

USE OF MECHANIZATION BY THE RICE GROWERS

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This is to certify that thesis entitled, “USE OF MECHANIZATYION BY THE RICE GROWERS” submitted to the Department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE IN AGRICULTURAL EXTENSION AND INFORMATION SYSTEM, embodies the result of a piece of bona fide research work carried out by Registration No. 19-10270 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

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

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DEDICATED

TO

MY BELOVED

FAMILY

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The Author

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ACRONYMS AND ABBREVIATIONS

BAU	Bangladesh Agricultural University
BADC	Bangladesh Agricultural Development Corporation
BARI	Bangladesh Agricultural Research Institute
BBS	Bangladesh Bureau of Statistics
BRRI	Bangladesh Rice Research Institute
DAE	Department of Agricultural Extension
<i>et al.</i>	All others
FAO	Food and Agriculture Organization
GO	Government Organization
NGO	Non- governmental Organization
SO	Scientific Officer
SPSS	Statistical Package for Social Science
SAAO	Sub-Assistant Agriculture Officer
SAU	Sher-E-Bangla Agricultural University
USDA	United States Department of Agriculture
MoA	Ministry of Agriculture

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ABSTRACT

Mechanization is a process through which agricultural activities can be improved and desired crop production can be achieved. The objectives of this study were to assess the use of mechanization by the farmers, to describe the selected characteristics of the farmers and to identify the contributory factors on use of mechanization. The selected characteristics were age, education, farm size, family size, annual family income, no of plots, no of crops grown, time spend in farms and extension media contact. The study was undertaken in Rangpur sadar upazila under Rangpur district. Validated and well-structured interview schedule was used to collect data. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the selected independent variables. Regression analysis was used in order to explore the contributing relationships between the concerned variables. The findings of the study showed that, 38.5% and 61.5% had low and medium level use of mechanization. The findings also implies that annual family income, time spend in farm and extension media contact had significant positive relationship with their use of mechanization. The findings may help to formulate better policies towards increase the use of machineries in rice cultivation.

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Every year almost 0.20 million people are being added to the total population whereas the estimated annual shrinkage of agricultural land is about 0.08 million hectares due to various non-agricultural activities like constructions of houses, offices, roads, mills, factories etc. (BRRI, 2009). Farm mechanization for crop production has become an important issue for agricultural production in the country. To feed her 180 million people from 8.2 million hectares of cultivable land is difficult. The land preparation was done almost 70% by machine (Farouk *et al*, 2007) which has now been raised to about 80%. Now, the country is self-sufficiency in cereal production. This is due to mechanized tillage and irrigation development and partial mechanization in other agricultural operations as well as development in other crop production sectors (BADC, 2008). The government has already given due importance to agricultural mechanization in the National Agricultural Policy. In the Policy, it is included that “The Government will encourage production and manufacturing of agricultural machinery adaptive to our socio-economic context. Now, the use of tractor is increasing day by day and power tillers and tractors do about 80 percent of the land preparation. The next operation that is being rapidly mechanized is threshing. Power operated multicrop threshers and shellers are widely using by the farmers for threshing paddy, wheat and maize. It is expected that the introduction of farm machinery through project will enhance agricultural mechanization program in Bangladesh.

Paddy is the main staple crop of Bangladesh accounting for 74.85% of total cropped area and 95% of cereal production (BBS, 2017). Since independence in 1971, the production of paddy has increased over three folds to 55.5 million tons compared to slightly more than double the population of 160 million and has attained self-sufficiency against shrinking of agricultural land by 0.5% per

year (FAO, [2014](#)). However, by 2030, the population of Bangladesh would be about 200 million and by 2050 the population would be about 222.5 million that would need a doubling of paddy production in Bangladesh (Alam and Khan, [2017](#)). To achieve this target, there is no other better option than to increase production per unit of land as well as cropping intensity. On the other hand, the current labor force employed in on-farm agricultural activities is about 43% would have been reduced to about 36.1% by 2020 (FAO, [2017](#)). That poses a great challenge to Bangladesh agriculture to produce almost double the present paddy production with decreasing number of labor force. To face the challenge of feeding growing population with shrinking on-farm labor force, appropriate scale agricultural mechanization would be one of the main options among many innovations and adaptations of technologies and strategies.

Mechanization is a process through which agricultural activities can be improved and optimum crop production can be achieved. Tools, implements and powered machinery are essential and major inputs to agriculture. The term “Farm Mechanization” is generally used as an overall description of the application of these inputs in crop cultivation. Different mechanical inputs currently practiced in different farming activities in Bangladesh. The cropping intensity and production of food crops has recently been increased significantly due to adoption of mechanized tillage, irrigation, and spraying operations (Sarker, 2000).

Bangladesh agriculture is currently faced with range of challenges like ageing farmers, feminization of agriculture, farm labor shortage, shrinking land, degradation of natural resources, soaring prices, and vulnerability to climate change. In the face of these challenges, we need knowledge- intensive green revolution that combines advances in science and agricultural engineering with the unique traditional knowledge to make agriculture more environmentally resilient (ESCAP Social and Economic Survey, 2016). To feed ever-increasing population in our country, it is therefore essential for production to keep up with increasing demand in a sustainable way.

