker.

3.7.1.8 Attitude towards rice mill

Attitude of a worker was used to refer his/her feelings and actions towards rice mill. There were 8 (Eight) statements (4 positive and 4 negative) related to rice mill. A statement was considered positive if it possessed an idea favorable

towards rice mill and a statement was considered negative if it was unfavorable towards the rice mill. The workers were asked to express their opinion in the form of strongly agree, agree, undecided, disagree and strongly disagree. A score of 4 was given to strongly agree, 3 to agree, 2 to undecided, 1 to disagree and 0 to strongly disagree whenever the statement was positive. A reverse scoring method was followed in case of negative statement such as 4 to strongly disagree, 3 to disagree, 2 to undecided, 1 to agree and 0 to strongly agree. The sum total of the scores obtained by a worker was his/her score for this variable. The scores of respondents could range from 0-32 while 0 indicate very unfavorable attitude, and 32 indicate highly favorable attitude towards rice mill.

3.7.1.9 Constraints faced by workers in rice mill

Constraints indicate the problem faced by the workers in rice mill. To determine constraints faced by workers in rice mill 8 constraints connected with rice mill were selected and a constraint facing scale was developed. The workers were asked to mention their response as ‘not at all’, ‘low’, ‘medium’ and ‘high’ for each constraint included in constraint facing scale based on their extent of constraints facing in rice mill. The score for ‘not at all’, ‘low’, ‘medium’ and ‘high’ constraints faced by the workers were 0, 1, 2 and 3, respectively. Thus constraints faced by workers in rice mill score could range from 0 to 24, while 0 indicates no constraints and 24 indicate very high constraints faced by the workers in rice mill.

3.7.2 Measurement of the dependent variable

“Impact of rice mill towards environmental, economic and health status of the mill workers” was the dependent variable in this study. The dependent variable was measured on the basis of changes occurred in four selected dimensions (environmental changes, changes in income, changes in family assets and changes in health status) of the respondents as a result of involvement with rice mill. In each case, the condition of workers ‘before’ and ‘after’ involvement

with rice mill was considered. The difference between two situations was determined for each case stated. This different indicated the changes in a dimension after involvement with rice mill. The above mentioned each dimension was measured by considering following techniques:

3.7.2.1 Environmental changes

It was measured on the basis of the extent of change occurred in four selected sub-dimensions (air pollution, water pollution, sound pollution and dust contamination). To determine the changes each respondent was asked to mention the level of pollution he/she faced at working place before and after involvement with rice mill at a 4-point likert scale named ‘no’, ‘slight’, ‘moderate’ and ‘severe’. The weights for ‘no’, ‘slight’, ‘moderate’ and ‘severe’ pollution faced by respondents were 0, 1, 2 and 3, respectively. The environmental changes were determined by computing total score of level of pollution faced by respondents “before” and “after” involvement with rice mill. Thus total score for environmental changes could range from 0 to 12, while 0 indicates no environmental change and 12 indicates very high environmental change at working place. To determine the total impact all the environmental changes were categorized and scored as follows:

Table 3.2 The scoring of environmental changes

Environmental changes	Score
No change (0)	0
Low changes (1-4)	1
Medium changes (5-8)	2
High changes (9-12)	3

3.7.2.2 Changes in income

A worker's income was measured in Taka on the basis of his/her total monthly earning from rice mill and others sources like agriculture, fisheries, livestock, poultry, business, labour etc. Incomes from different sources were added together to obtain total income. The total earnings in Taka were converted into income score. A score of one (1) was assigned for each one thousand Taka. The changes in income were determined by computing income score of the worker between "before" and "after" involvement with rice mill. To determine the total impact all the changes in income were categorized and scored as follows:

Table 3.3 The scoring of changes in income

Changes in income	Score
No change (0)	0
Low changes (1-3 thousand Tk.)	1
Medium changes (4-6 thousand Tk.)	2
High changes (above 6 thousand Tk.)	3

3.7.2.3 Changes in family assets

It referred to the family assets condition the respondents both "before" and "after" involvement with rice mill. In this study 10 items were included to determine the assets possession of the respondents. Each respondent was asked to indicate his possession against 10 items.

Table 3.4 The items of family assets and their price

Sl. No.	Items	After involvement		Before involvement	
		No.	Price	No.	Price
1	Homestead area				
2	Farmland				
3	Ghor				
4	Cow				
5	Goat				
6	Hen/Duck				
7	Rickshaw				
8	By-cycle				
9	Television				
10	Others……				
	Total				

The changes in family assets were determined by computing total price of all items the worker had “before” and “after” involvement with rice mill. A score of one (1) was assigned for each one thousand Taka. To determine the total impact all the changes in family assets were categorized and scored as follows:

Table 3.5 The scoring of changes in family assets

Changes in family assets	Score
No change (0)	0
Low changes (1-67 thousand Tk.)	1
Medium changes (68-135 thousand Tk.)	2
High changes (above 135 thousand Tk.)	3

3.7.2.4 Changes in health status

It was measured on the basis of the extent of change occurred in four selected sub-dimensions such as changes in body weight, eye irritation, skin diseases and problems in respiratory system faced by respondents. To determine the changes each respondent was asked to mention the level of affect he/she faced before and after involvement with rice mill at a 4-point likert scale named ‘no’, ‘rarely’, ‘occasionally’ and ‘often’. The weights for ‘no’, ‘rarely’, ‘occasionally’ and ‘often’ affect faced by respondents were 0, 1, 2 and 3, respectively. The changes in health status were determined by computing total score of level of affect faced by respondents “before” and “after” involvement with rice mill. Thus total score for changes in health status could range from 0 to 12, while 0 indicates no change in health status and 12 indicate very high changes in health status. To determine the total impact all the changes in health status were categorized and scored as follows:

Table 3.6 The scoring of changes in health status

Changes in health status	Score
No change (0)	0
Low changes (1-3)	1
Medium changes (4-7)	2
High changes (above 7)	3