However, additional increases in agricultural production are difficult to achieve due to resource constraints, especially on land and water. While gains from increased area cultivated are hardly achievable, over utilization of inputs (such as fertilizers and pesticides) is already undermining soil quality and fertility. Thus, improved agricultural technology holds the key to increasing food production. Technology-driven agricultural growth can contribute significantly to growth in national income and poverty alleviation. Among many agricultural inputs, agricultural machinery plays an important role in promoting crop production to a targeted level to sustain self-sufficiency in cereal production in the country, which has increased more than three folds over the last two decades to 38.50 million tons (Ahmed *et al.*, 2016). Farm mechanization has seen a rather slow progress over the years. The demand of important agricultural equipment like tractors, power tillers, combine harvesters, irrigation pump sets, diesel engines, has shown an increasing trend. Rangpur is one of the important districts regarding rice production. Farmers of this district use various machines to cultivate rice. However, what extent they use machines is not studied. Therefore, a study entitled use of mechanization by the rice growers is necessary to conduct.

1.2 Statement of the Problem

Rice and wheat are the most important and staple food of Bangladesh. At present, rice and wheat production is about 30.52 million tons over an area of 11.73 million hectares. More than 80% of the cultivable land is under rice and wheat cultivation (Talukder, 2013). Almost all amounts of these crops are harvested manually by sickle, which is laborious, time consuming and costly. Harvesting and threshing are the most important operations in the entire range of field operations, which are laborious involving human drudgery and requires about 150-200 man-h/ha for harvesting of paddy alone (Salassi and Deliberto, 2010; Veerangouda *et al.*, 2010). To reduce the harvesting loss and cost, timely harvesting of paddy and wheat is very important. A well designed,

combine harvester can play an important role in harvesting of paddy and wheat in time, efficiently and in less cost. Considering the above matters, adoption of mechanical harvesting practices like using reaper and combine harvester is urgently needed to reduce the human drudgery, labor involvement, harvesting losses and increase the cropping intensity, crop productivity, economic emancipation. Also, mechanical harvesting of paddy could be a great opportunity to intensify the percentage of GDP in Bangladesh which will assist to strengthen the food security in northern area of Bangladesh.

Based on the above discussion, this study was intended to explore the following questions:

- i. What is the use of machinery by the rice farmers?
- ii. What are the farmers' characteristics who use of machineries in rice cultivation?
- iii. What are the contributory factors on the use of mechanization?

1.3 Objectives of the Study

Considering the importance of agricultural mechanization, the following objectives were taken in order to give proper direction in the study:

1. To assess the use of mechanization by the rice farmers
2. To describe the selected characteristics of rice farmers
3. To identify the contributory factors on the use of mechanization

1.4 Justification and Scope of the Study

Farmers have different views about the use of mechanization, which also influence farmer's socio economic status of livelihood both positively and negatively. Moreover, the use to which agricultural mechanization has influenced farm production depends on the improvements in farm level machinery usage and farming efficiency. Mechanization of farm is needed from the view point of the profitability of agriculture. Therefore, the contribution of farm mechanization on improving farm level efficiency and production has yet to be analyzed in the Rangpur District. Most importantly,

the farmers are getting the realization that to save time and improve productivity and to do profitable agriculture, there is no other better option than to go for mechanized agriculture. In this context, the present study have been taken. The findings of the study may help better policies to increase agricultural mechanization.

1.5 Assumptions of the Study

The researcher made the following assumptions while undertaking the study.

- I. The researcher who has acted as interviewer was well adjusted to the social and cultural environment of the study area. Hence, the data collected by the researcher from the respondents furnished their correct opinions.
- II. The respondents were capable of furnishing proper responses to the questions included in the interview schedule.
- III. Views and opinions given by the respondents included in the sample of the study were the representative views and opinions of the whole population of the study area.
- IV. The responses furnished by the respondents were reliable and valid. They expressed the truth about their convictions and awareness.
- V. The information sought reveals the real situation to satisfy the objectives of the study.
- VI. The items, questions and scales included in the questionnaire were relevant and appropriate.
- VII. Data were normally and independently distributed.
- VIII. The sampling procedures followed for this study, the analysis of data and interpretations etc. were free from all biases.

1.6 Limitations of the Study

In order to make the study manageable and meaningful from the point of view of research, it was necessary to state the limitations of this study, which are given as follows:

1. The study was confined to Rangpur districts of Rangpur division.
2. The characteristics of the respondents in the study area were many and varied. However, only nine characteristics were selected for investigation in this study as stated in the objectives.
3. The researcher relied on the data furnished by the farmers from their memory during interview.
4. For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target population. However, the researcher tried to overcome the problem as far as possible with sufficient tact and skill.

1.7 Definition of Important Terms

For clarity of understanding a number of key terms used through the study are defined below:

Agricultural Mechanization: Agricultural mechanization today has a very broad meaning. This broad meaning includes production, distribution and utilization of a variety of tools, machinery and equipment for the development of agricultural land, planting, harvesting and primary processing.

Age: Age of a respondent defined as the span of his/her life and is measured by the number of years from his/her birth to the time of interviewing.

Education: Education referred to the development of desirable change in knowledge, skill, attitude and ability in an individual through reading, writing, working, observing and other related activities. It was measured on the basis of classes a farmer had passed from a formal educational institution.

Family size: Family size referred to actual number of permanent members in a subject's family who live in a fixed dwelling unit and eat from the same cooking arrangement.

Farm size: Family size referred to the cultivated area either owned by the farmer or obtained from others on barga system, the area being estimated in terms of full benefit and half benefit to the farmer respectively. The self-cultivated owned land and cultivated area taken as lease or mortgage from others was recognized as full benefit. In this study farm size was measured in hectare.

Annual family income: Annual family income referred to the total annual earnings of all the family members of a respondent from agriculture, livestock and fisheries and other accessible resources.

Number of plots: Number of plots are mentioned how many plots did they have. This number of plots from including homestead, own land under own cultivation, land taken from others as barga, land taken from others as lease.