3.7.3 Measurement of impact of rice mill towards environmental, economic and health status of the mill workers

The changes in four dimensions were categorized and the categorized score was added together to get the impact of rice mill towards environmental, economic and health status of the mill workers**.** The following formula was used for impact score:

$Y = Y_1 + Y_2 + Y_3 + Y_4$ (Hasan, 2013)

Where, Y = Impact of rice mill towards environmental, economic and health status of the mill workers

Y_1 = Environmental changes

Y_2 = Changes in income

Y_3 = Changes in family assets and

Y_4 = Changes in health status

3.8 Data processing and analysis

After completing the field survey data from all the interview schedules were compiled, tabulated, coded and analyzed in accordance with the objectives of the study. All the responses in the interview schedule were given numerical coded values. All local units were converted into standard units and all qualitative data were converted into quantitative data by means of suitable scoring system whenever necessary. The statistical measures such as number, percentage, mean and distribution was measured by using Microsoft office excel 2007 and used it for describing the variables of the study. In order to explore the relationships between the selected characteristics of the workers and the impact of rice mill, Karl Pearson correlation co-efficient (r) was computed by using IBM SPSS Statistics 20. Five percent (0.05) and one percent (0.01) level of significance were used as the basis of rejecting any null hypothesis.

When the calculated value of co-efficient of correlation 'r' was equal to or greater than tabulated value at designated level of significance at same degrees of freedom, the null hypothesis was rejected and it indicated that there was significant relationship between the concerned variables. However, when the calculated value of co-efficient of correlation was smaller than the tabulated value at the designated level of significant at same degrees of freedom, it indicated that the null hypothesis could not be rejected and there was no relationship between the concerned variables.

3.9 Hypothesis of the study

Goode and Hatt (1952) defined that "A hypothesis is proposition which can be put to a test to determine its validity. It can be contrary to, or in accord with common sense and also may prove to be correct or incorrect. In any study, it leads to an empirical test. For any statistical test null hypothesis formulation becomes necessary. In this study the following null hypothesis was formulated to explore the nature of relationship between the variables. The null hypothesis

was “There is no relationship between selected nine characteristics of the workers and the impact of rice mill”. The selected characteristics were: age, level of education, family size, types of employment contracts of workers, experience as rice mill workers, professional training experience, knowledge on rice mill, attitude towards rice mill and constraints faced by workers in rice mill.

CHAPTER IV

RESULTS AND DISCUSSION

In this chapter the findings of the study and interpretations of the results have been systematically presented according to the objectives of the study in different sections. The first section deals with the nine selected characteristics of the rice mill workers while the second section deals with the impact of rice mill towards environmental, economic and health status of workers. The third section deals with the relationships between the selected characteristics of workers and impact of rice mill towards environmental, economic and health status of workers.

4.1 Selected characteristics of the rice mill workers

According to the objectives of the study, data were collected from a sample of 90 rice mill workers. In this section the findings of the nine selected characteristics of the rice mill workers was described in nine subsections. The selected characteristics included age, level of education, family size, types of employment contracts of workers, experience as rice mill workers, professional training experience, knowledge on rice mill, attitude towards rice mill, constraints faced by workers in rice mill.

4.1.1 Age

Age of the respondents ranged from 19 to 48 years, the average being 29.58 years and the standard deviation was 6.55. On the basis of age, the workers were classified into three categories: Young aged (less than 30 years), middle aged (30-45 years) and old aged (above 45 years). Table 4.1 contains the distribution of rice mill workers according to their age.

Table 4.1 Distribution of rice mill workers according to their age

Age based categories (in years)	Workers		Mean	Standard deviation
	No.	Percent		
Young (<30)	53	58.89	29.58	6.55
Middle (30-45)	35	38.89		
Old (>45)	2	2.22		
Total	90	100.00		

From the data presented in Table 4.1 it was found that the highest proportion (58.89 percent) of the workers were in the young aged category compared to 38.89 percent into middle aged category. Only a small portion (2.2 percent) of the workers was in the old aged category. Data also indicated that the young aged workers constitute more than half of the respondents. The young and middle aged workers constitute about 98 percent. As working in rice mill was more energetic than any other works, young and middle aged workers involved here more than old aged workers. The young aged workers seem the highest percentage because they are more energetic than others. For the same reason the percentage of old aged seems very low. Siddique (2007) observed the mean was 33.85, range was 15-70 and the largest (63 percent) of the workers were middle aged (21-45). Farukh and Zaman (2002) found 22 percent of the workers were young. The value was changed due to selection of different area, class interval or others socio-economic conditions.

4.1.2 Level of education

The education score of the respondents ranged from 0 to 10 with an average being 1.56 and the standard deviation was 2.39. Based on their level of education, the respondents were categorized into four categories: illiterate (0),

can sign only (0.5), primary level (1 to 5) and secondary level (6 to 10). Table 4.2 shows the distribution of the rice mill workers according to their level of education scores.

Table 4.2 Distribution of rice mill workers according to their level of education

Educational level based categories (in year of schooling)	Workers		Mean	Standard deviation
	No.	Percent		
Illiterate (0)	40	44.44	1.56	2.39
Can sign only (.5)	12	13.33		
Primary Level (1 to 5)	31	34.44		
Secondary Level (6 to 10)	7	7.78		
Total	90	100.00		

From Table 4.2, it was revealed that majority of the workers (44.44 percent) were illiterate compared to 34.44 percent having primary education, 13.33 percent can sign only and 7.78 percent having secondary education. No workers had any higher education. The data showed that near 58 percent workers had no institutional education and the secondary level of education was near 8 percent who worked as a manager of rice mill. Siddique (2007) observed 32.4 percent of the workers were illiterate and 43.33 percent had primary level of education. Farukh and Zaman (2002) found similar result.