Number of crops grown: Number of crops grown referred to how many crops did they cultivate on a year. This number of crops from including homestead, own land under own cultivation, land taken from others as barga, land taken from others as lease.

Time spend in farms: Time spend in farms referred how much time did they spend in their farm hour per week. Proper utilization and better outcome from the farm spending time is significant. Management of farm in a daily basis can bring better result for the farmers to be self-sufficient.

Extension media contact: Extension media contact referred to one's becoming accessible to the influence of extension contact through different extension teaching methods or refers to the individual exposure to or contact with information sources.

CHAPTER II

REVIEW OF LITERATURE

Review of literature provides the clear and concise direction of the researcher for conducting the experiment. With aim to get clear and concise direction, this chapter deals with the review of past research works that relates to this investigation directly or indirectly. The reviews are conveniently presented based on the major objectives of the study. This study was mainly concerned with use of mechanization by the rice growers. The researcher intensively searched internet, websites, available books, journals and printed materials from different sources of home and abroad.

However, the literatures have been organized into following four sections to set the context of the study :

First section: Agricultural mechanization in Bangladesh

Second section: Farm use of machineries

Third section: Relationship between farmers characteristics and use of machineries

Fourth section: The Conceptual Framework of the Study

2.1 Agricultural mechanization in Bangladesh

Mechanization may be defined as the process of injecting power and machinery between man and materials in a production system (Khalequzzaman and Karim, 2007). Agricultural mechanization is an art and scientific application of agricultural machinery, tool and implement for increasing farm production and cropping intensity. The irrigation policy in Bangladesh in the 20th century originally focused on large-scale canal systems and Deep Tube Wells (DTW) (Bigg & Justice, 2015).

At present, 80% of total land is prepared by power tiller and 18% by tractor or 2WTs and/or 4WTs (Islam, 2018 and Kienzle *et. al.*, 2013). However, mechanization of other agricultural field operations is still very low in Bangladesh and thus, adoption of other agricultural equipment such as bed makers, seeders, weeders, harvesters and winnowers is not common (Islam, 2009). From the onset mechanization in Bangladesh spurred farm machinery hiring services. In the 1960s, BADC established a rental operation system of LLP at a 75% subsidy scheme to farmers. Due to the prevailing small landholdings, many farmers who own agricultural machines opt for hiring out these machines in addition to operating on their own land (Bigg & Justice, 2015; Kienzle *et. al.*, 2013). This, on the one hand, optimizes the use of machines and on the other hand, increases farmers access to these machines. Through custom hiring services, even the poor can afford to mechanize farming (Alam *et. al.*, 2004). This has been reported across South Asia and for different implements – including 4 wt drawn zero-till seed drills (Erenstein & Farooq, 2009), laser-land leveling (Aryal *et. al.*, 2015) and 2wt (Mottaleb *et. al.*, 2017). Hence the existence of rental markets can facilitate rapid adoption of lumpy technology and make technology accessible to even poor and marginal farmers who otherwise could not invest in or access it.

Bangladesh agriculture is now one of the most mechanized agricultural economies in south Asia (Baudron *et. al.*, 2015; Islam, 2009). This was facilitated by a focus on small-scale machinery more adapted to its socio-economic context can be it through cheap imports or local production and manufacturing. Table 01 presents the existing scenario of farm machinery available in Bangladesh.

Table 2.1: Present status of farm machinery in Bangladesh

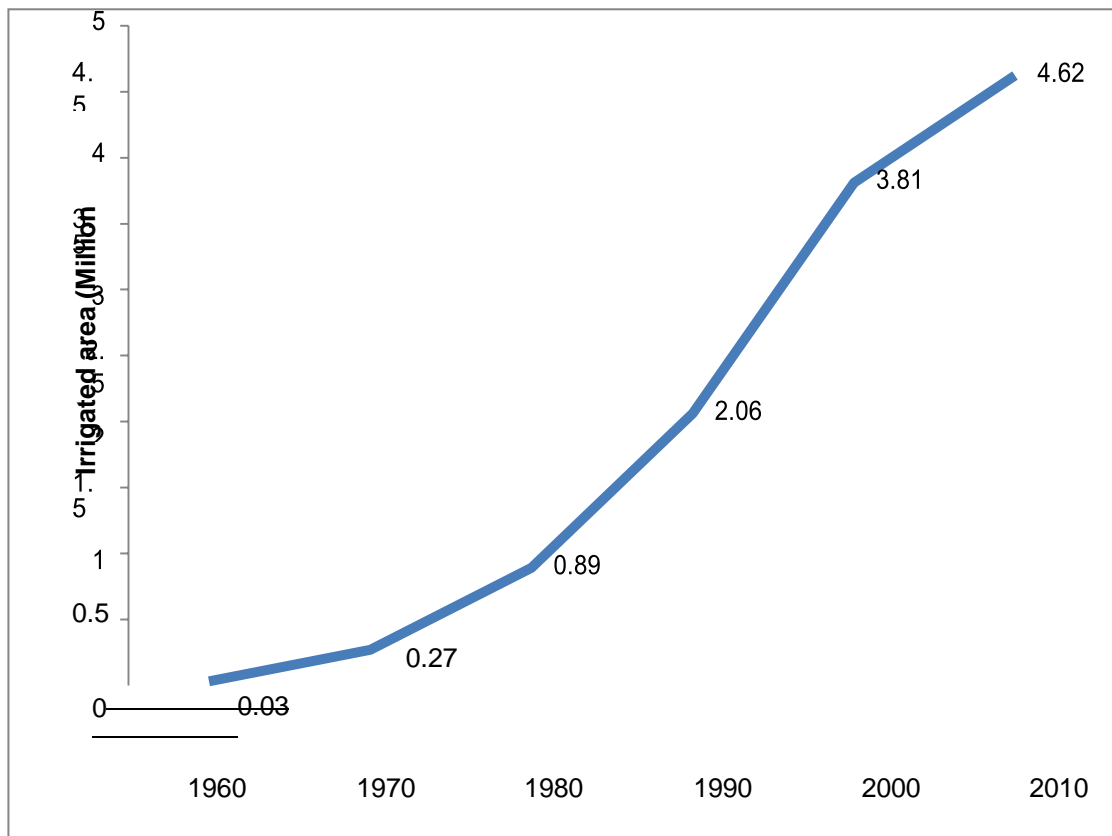
Name of machine	Quantity, no.	Source
Diesel engine	25,00,000	Anon. (2016)
Power tiller	7,00,000	Ahmed, 2014; <i>Tiwari et. al.</i> , 2017
Tractor	60,000	Ahmed, 2014; Kabir, 2014
Seeder	5,000	Wohab, 2012
Rice transplanter	300	Islam, 2016
Weeder	2,50,000	Ahmed, 2014; <i>Tiwari et.</i> <i>al.</i> , 2017
Granular urea applicator	800	Ahmed, 2014
Prilled urea applicator	18,000	Anon. (2016)
Sprayer	13,00,000	Ahmed, 2014
Reaper	500	Ahmed, 2014; <i>Tiwari et.</i> <i>al.</i> , 2017
Combine harvester	130	Ahmed, 2014; Kabir, 2014
Open drum thresher	1,50,000	Anon. (2016), Alam, M. (2016).
Closed drum thresher	2,20,000	Anon. (2016), Alam, M. (2016).
Winnower	3000	Ahmed, 2014; <i>Tiwari et. al.</i> , 2017