4.1.3 Family size

Family size of the respondent workers ranged from 2 to 9 with an average of 4.76 and standard deviation was 1.78. On the basis of family size the respondent workers were classified into 3 categories such as small family (less

than 4 members), medium family (4-6 members) and large family (above 6 members) which have been shown in Table 4.3.

Table 4.3 Distribution of rice mill workers according to their family size

Family size based categories (in number)	Workers		Mean	Standard deviation
	No.	Percent		
Small family (< 4)	7	7.78	4.76	1.78
Medium family (4 to 6)	66	73.33		
Large family (> 6)	17	18.89		
Total	90	100.00		

From the data presented in Table 4.3, it was revealed that the highest proportion (73.33 percent) of the workers belonged to the medium family size category compared to 18.89 percent of the workers belonged to large family size category and a small proportion (7.78 percent) of the workers belonged to small family size category. The average family size in the study community was 4.76 where the average family size in Bangladesh was 4.06 (BBS, 2017). The data indicated that they average family size in the study community was higher than the national average family size. Siddique (2007) observed that the workers community 53.33 percent of the workers had family member from 5 to 7 persons.

4.1.4 Types of employment contracts

According to the types of employment contracts of workers the computed scores ranged from 1 to 3 with an average of 2.02 and standard deviation was 0.72. The workers of rice mill were classified into 3 categories according to the types of employment contracts such as permanent workers (3), seasonal workers (2) and contract workers (1). Table 4.4 shows the distribution of the rice mill workers according to their types of employment contracts scores.

Table 4.4 Distribution of rice mill workers according to their types of employment contracts

Types of employment contracts based categories (score)	Workers		Mean	Standard deviation
	No.	Percent		
Permanent workers (3)	22	24.44	2.02	0.72
Seasonal workers (2)	44	48.89		
Contract workers (1)	24	26.67		
Total	90	100.00		

From the data presented in Table 4.4, it was revealed that the highest proportion (48.89 percent) of the workers belonged to the seasonal workers category compared to 26.67 percent of the workers belonged to the contract workers category and 24.44 percent of workers belonged to the permanent workers category. This data indicated that in rice mill seasonal workers were more than contract workers and permanent workers and permanent workers were lesser than others two. As production in rice mill is not equal year round, all millers employed a small numbers of workers as permanent workers and they employed more workers in season or at the time of large production. Farouq and Islam (1995) observed that most of the rice mill had 2 or 3 permanent workers and they employed 8 to 18 seasonal workers to maintain their workers demand at season. This number is quite similar to the study.

4.1.5 Experience as rice mill worker

The scores of experience as rice mill worker of the respondents ranged from 1 to 20 with an average of 7.01 and standard deviation was 4.88. According to possible experience score, the respondents were classified into three categories such as low experience (1-7), medium experience (8-14) and high experience (above 15). The distribution of rice mill workers according to their experience as a rice mill worker has been presented in Table 4.5.

Table 4.5 Distribution of rice mill workers according to their experience as a rice mill worker

Experience based categories (years)	Workers		Mean	Standard deviation
	No.	Percent		
Low experience (1-7)	59	65.56	7.01	4.88
Medium experience (8-14)	19	21.11		
High experience (>14)	12	13.33		
Total	90	100.00		

Table 4.5 indicates that the low experience category constituted the highest proportion (65.56 percent) of workers followed by medium experience category (21.11 percent) and high experience category (13.33 percent). This data mentioned that most of the workers did not take this profession as life time profession; they change their profession after some years. As working in rice mill is very hard work, most of the workers leave this profession when they become middle age or old age. For this reason high experience workers were very low in percentage and low experience workers were very high in percentage in rice mills.

4.1.6 Professional training experience

Professional training experience scores of the rice mill workers ranged from 0 to 60 with an average of 6.33 and standard deviation was 14.06. According to possible professional training experience score, the respondents were classified into four categories such as no training experience (0), low training experience (1-20), medium training experience (21-40) and high training experience (above 40). The distribution of rice mill workers according to their professional training experience has been presented in Table 4.6.

Table 4.6 Distribution of rice mill workers according to their professional training experience

Training experience based categories (days)	Workers		Mean	Standard deviation
	No.	Percent		
No training experience (0)	70	77.78	6.33	14.06
Low training experience (1-20)	9	10.00		
Medium training experience (21-40)	7	7.78		
High training experience (>40)	4	4.44		
Total	90	100.00		

Table 4.6 indicates that the no training experience category constituted the highest proportion (77.78 percent) of the workers followed by low training experience category (10 percent), medium training experience category (7.78 percent) and high training experience category (4.44 percent). Form the data it was found that most of the workers had no training experience and only about 5 percent workers had high training experience. Total low, medium and high trained workers were about 22 percent which was very low compare with no

trained workers. Proper training protects the workers from health hazards, reduce environmental pollution. So different social organization, government organization, health department arrange training program for the workers community but most of the workers had no interest on training because most of them were illiterate and worked in rice mill as day labour. So, they thought that attending any training program was loss of times. Only the workers who involved with technical work had low training experience.

4.1.7 Knowledge on rice mill

Knowledge on rice mill score of a respondent could range from 0 to 20 with the observed range from 7 to 20. The mean and standard deviation of knowledge was 13.58 and 3.53 respectively. On the basis of observed knowledge scores, the workers were classified into three categories such as poor knowledge (7-11), moderate knowledge (12-16) and adequate knowledge (above 16). The distribution of the rice mill workers according to their knowledge has been given in Table 4.7.

Table 4.7 Distribution of rice mill workers according to their knowledge on rice mill

Knowledge based categories (score)	Workers		Mean	Standard deviation
	No.	Percent		
Poor knowledge (7-11)	28	31.11	13.58	3.53
Moderate knowledge (12-16)	35	38.89		
Adequate knowledge (>16)	27	30.00		
Total	90	100.00		

Table 4.7 indicates that the moderate knowledge category constituted the highest proportion (38.89 percent) followed by poor knowledge category (31.11 percent), and adequate knowledge category (30 percent). From the data it may be concluded that all the workers had some knowledge on rice mill but that was not enough. Adequate knowledge holder workers percentage was lower than others two. So, the mill workers should know more information about rice mill which help them to protect environmental pollution, and also protect them from health hazards.

4.1.8 Attitude towards rice mill

"An attitude is a more or less stable set of opinion, interest or purpose, evolving expectancy of particular kind of experience and readiness with appropriate kind of response" (Drever, 1968). Rogers and Shoemaker (1971) regarded "attitude is a relatively stable organization of an individual's beliefs about an object that predisposes his actions."

Observed score of attitude towards rice mill of the workers ranged from 8 to 28 against the possible range from 0 to 32. The mean and standard deviation of attitude towards rice mill was 15.31 and 4.36 respectively. On the basis of attitude towards rice mill scores, the workers were classified into three categories such as low favorable attitude (8-14), medium favorable attitude (15-21) and high favorable attitude (above 21). The distribution of the rice mill workers according to their attitude towards rice mill has been given in Table 4.8

Table 4.8 Distribution of rice mill workers according to their attitude towards rice mill

Attitude based categories (score)	Workers		Mean	Standard deviation
	No.	Percent		
Low favorable attitude (8-14)	44	48.89	15.31	4.36
Medium favorable attitude (15-21)	37	41.11		
High favorable attitude(>21)	9	10.00		
Total	90	100.00		

Data presented in Table 4.8 shows that almost half (48.89 percent) of the workers had low favorable attitude towards rice mills where 41.11 percent had medium favorable attitude towards rice mills and 10 percent had high favorable attitude towards rice mills. From the data it was clear that the workers were not satisfied in different activities of rice mill. As a result half of them showed low favorable attitude towards rice mill.

4.1.9 Constraints faced by workers in rice mill

The score of constraints faced by workers in rice mill could range from 0 to 24 but the observed range was 8 to 22. The mean and standard deviation of constraints faced by workers in rice mill score was 15.76 and 3.89 respectively. On the basis of observed constraints faced in rice mill score the workers were classified into three categories, such as low constraints faced (8-12), medium constraints faced (13-17) and high constraints faced (above 17). The distribution of the workers based on their constraints faced in rice mill score has been presented in Table 4.9.

Table 4.9 Distribution of rice mill workers according to constrains faced by workers in rice mill

Constraints based categories (score)	Workers		Mean	Standard deviation
	No.	Percent		
Low constraints (8-12)	20	22.22	15.76	3.89
Medium constraints (13-17)	34	37.78		
High constraints (>17)	36	40.00		
Total	90	100.00		

Table 4.9 indicates that highest proportion (40 percent) of the workers felt in high constraint faced category compared to 37.78 percent in medium constraints faced category and 22.22 percent in low constraints faced category. From the data it was revealed that all the rice mill workers faced constraints in rice mill and majority of them faced high constraints. So, the rice mill authority should determine the main constrains in rice mill such as unhealthy environment, ricks of accident, lacks of recreation facilities etc and take appropriate strategies and policies to reduce the constraints of the workers in rice mill.

4.2 Impact of rice mill towards environmental, economic and health status of workers

Rice mill plays an important role towards environmental, economic and health status of the workers. The impact of rice mill towards environmental, economic and health status of the workers was measured on the basis of changes occurred in four selected dimensions named environmental changes, changes in income, changes in family assets and changes in health status of the respondents as a

result of their involvement with rice mill. In each case, the condition of the workers ‘before’ and ‘after’ involvement with rice mill was considered.

4.2.1 Salient features of the four dimensions on the impact of rice mill

The impact of rice mill towards environmental, economic, and health status of the workers can be assessed by comparing information about ‘before’ and ‘after’ condition on environmental changes, changes in income, changes in family assets and changes in health status of the workers. Salient features of this four selected dimensions on the impact of rice mill has been presented in Table 4.10.

Table 4.10 Salient features of the four dimensions on the impact of rice mill

Dimensions of impact of rice mill	Ranges (observed score)	Categories	Workers		Mean	SD
			No.	Percent		
Environmental changes (score)	2-12	No change (0)	0	0	6.09	2.41
		Low change (1-4)	26	28.89		
		Medium change (5-8)	49	54.44		
		High change (above 8)	15	16.67		
Changes in income (Thousand Tk.)	0-10	No change (0)	1	1.11	3.75	2.37
		Low change (1-3)	50	55.56		
		Medium change (4-6)	23	25.56		
		High change (above 6)	16	17.78		
Changes in family assets (Thousand Tk.)	0-200	No change (0)	20	22.22	57.53	54.45
		Low change (1-67)	38	42.22		
		Medium change (68-135)	23	25.56		
		High change (above 135)	9	10.00		
Changes in health status (score)	0-10	No change (0)	14	15.56	4.61	3.18
		Low change (1-3)	24	26.67		
		Medium change (4-6)	22	24.44		
		High change (above 6)	30	33.33		

Environmental changes: It was found at the Table 4.10 that score of environmental change ranged from 2 to 12 with an average of 6.09 and standard deviation 2.41. From the data it was revealed that the highest 54.44 percent workers faced medium environmental change at their working place after involvement with rice mill compared to low environmental change 28.89 percent and high environmental change 16.67 percent.

Environmental pollution faced by the workers in rice mill: Most of the workers faced some common environmental pollution in rice mill such as excessive dusts in the mill house (91.12%), bad smell from soaking water (81.12%), noise pollution due to belt movement (68.88%), inadequate facility for disposal of soaking water and others wastes (61.12%), drainage system pollute surrounding water (54.45%), black smoke produce from chimney (84.45%), unhygienic environment (80%), ash pollute surrounding air (75.55%), rice husk pollute the air (87.78%) and hamper the agriculture crop productivity (56.67%). Table 4.11 showed the number of workers and their percent who faced environmental pollution in rice mill.