Power driven pump	1,67,175	Anon. (2016)
Deep tube well	35,566	Anon. (2016)
Shallow tube well	15,48,711	Anon. (2016)

In 2000, the land preparation was done almost 50% by machine which has now been raised to about 80% (Farouk *et al.*, 2015). But bed makers, seeders, weeders, harvesters and winnowers- all have limited uses. However, threshing of maize is accomplished almost 100% by power and hand maize shellers and those of paddy and wheat, over 80%, by both power and manual threshers. Efforts are being continued by the researchers to improve the machine performance.

In 2007-2008, the irrigated area coverage by different irrigation equipment was about 61% of the net cultivable area (8.29 million hectares). During the period, the associated mechanized equipment were 1339198 which were 10.13% higher than those of the previous year. Though irrigation is done in a substantial area, the efficiency of irrigation schemes is very low (about 25-40% for rice and 50-55% for non- rice crops). About 80% irrigation is done by ground water and the rest by surface water (BADC, 2010). In Fig. 1.1 is shown the irrigation development of the country.

Figure 1.1: Irrigated area in different year



Source: BADC, 2010

In addition, limited efforts to utilize solar energy for supply of household electricity for lighting and household water supply in the rural areas have been taken by NGOs. The possibility to use solar energy for pumping water for irrigation and use of vermi- compost for crop production. About 60,000 bio-gas plants are in operation to produce gas and fertilizers.

Mechanization is an important tool for profitable and competitive agriculture. The need for mechanization is increasing fast with the decrease of draft power. Without mechanization it will not be possible to maintain multiple cropping patterns, which need quick land preparation, planting, weeding, harvesting, processing etc. (MoA, 2013). It is, therefore, necessary and of course, logical to undertake a research.

2.2 Farmers use of machineries

Wang zhikai (2003) reported that mechanization for land preparation, irrigation and field management is fairly high, but is rather than low for rice planting and harvesting.

Darshan *et al.* (2005) stated that adoption of mechanization ranged between low (52.0%) to medium (48.0%).

Shakirullah and Ramzan (2006) in their study on use of adoption of modern agricultural machinery in Pakistan concluded that 11.25 percent respondents owned tractors. Among the tractor owners, 88.88 percent also owned threshers, 44.44 percent owned ridgers and 100 per cent owned chisel ploughs and blades.

Mansoor *et al.* (2007) reported that 10 percent of the respondent farmers had their own tractor and the remaining 90 percent hired the tractors for ploughing and threshing and 62.5 percent for transportation purposes. For farm operations cultivator was used by 53.75 percent of the sampled farmers, mould board plough by 41.25 percent, disk-plough by 32.5 percent, harrow by 77.5 percent, rotavator by 52.5 percent, and leveling blade by 65 percent.

Singh *et al.* (2007) reported that 22.8 percent of farm women worked with wheel hoes whereas 14.2 percent worked with threshers, 8.2 percent with groundnut decorticators, 5.1 percent with hand Maize Sheller, 2.4 percent with seed treatment drums, 1.2 percent with cleaner graders and 0.7 percent with tractors.

Kumar *et al.* (2008) found that majority (54.00%) of farmers used cultivators and 50.00 percent used disc harrows. For farm operations cultivator was used by 52.78 percent of the sampled farmers, mould board plough by 39.5percent, disk-plough by 33.3percent.

Tekwa *et al.* (2010) disclosed that there was a higher concentration of traditional technologies among the farmers compared to mechanization.

Yohanna *et al.* (2011) in their study on mechanization problems of small farmers found various levels of mechanization tools use in the various farm operations as follows: land clearing (21.54%), tillage (24.62%), planting (3.85%), spraying (86.15%), weeding (3.08%) and harvesting (40%).

Musa *et al.* (2012) revealed that 60 per cent of the respondents adopted mechanization and it boosted their crop production and reduced the use of other forms of manual labor.