Table 4.11 Environmental pollution faced by the workers in rice mill

Sl. No.	Issues	Yes		No	
		No. of Workers	Percent	No. of Workers	Percent
1	Excessive dusts in the mill house	82	91.12	8	8.88
2	Bad smell from soaking water	73	81.12	17	18.88
3	Noise pollution due to belt movement	62	68.88	28	31.12
4	Inadequate facility for disposal of soaking water and others wastes	55	61.12	35	38.88
5	Drainage system pollute surrounding water	49	54.45	41	45.55
6	Black smoke produce from chimney	76	84.45	14	15.55
7	Unhygienic environment	72	80	18	20
8	Ash pollute surrounding air	68	75.55	22	24.45
9	Rice husk pollute the air	79	87.78	11	12.22
10	Hamper the agriculture crop productivity	51	56.67	39	43.33

Drainage system

Ash beside crop field

Soaking water

Black smoke

Black smoke

Dust in husking room

Plate 2: Photographs shows the environmental pollution by rice mill

Changes in income: The score of changes in income at the Table 4.10 ranged from 0 to 10 with an average of 3.75 and standard deviation 2.37. Data shows that the highest (56.56 percent) workers had low changes in monthly income after involvement with rice mill compared to medium changes (25.56 percent) and high changes (17.78 percent). About 1.11 percent workers had no change in their monthly income after involvement with rice mill. From the data, it could be revealed that about 99 percent of the workers faced more or less positive changes in their monthly income but the changes were very low after involvement with rice mill.

Changes in family assets: The findings of changes in family assets of the workers after involvement with rice mill have been shown in Table 4.10. The data shows that the score of changes in family assets ranged from 0 to 200 with an average of 57.52 and standard deviation was 54.45. The Table 4.10 mentioned that the highest 42.22 percent workers could progress their family assets at low scale compared to 25.56 percent could progress at medium scale and 10 percent could progress at high scale after involvement with rice mill. About 22.22 percent of the workers could not progress their family assets after involvement with rice mill. From the data it can be said that about one-fourth of the workers could not progress their family assets and about half of the workers could progress their family assets at low scale after involvement with rice mill. The progression at high scale was negligible.

Changes in health status: The Table 4.10 shows the changes in health status which score ranged from 0 to 10 with an average of 4.61 and standard deviation was 3.18. The data mentioned that the highest (33.33 percent) workers faced high change in their health status compared to (26.67 percent) low change and (24.44 percent) medium change after involvement with rice mill. About 15.56 percent of the workers had no change in their health status after involvement with rice mill. From the discussion it could be revealed that about 85 percent workers faced negative changed in their health status after

involvement with rice mill where one-thirds of the workers faced high negative changed in their health status.

Health problems faced by the workers in rice mill: Most of the workers faced some common health problem in rice mill such as pain in body at night (94.44%), pain in leg, neck and others part (85.56%), chest become heavier (72.22%), lack of physical feeling on body and leg (76.67%), neck become rigid (64.45%), dust contamination (92.22%), weakness problem (82.22%), backache (86.67%), dry cough (74.44%), problem in respiratory system (90%). Table 4.12 showed the number of workers and their percent who faced different health problem in rice mill.

Table 4.12 Health problems faced by the workers in rice mill

Sl. No.	Issues	Yes		No	
		No. of Workers	Percent	No. of Workers	Percent
1	Pain in body at night	85	94.44	5	5.56
2	Pain in leg, neck and others part	77	85.56	13	14.44
3	Chest become heavier	65	72.22	25	27.78
4	Lack of physical feeling on body and leg	69	76.67	21	23.33
5	Neck become rigid	58	64.45	32	35.55
6	Dust contamination	83	92.22	7	7.78
7	Weakness problem	74	82.22	16	17.78
8	Backache	78	86.67	12	13.33
9	Dry cough	67	74.44	23	25.56
10	Problem in respiratory system	81	90	9	10

4.2.2 Impact of rice mill towards environmental, economic and health status of the workers

The changes in four dimensions (environmental changes, changes in income, changes in family assets and changes in health status) were categorized and scored. The score for changes in each dimension could be ranged from 0 to 3. Thus total score of changes in four dimensions could be ranged from 0 to 12. This total score indicated the score on impact of rice mill towards environmental, economic and health status of the workers. The score on impact of rice mill towards environmental, economic and health status of the rice mill workers could be ranged from 0 to 12. The observed score was 1 to 12 where the average was 6.39 and standard deviation was 2.87. Based on the observed scores the workers were categorized into three categories as low impact (1-4), medium impact (5-8) and high impact (above 8). Data in Table 4.11 shows the distribution of workers according to impact of rice mill towards environmental, economic and health status of the rice mill workers.

Table 4.13 Distribution of rice mill workers according to impact of rice mill towards environmental, economic and health status of the workers

Impact based categories (score)	Workers		Mean	Standard deviation
	No.	Percent		
Low impact (<5)	26	28.89	6.39	2.87
Medium Impact (5-8)	40	44.44		
High impact (>8)	24	26.67		
Total	90	100.00		

From the data presented in Table 4.11 it was revealed that the highest (44.44 percent) workers faced medium impact of rice mill towards environmental, economic and health status of workers compared to (28.89 percent) low impact and (26.67 percent) faced high impact of rice mill towards environmental, economic and health status of the workers at Pabna district.

4.3 Relationship between the workers' selected characteristics and the impact of rice mill on environmental, economic and health status of workers

This section deals with the relationships of the nine selected characteristics of the workers with impact of rice mill towards environmental, economic and health status of rice mill workers. The nine characteristics of the workers were: age, level of education, family size, types of employment contracts of workers, experience as rice mill workers, professional training experience, knowledge on rice mill, attitude towards rice mill and constraints faced by workers in rice mill.

The summary of the results of the correlation co-efficient between the nine selected characteristics of the workers and impact of rice mill towards environmental, economic and health status of rice mill workers has been shown in Table 4.12. The correlation matrix is presented in Appendix II.