Vinay *et al.* (2012) reported that majority (57.43 %) of the respondents used country plough as a primary tillage implement, 75.56 percent used cultivator as a secondary tillage implement and 57.43 percent respondents used traditional sowing methods.

Owombo *et al.* (2012) stated that 72.1 percent of adopters adopted only mechanized land preparation followed by 19.4 percent mechanized land preparation and planting and 8.5 percent mechanized other operation such as processing (shelling).

Shamabadi (2012) found that more than 95 percent of land preparation is done by draft tractors using 3-bottom mould board ploughs.

Tewari *et al.* (2012) narrated that implements used by the cultivators for performing various Agricultural operations are Desi plough, wooden leveller, long handle spade, row marker and Khurpi.

Akinfiresoye and Agbetoye (2013) revealed that 80 percent of the farmers used the knapsack sprayer while only 20 percent used boom sprayer.

Nagaraj *et al.* (2013) revealed that less than half of the respondents (42.50%) belonged to medium level of adoption category.

Dange *et al.* (2014) reported that nearly 36.00 percent of small farmers belonged to high adoption gap category and 26.00 percent adoption gap was

found among the big farmers. 36.0 percent of the sugarcane growers expressed that mechanization was most needed in weeding, harvesting and planting operations and 64.00 percent of the sugarcane growers felt that further mechanization in irrigation is needed.

Islam (2018) reported that Now, almost 100% power tillers are being imported from China. Two models of power tiller namely Dongfeng and Sifang are widely used in the country. Very few rice transplanters including walking and ride on types are operated in the country and all the transplanters are imported from Korea and China.

Alam *et. al.*,(2014b) stated that the growth of farm machinery manufacturing and associated industries were about 70 foundries, 800 agro- machinery manufacturing workshop, 1,500 spare parts manufacturing industries and workshops and about 20,000 repair and maintenance workshops are engaged in agro-machinery subsector of the country.

2.3 Relationship between farmers characteristics and use of machineries

2.3.1 Age and use of machineries

Rahman (2004) reported in his study that age of the farmers had no significant relationship with the use of machineries.

Akhter (2003) also reported that use of agricultural machineries has significant and positive relationship with their age.

Rahman (2018) reported in his study that age of the farmers had non-significant negative relationship with their use of Mechanization.

2.3.2 Educational qualification and use of machineries

Rahman (2018) reported in his study that educational qualification of the farmers had significant positive relationship with the use of mechanization.

Islam (2005) also revealed that there was significant and positive relationship with their level of education and use of machineries.

Hossain (2003) reported in his study that there was significant and positive relationship with their level of education and use of mechanization.

2.3.3 Farm size and use of machineries

Rahman (2004) reported in his study that there was significant and positive relationship with farm size and use of machineries.

Rahman (2018) reported in his study that farm size of the farmers had no significant positive relationship with their use of mechanization.

2.3.4 Annual family income and use of machineries

Islam (2021) conduct a study on utilization of agricultural machineries by the farmers of saghata upazilla under gaibandha district found there is a significant and positive relationship with annual family income and their use of machineries.

Rahman (2018) reported in his study that Annual family income of the farmers had significant positive relationship with their use of mechanization.

2.3.5 Extension media contact and use of machineries

Islam (2018) reported that the extension contact of the farmers had significant positive relationship with the use level of machineries.

Rahman (2018) reported in his study that extension media contact of the farmers had significant positive relationship with their use of mechanization.

2.5 Conceptual framework of the study

In scientific research, conceptual framework is selection and measurement of variables. Properly constructed hypothesis of a research contains “dependent variable” and “independent variables”. This study is concerned with the farmers use of machineries. So the use of mechanization by the rice growers were the main focus and the dependent variable of the study. After consulting with the relevant experts and reviewing of past related literatures, 9 selected characteristics of the farmers were considered for the study as the independent variables, which might have contribution on level of use agricultural mechanization. Based on this discussion the conceptual framework of this study has been formulated as shown in figure 2.1

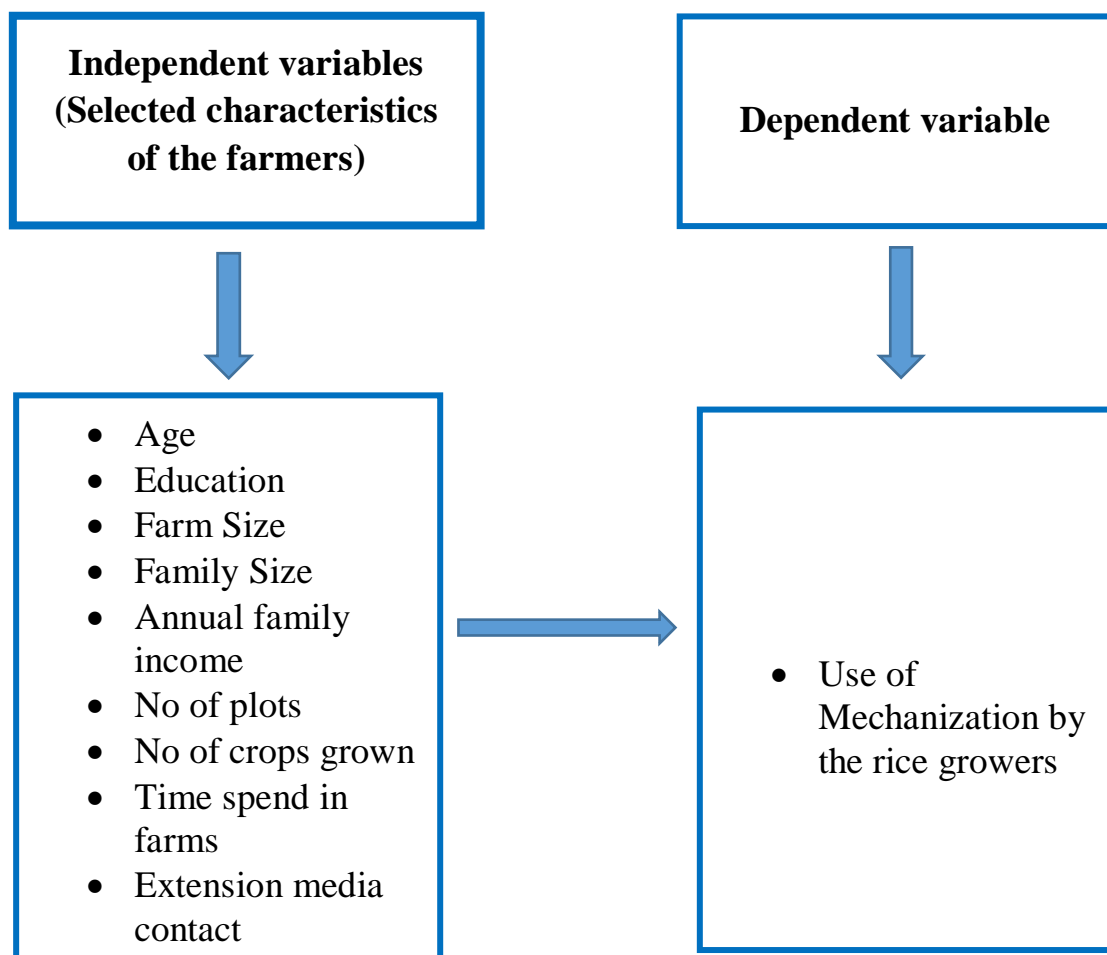


Figure 2.1: Conceptual Framework of the study

CHAPTER III

METHODOLOGY

The methodology used in conducting any scientific research is critically important and deserves careful consideration. Research method is a structured set of guidelines or activities to generate valid and reliable research results. Appropriate methodology directs the researcher to collect valid and reliable information in terms of hypothesis or research instrument and to analyze the information rightly to reach at valid results. The methods and operational procedures will be followed in conducting this study has been discussed in this chapter. Further, this chapter includes the operational format, statistical methods and their use have been mentioned in the later section of this chapter.

3.1 Locale of the Study

The present study was conducted at Rangpur sadar upazila under Rangpur district in Bangladesh. Rangpur district is one of the agriculturally important districts where rice, wheat, maize, vegetables are intensively cultivated. Most of the farmers of this area are directly and/or indirectly engaged in agricultural activities and few people are service holders and businesspersons. Rangpur is located on the north-western part of the country. Four village namely, Darshana Pahari manjai, Ghagot para, Akkelpur and Dangirpar are under Rangpur Sadar upazila of Rangpur district were selected purposively. Four villages from each union were selected randomly as the locale of the study. A purposive sampling procedure was followed to selected one district from all over the Bangladesh. A map of Rangpur district is given in Figure 3.1



Figure 3.1 Map of Rangpur District

3.2 Population and Sampling

The farmers who are engaged with rice cultivation and permanently lived of selected four villages under Rangpur sadar Upazilla of Rangpur district were considered as the population of the study. A lists of farmers who are involved

in rice cultivation of these villages were prepared with the help of Sub Assistant Agriculture Officers (SAAO) of that area. Total farmers of this area were 1043, which constituted the population of this study. Ten (10%) of population is considered as sample for the study. Beside this, a reserved list of 10 farmers was prepared who were supposed to be interviewed only when a respondent in the original sample list was unavailable during data collection. The distribution of the population and sample is shown in Table 3.1

Table 3.1 Distribution of the population and sample including reserve list

Study area (Villages)	Population size	Sample size	Reserve sample Size
Darshana Pahari manjai	281	28	3
Ghagotpara	247	25	4
Akkelpur	242	24	3
Dangirpar	273	27	0
Total	1043	104	10

3.3 Research Instrument

In order to collect relevant data for the study, a structured interview schedule was prepared keeping the objectives in mind. The questions and statements contained in the schedule were simple, direct and easily understandable by the respondents. The schedule contained closed form of questions. A draft interview schedule was prepared in advance before using the same for collection of data. The draft schedule was pre-tested with 10 respondents selected from the study area. This pre-test facilitated the researcher to identify

faulty questions in the draft schedule and necessary corrections, addition and adjustment was made afterwards in the schedule on the basis of the pre-test results.

3.4 Data Collection Procedure

Data were collected from the selected 104 farmers by face-to-face interview. Questions were asked systematically and explanation was made whenever necessary. The respondents were interviewed at their leisure time so that they can give accurate information in a cool mind. The investigator faced no serious problems. To build rapport and motivation in the interview situations, the researcher attempted to provide conditions that maximum trust maintained each respondent's interest and reduced status difference.

3.5 Variables to be used

A variable is any characteristics, which can simulate varying or different values in successive individual cases. An organized piece of research usually contains at least two important variables viz., dependent variable and independent variables.

3.5.1 Dependent variable

Dependent variable is the variable that is being measured in an experiment. Or the variables those are affect during research are called dependent variable. In this study, the dependent variable is use of mechanization by the rice growers, which was measured based on farmer' use of machinery.

3.5.2 Independent variables

Independent variables are the variables that the researcher changes to test their dependent variable. Or the variables that can take different values and can cause corresponding changes in other variables. In this research, the researcher

selected nine characteristics of the respondent as the independent variables. The independent variables for this study are- age, education, family size, farm size, annual family income, number of plots, number of crops grown, time spend in farms and extension media contact.