Table 4.14 Correlation co-efficient between the nine characteristics of the workers and impact of rice mill on environmental, economic and health status of workers

Dependent Variable	Independent Variables	Computed value 'r'	Tabulated value 'r'	
			0.05	0.01
Impact of rice mill towards environmental, economic and health status of workers	Age	0.881**	0.205	0.267
	Level of education	-0.109NS		
	Family size	0.816**		
	Types of employment contracts	0.501**		
	Experience as rice mill worker	0.866**		
	Professional training experience	0.394**		
	Knowledge on rice mill	0.740**		
	Attitude towards rice mill	-0.182NS		
	Constrains faced by workers in rice mill	0.348**		

NS = Non significant

* = Significant at 5 percent (0.05) level

** = Significant at 1 percent (0.01) level

4.3.1 Relationship between age of the workers and the impact of rice mill

The correlation co-efficient between age of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis “there is no relationship between age of the workers and the impact of rice mill”. The calculated value of correlation co-efficient (r) between these two variables was 0.881 as shown in table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of ‘r’ (0.881) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

From the findings, the researcher concluded that age of the workers had a positive and highly significant relationship with the impact of rice mill. This means that age was related in changing the environmental, economic and health status of rice mill workers.

4.3.2 Relationship between level of education of the workers and the impact of rice mill

The correlation co-efficient between level of education of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis “there is no relationship between level of education of the workers and the impact of rice mill”. The calculated value of correlation co-efficient (r) between these two variables was -0.109 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a negative trend.

- The computed value of ‘r’ (-0.109) was smaller than the tabulated value (r = 0. 0.205) with 88 degrees of freedom at 0.05 level of significance.
- The concerned null hypothesis was accepted.

So, the researcher revealed that the level of education of the workers had a negative, but non-significant relationship with the impact of rice mill towards environmental, economic and health status of rice mill workers.

4.3.3 Relationship between family size of the workers and the impact of rice mill

The correlation co-efficient between family size of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis “there is no relationship between family size of the workers and the impact of rice mill”. The calculated value of correlation co-efficient (r) between these two variables was 0.816 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of ‘r’ (0.816) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

So, the finding showed that family size of the workers had a positive and highly significant relationship with the impact of rice mill. This means that family size of the workers was related in changing the environmental, economic and health status of rice mill workers.

4.3.4 Relationship between types of employment contracts of the workers and the impact of rice mill

The correlation co-efficient between types of employment contracts of the workers and the impact of rice mill towards environmental, economic and

health status of the rice mill workers was examined by testing the following null hypothesis “there is no relationship between types of employment contracts of the workers and the impact of rice mill”. The calculated value of correlation co-efficient (r) between these two variables was 0.501 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of ‘r’ (0.501) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

On the basis of above finding, it was revealed that types of employment contracts of the workers had a positive and highly significant relationship with the impact of rice mill. This means that types of employment contracts of the workers was related in changing the environmental, economic and health status of rice mill workers.

4.3.5 Relationship between experience as rice mill worker and the impact of rice mill

The correlation co-efficient between experience as rice mill worker and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis “there is no relationship between experience as rice mill worker and the impact of rice mill”. The calculated value of correlation co-efficient (r) between these two variables was 0.866 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of ‘r’ (0.866) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

From the above finding, it was concluded that experience as rice mill worker had a positive and highly significant relationship with the impact of rice mill. This means that experience as rice mill worker was related in changing the environmental, economic and health status of rice mill workers.

4.3.6 Relationship between professional training experience of the workers and the impact of rice mill

The correlation co-efficient between professional training experience of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis "there is no relationship between professional training experience of the workers and the impact of rice mill". The calculated value of correlation co-efficient (r) between these two variables was 0.394 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of 'r' (0.394) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

So, from the above finding, it was revealed that professional training experience of the workers had a positive and highly significant relationship with the impact of rice mill. This means that professional training experience of the workers was related in changing the environmental, economic and health status of rice mill workers.

4.3.7 Relationship between knowledge on rice mill of the workers and the impact of rice mill

The correlation co-efficient between knowledge on rice mill of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis

"there is no relationship between knowledge on rice mill of the workers and the impact of rice mill". The calculated value of correlation co-efficient (r) between these two variables was 0.740 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of 'r' (0.740) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

The above finding showed that knowledge on rice mill of the workers had a positive and highly significant relationship with the impact of rice mill. This means that knowledge on rice mill of the workers was related in changing the environmental, economic and health status of rice mill workers.

4.3.8 Relationship between attitude towards rice mill of the workers and the impact of rice mill

The correlation co-efficient between attitude towards rice mill of the workers and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis "there is no relationship between attitude towards rice mill of the workers and the impact of rice mill". The calculated value of correlation co-efficient (r) between these two variables was -0.182 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a negative trend.
- The computed value of 'r' (-0.182) was smaller than the tabulated value (r = 0. 0.205) with 88 degrees of freedom at 0.05 level of significance.
- The concerned null hypothesis was accepted.

So, the researcher revealed that attitude towards rice mill of the workers had a negative, but non-significant relationship with the impact of rice mill towards environmental, economic and health status of rice mill workers.

4.3.9 Relationship between constraints faced by workers in rice mill and the impact of rice mill

The correlation co-efficient between constraints faced by workers in rice mill and the impact of rice mill towards environmental, economic and health status of the rice mill workers was examined by testing the following null hypothesis "there is no relationship between constraints faced by workers in rice mill and the impact of rice mill". The calculated value of correlation co-efficient (r) between these two variables was 0.348 as shown in Table 4.12 which led to the following observation:

- The relationship observed between this two concerned variables showed a positive trend.
- The computed value of 'r' (0.348) was larger than the tabulated value (r = 0.267) with 88 degrees of freedom at 0.01 level of significance.
- The concerned null hypothesis was rejected.

From the above finding it was concluded that constraints faced by workers in rice mill had a positive and highly significant relationship with the impact of rice mill. This means that constraints faced by workers in rice mill were related in changing the environmental, economic and health status of rice mill workers.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study was conducted at two upazilas of Pabna district to observe the impact of rice mill towards environmental, economic and health status of the workers. Panda sadar and Santhia upazila under Pabna district were the locales of the study. The selected characteristics of the workers were age, level of education, family size, types of employment contracts, experience as workers, professional training experience, knowledge on rice mill, attitude towards rice mill, constraints faced by workers in rice mill.

In total 30 rice mills were selected randomly from the two upazilas. From each rice mill 3 workers were selected randomly to collect data. Total 90 workers were selected as the sample of the study. The data were collected from 1 August, 2017 to 25 October, 2017 using a pre-tested interview schedule. The collected data were then compiled, tabulated and analyzed in accordance with the objectives of the study. The summery of the finding were-

Age of the respondents ranged from 19 to 48 years where the average age was 29.58 years. The highest proportion (58.89 percent) of the workers was in the young aged category (<30) where 38.89 percent was in middle aged category (30-45) and only 2.2 percent of the workers was in the old aged category (>45).

The education score of the respondents ranged from 0 to 10 where the average was 1.56. Majority of the workers (44.44 percent) were illiterate where 34.44 percent had primary education, 13.33 percent can sign only and 7.78 percent had secondary education.

Family size of the respondent workers ranged from 2 to 9 with an average of 4.76. The highest proportion (73.33 percent) of the workers belonged to the medium family size category where 18.89 percent of the workers belonged to

large family size category and a small proportion (7.78 percent) of the workers belonged to small family size category.

According to the types of employment contracts the highest proportion (48.89 percent) of the workers belonged to the seasonal workers category where 26.67 percent of the workers belonged to the contract workers category and 24.44 percent of workers belonged to the permanent workers category.

The scores of experience as rice mill worker of the respondents ranged from 1 to 20 with an average of 7.01. The highest proportion (65.56 percent) was in low experience category, where 21.11 percent was in medium experience category and 13.33 percent was in high experience category.

The highest proportion (77.78 percent) of workers had no training experience where 10 percent was in low training experience category, 7.78 percent was in medium training experience category and 4.44 percent was in high training experience category.

Knowledge on rice mill scores of the respondent ranged from 7 to 20 with an average 13.58. The moderate knowledge category (12-16) constitute the highest proportion (38.89 percent) where 31.11 percent was in poor knowledge category (7-11), and 30 percent was in adequate knowledge category (>16).

Observed score of attitude towards rice mill of the rice mill workers ranged from 8 to 28 where the average was 15.31. About 48.89 percent of the workers had low favorable attitude towards rice mills (8-14) where 41.11 percent had medium favorable attitude towards rice mills (15-21) and 10 percent had high favorable attitude towards rice mills (>21).

The observed score of constraints faced by workers in rice mill ranged from 8 to 22 and the average was 15.76. The highest proportion (40 percent) of the respondents felt in high constraints faced category (>17) where 37.78 percent was in medium constraints faced category (13-17) and 22.22 percent was in low constraints faced category (8-12).

About 54.44 percent workers faced medium negative environmental change, 28.89 percent faced low negative environmental change and 16.67 percent faced high negative environmental change at their working place after involvement with rice mill.

In case of monthly income 56.56 percent workers had low positive changes, 25.56 percent had medium changes, 17.78 percent had high positive changes and 1.11 percent workers had no change after involvement with rice mill.

In case of family assets 42.22 percent workers could improve at low scale, 25.56 percent could improve at medium scale, 10 percent could improve at high scale and 22.22 percent of the workers could not improve after involvement with rice mill.

About 33.33 percent of workers faced high negative change in their health status, 26.67 percent faced low negative change, 24.44 percent faced medium negative change and 15.56 percent of the workers faced no change in their health status after involvement with rice mill.

The highest (44.44 percent) of the workers faced medium impact of rice mill on environmental, economic and health status where 28.89 percent faced low and 26.67 percent faced high impact of rice mill on environmental, economic and health status after involvement with rice mill.

Correlation co-efficient analysis indicated that age, family size, types of employment contracts of workers, experience as rice mill workers, professional training experience, knowledge on rice mill, constraints faced by workers in rice mill had a positive and highly significant relationship with the impact of rice mill towards environmental, economic and health status of the mill workers of Pabna sadar and Santhia upazilas under Pabna district.

However, level of education and attitude towards rice mill had no significant relationship with the impact of rice mill towards environmental, economic and health status of the mill workers.

5.2 Conclusions

On the basis of the findings of the study, the logical interpretation of their meaning and other relevant facts enabled the researcher to draw the following conclusions:

I. Most of the workers were young, had no institutional education and professional training, and had low experience and moderate knowledge on rice mill.

II. Majority of them worked as a contract workers and faced high constraints in rice mill.

III. The workers faced environmental pollution at their working place after involvement with rice mill.

IV. Economic progression of the workers was very low at rice mill.

V. Most of the workers affect health problem in rice mill.

5.3 Recommendations

On the basis of the study the following recommendations were made by the researcher:

I. All rice mills should have waste dumping arrangement, good drainage facilities and chimney of more than 12.2 m (40 feet) to decrease environmental pollution.

II. Workers should be given service and social security's under the employment and wage rules for the industries.

III. The workers should use mask or some other things like a thin piece of cloth to their nose and mouth to protect them from dusts.

IV. Government rules and laws should be abided by the rice mill owners to ensure safety of the workers, to improve the working environment and to reduce health hazards.

CHAPTER VI

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APPENDICES

Appendix I: English version of the interview schedule

Department Of Agroforestry and Environmental Science
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On

"**Impact of Rice Mill towards Environmental, Economic and Health Status of Workers in Pabna District"**

Serial no: …….

Name of the worker: …….. …….

Village……Union……

Upazila……..……. District..……

Name of the mill: ….……

Please answer the following questions (put tick mark on the appropriate place where applicable)

1. Age

How old are you? …… years.