3.6 Measurement of Selected Characteristics of the Farmers

The nine characteristics of the respondents namely age, education, family size, farm size, annual family income, no of plots, no of crops grown, time spend in farms and extension media contact constituted the selected characteristics of this study. The measurement procedure of these selected characteristics discussed below.

3.6.1 Age

Age of a respondent was measured in terms of years from his/her birth to the time of interviewing. It was expressed in terms of complete years. . This variable appears in item number 1 in the interview schedule as presented in Appendix-I.

3.6.2 Level of Education

Level of education was measured as the knack of an individual respondent to read and write or the formal education received up to a certain standard. If a respondent did not accomplish formal education, his score was assigned as zero (0). A score of 0.5 was given to a respondent who only could sign his/her name. A score of one (1) was assigned for each year of schooling. If a respondent passed the S.S.C examination, his education score was given as 10, 12 for H.S.C., and so on. This variable appears in item number 2 in the interview schedule as presented in Appendix-I.

3.6.3 Family size

The family size of a respondent measured as the total numbers of family members of his/ her family . This variable appears in item number 4 in the

interview schedule as presented in Appendix-I.

3.6.4 Farm size

The farm size of a respondent measured as the total area of land on which his/her family carried out farming operations, the area being in terms of full benefit to his/her family. Data obtained from asking direct question. The farm size was measured in hectares by using the following formula:

$$\text{Farm size} = A + B + 1/2 (C+D) + E$$

Where,

A = Homestead area including pond

B= Own land under own cultivation

C= Land given to others as barga

D= Land taken from others as barga

E= Land taken from others as lease

Total farm size of each respondent was categorized into 4 types (Islam, 2007). The farmers who had land bellow 0.20 hectare were considered as marginal farmer. The farmers who had land between >0.20 to 1.00 hectare were considered as small farmers; the farmers who had land >1.00 hectare were considered as medium farmers. This variable appears in item number 3 in the interview schedule as presented in Appendix-I.

3.6.5 Annual family income

Annual income of a respondent was measured on the basis of total yearly earning by the respondent himself and other family members. The value of all the sources encompassing crops (rice, wheat, maize), vegetables, fruits, dairy and poultry, fish culture, service, business, and day labour etc. were taken into consideration. For calculation of income score, one (1) was assigned for each one thousand taka of income. This variable appears in item number 5 in the

interview schedule as presented in Appendix-I.

3.6.6 Number of plots

Number of plots are mentioned how many plots did they have. This number of plots from including homestead, own land under own cultivation, land taken from others as borga, land taken from others as lease.

3.6.7 Number of crops grown

Number of crops grown referred to how many crops did they cultivate on last year. This number of crops from including homestead, own land under own cultivation, land taken from others as borga, land taken from others as lease.

3.6.8 Time spend in farm

Time spend in farms referred how much time did they spend in their farm hour/week. Proper utilization and better outcome from the farm spending time is significant. Management of farm in a daily basis can bring better result for the farmers to be self-sufficient.

3.6.9 Extension media contact

The extension media contact of a respondent was measured on the basis of the response of the media contact user farmers against the use of his using of selected five media by putting tick mark against any one of the five responses: regularly, frequently, occasionally, rarely and not at all. The responses were scored as 4, 3, 2, 1 and 0 respectively. The use of extension media contact score of the respondents ranged from 0 to 20 where, 0 indicates no use and 20 indicates very high use. Based on their extension media contact, the respondents were classified into three categories as low contact, medium contact, and high contact. This variable appears in item number 9 in the interview schedule as presented in Appendix-I.

3.7 Measurement of Dependent Variable

The dependent variable of the study was use of mechanization by the rice growers. It was measured based on 8 stages or practices being used machine by the rice growers. The practices/stages are land preparation, planting, weeding, fertilizer application, pesticide application, irrigation, harvesting and threshing. The respondents were asked to indicate whether they use or not of these 8 operations with responses as “yes or no”. A weight was assigned to the alternative responses as 1 for yes and 0 for no responses respectively. Use of farm machinery score of the respondents were computed by summing up all the scores obtained by them from all the 8 operations. Finally, the score was converted into percentage. Thus, the possible range of use on agricultural mechanization score was 0-100, while 0 indicated no use and 100 indicated highest use on agricultural mechanization.

3.8 Statement of the Hypothesis

A hypothesis is a conjectural statement of the relations between two or more variables. Hypothesis is always in declarative sentence form and they relate either generally or specially, variables to variables. As defined by Goode and Hatt (1952) “A hypothesis is a proposition which can be put to a test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test”. The following hypothesis was considered to explore the relationship between the dependent and independent variables. Hypothesis may be broadly divided into two categories, namely, research hypothesis and null hypothesis.

3.8.3 Research hypothesis

Based on review of literature and development of conceptual framework, the following research hypothesis was formulated: ‘There were significant relationships between the selected nine characteristics (i.e. age, education,

family size, farm size, annual family income, no of plots, no of crops grown, time spend in farms, and extension media contact) of the farmers and their relation towards mechanization. However, when a researcher tries to perform statistical tests, then it becomes necessary to formulate null hypothesis.

3.8.4 Null hypothesis

Null hypothesis: ‘There was no significant relationship between the selected nine characteristics (i.e. age, education, family size, farm size, annual family income, no of plots, no of crops grown, time spend in farms and extension media contact) of the farmers and their relation towards mechanization.