2. Level of education

Please mention your level of education

a) Can not read and write .....

b) Can sign only .....……...

c) I have passed class .....

d) I have……. Class equivalent non formal education

3. Family Size: What is the number of your family member(s)……..…person(s)

4**. Types of employment contracts:**

a) Permanent b) Seasonal c) Contract

5. Experience as rice mill worker: ..... year(s)

6. Professional training experience: Have you received any training related as rice mill worker yet?

Yes……. No…….

If yes please mention the following information

Sl. No.	**Subject matter of training**	**Sponsoring organization**	**Duration (in days)**

7. Knowledge on rice mill: Please answer the following questions regarding rice mill

Sl. No.	**Questions**	**Score**	
		Assigned	Obtained
1	Mention two environmental problem occurred by rice mill	2	
2	Mention two health hazards that occurred due to working at rice mill	2	
3	Mention two common economic problems that faced by rice mill workers	2	
4	What kind of the housing materials is used in developing mill structures?	2	
5	What kind of fuel used in running the mill machineries?	2	

Sl. No.	Questions	Score	
		Assigned	Obtained
6	What are the water source(s) of the mill?	2	
7	How the mill used to develop the drainage system?	2	
8	Mention the chimney condition	2	
9	What are the appropriate/proper places of throughput the ash & waste	2	
10	How rice husk is utilized?	2	

8. Attitude towards rice mill: Please express your attitude towards rice mill in the following aspects-

Sl. No.	Statement	Nature of Opinion				
		SA	**A**	**U**	**D**	**SD**
1 (+)	Rice mill give me employment opportunity					
2 (+)	Rice mill create employment opportunity for rural woman					
3 (+)	Improve socio-economic condition of the workers					
4 (+)	Improve family purchases power					
5 (-)	The salary is not sufficient					
6 (-)	Have no job security					
7 (-)	Do not have any medicinal facilities					
8 (-)	No work no pay rule					

9. Constraints faced by workers in rice mill: Please mention the extent of constraints you faced during mill work-

Sl. No.	Constraints	Extent of constraints			
		Not at all	Low	Medium	High
1	Unhealthy environment				
2	Poor aeration facility in mill house				
3	Ricks of accident				
4	Poor sanitation facility				
5	Unavailable shed for taking temporary rest				
6	It is hard to be a member of trade union				
7	Lack of recreation facilities				
8	Salary range based on gender discrimination				

10. Impact of rice mill: Please give the following information on environmental, economic and health effects of rice mill

Environmental changes: Please mention the level of pollution at your working place against the following issues you faced before and after involvement with rice mill

SL. No	Issues	Before involvement				After involvement			
		No	Slight	Moderate	Severe	N	Sl	M	S
1	Air pollution								
2	Water pollution								
3	Sound pollution								
4	Dust contamination								

Environmental pollution faced by the workers in rice mill: Please mention the environmental pollution you face in rice mill

Sl. No.	Issues	Yes	No
1	Excessive dusts in the mill house		
2	Bad smell from soaking water		
3	Noise pollution due to belt movement		
4	Inadequate facility for disposal of soaking water and others wastes		
5	Drainage system pollute surrounding water		
6	Black smoke produce from chimney		
7	Unhygienic environment		
8	Ash pollute surrounding air		
9	Rice husk pollute the air		
10	Hamper the agriculture crop productivity		

Changes in income: Please mention your monthly income from the following sources before and after involvement with rice mill

Sl. No.	Source of income	Amount (in Tk) Before involvement	Amount (in Tk) After involvement
1	Rice mill		
2	Agriculture/Livestock/ Poultry/ Fisheries		
3	Business		
4	Day labour		
5	Others		
	Total		

Changes in family assets: Please mention quantity of your family assets before and after involvement with rice mill

Sl. No.	Item	Before involvement		After involvement	
		No.	Price	No.	Price
1	Homestead area				
2	Farmland				
3	Ghor				
4	Cow				
5	Goat				
6	Hen/Duck				
7	Rickshaw				
8	By-cycle				
9	Television				
10	Others……				
	Total				

Changes in health status: Please mention the level of affect against the following issues you faced before and after involvement with rice mill

Sl. No.	Issues	Before involvement				After involvement			
		No	Rarely	Occasionally	Often	N	R	Oc.	Of.
1	Body weight loss								
2	Eye irritation								
3	Skin disease								
4	Problems in respiratory system								

Health problems faced by the workers in rice mill: Please mention the health related problems you face in rice mill

Sl. No.	Issues	Yes	No
1	Pain in body at night		
2	Pain in leg, neck and others part		
3	Chest become heavier		
4	Lack of Physical feeling on body and leg		
5	Neck become rigid		
6	Dust contamination		
7	Weakness problem		
8	Backache		
9	Dry cough		
10	Problem in respiratory system		

Thank you for your co-operation

Date:…… …… Signature:……

Appendix II Correlation matrix of the variable

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
X_1	-									
X_2	.881**	-								
X_3	-.109	-.051	-							
X_4	.816**	.879**	-.067	-						
X_5	.866**	.946**	-.175	.868**	-					
X_6	.501**	.540**	.233*	.586**	.449**	-				
X_7	.394**	.498**	.493**	.448**	.431**	.398**	-			
X_8	.740**	.736**	.251*	.696**	.692**	.545**	.518**	-		
X_9	-.182	-.070	.503**	-.121	-.125	.052	.248*	-.002	-	
X_{10}	.348**	.274**	-.509**	.256*	.331**	-.195	-.248*	.181	-.348**	-

** Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

X_1= Impact of rice mill
X_2= Age
X_3= Level of education
X_4= Family size
X_5= Experience as rice mill worker
X_6= Types of employment contracts
X_7= Professional training experience
X_8= Knowledge on rice mill
X_9= Attitude towards rice mill
X_{10}= Constrains faced by workers in rice mill