3.9 Data Processing

3.9.1 Editing

The collected raw data were examined thoroughly to detect errors and omissions. As a matter of fact, the researcher made a careful scrutiny of the completed interview schedule to make sure that necessary data were entered as complete as possible and well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

3.9.2 Coding and tabulation

After completion of field survey, all the data were coded, compiled and tabulated according to the objectives of the study. Local units were converted into started units. All the individual response to questions of the interview schedule was transferred into a master sheet to facilitate tabulation and categorization.

3.9.3 Categorization of data

Following coding operation, the collected raw data from respondents were classified into various categories to facilitate the description of the variables. These categories were developed for each of the variables by considering the

nature of distribution of the data and extensive literature review. The procedures for categorization have been discussed while describing the variables under consideration in Chapter 4.

3.10 Statistical Procedures

The data were analyzed in accordance with the objectives of the study. Qualitative data were converted into quantitative data by means of suitable scoring technique wherever necessary. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the variables. Regression analysis was used in order to explore the relationships between the concerned variables. Five percent (0.05) level of probability was the basis for rejecting any null hypothesis throughout the study. The SPSS computer package was used to perform all these processes.

CHAPTER IV

RESULT AND DISCUSSION

The results or the findings of this study and its explanation or illustration have been presented here in this chapter. According to the objectives of the study, collected data were surveyed, analyzed, tabulated and statistically treated which were obtained from the respondents. These are presented in three section according to the objectives of the study. The first section deals with the selected characteristics of the farmers, while the second section deals with use of mechanization by the farmers. In the third section relationship between the Selected Characteristics of the farmers and their use of mechanization have been discussed.

4.1 Selected Characteristics of the Farmers

Nine characteristics of the farmers were selected to find out their relationships with their use of mechanization. The selected characteristics included their age, educational qualification, farm size, family size, annual family income, no of crops grown, time spend in farm, no of plots and extension media contact. These characteristics of the farmers are described in this section.

Data contained in the Table 4.1 reveal the salient features of the characteristics of the farmers in order to have an overall picture of these characteristics at a glance. However, for ready reference, separate tables are provided while presenting categorizations, discussing and /or interpreting results concerning each of the characteristics in this chapter. The salient features of the selected characteristics of the farmers are shown in the following table.

Table 4.1 Salient features farmers with their selected characteristics

Sl. No.	Characteristics	Unit of measurement	Possible range	Observed Range	Mean	S.D.
1	Age	Year	Unknown	27-67	48	10.37
2	Educational qualification	Schooling years	Unknown	0-17	5.538	4.66
3	Farm size	Hectare	Unknown	0.23-1.40	0.533	0.206
4	Family size	No. of members	Unknown	3-8	4.79	.972
5	Annual family income	“000” Taka	Unknown	114-1000	379.31	149.686
6	Time spend in farms	Hours/week	Unknown	7-28	18.12	3.945
7	No. of crops grown	Number	Unknown	2-7	3.47	.859
8	No. of plots	Number	Unknown	2-8	4.87	1.488
9	Extension media contact	Score	0-20	7-14	10.03	1.39
10	Mechanization	Percentage	0-100	14-63	47.97	10.272

4.1.1 Age

Age of the respondents ranged from 27 to 67 years, the average being 48 years, the standard deviation was 10.37. Regarding age, the farmers were classified into three categories according to Ministry of Youth and Sports, Bangladesh, 2008, such as “young aged” (up to 35), “middle aged” (36-50) and “old aged” (above 50 years). Table 4.2 contains the distribution of the respondents according to their age.

Table 4.2 Distribution of the farmers according to their age

Categories	Farmers		Mean	SD
	Number	Percent		
Young aged (Up to 35)	14	13.5	48	10.37
Middle aged (36-50)	42	40.3		
Old aged (>50)	48	46.2		
Total	104	100		

Data presented in table 4.2 indicated that the highest proportion (46.2%) of the respondents was in old aged category compared to (13.5%) young aged and (40.3%) middle aged category. The findings indicate that a large proportion (46.6%) of the farmers were old aged. It also found that, old aged farmers are proportionately higher than two other categories.

The middle and old aged farmers were generally more possessed farm implements than the young. It may be due to middle aged to old aged people are generally receptive to new ideas and things. They are more innovative than young aged people. It means that farm mechanization in the study area is being managed by middle aged to old aged farmers.

4.1.2 Educational qualification

Education of a respondent was measured by the level of his/her formal education i.e. the number of class passed by him. The education score of the respondents ranged from 0 to 17, the average being 5.54, the standard deviation was 4.5, and the coefficient of variation was 62.65. Based on their level of education, the respondents were grouped into five categories according to Hoque, 2016 and Masud, 2007 such as- “Illiterate” (0), “Can sign only” (0.5), "Primary education" (1-5), "Secondary education" (6-10), “Higher secondary and above” (>10).

Table 4.3 Distribution of the farmers according to their educational qualification

Categories (Schooling years)	Farmers		Mean	SD
	Number	Percent		
Illiterate (0)	7	6.7	5.54	4.5
Can sign only (0.5)	32	30.8		
Primary (1-5)	16	15.4		
Secondary (6-10)	37	35.6		
Higher secondary and above (>10)	12	11.5		
Total	104	100		

Table 4.3 shows that respondent under secondary education category constitute the highest proportion (35.6%) followed by Secondary (35.6%), primary education (15.4%), Illiterate (6.7%) and higher secondary (11.5%). Education broadens the horizon of outlook of farmers and expands their capability to analyze any situation related to utilization of modern technologies. An educated farmer is likely to be more responsive to the

modern facts, ideas, and information of modern farm technologies. To adjust with the same, they would be progressive minded to adopt modern technologies related to farm mechanization as well as involve with modern cultural farm activities.

4.1.3 Farm size

Farm size varied from 0.23 to 1.40 hectares with a mean of 0.533 and standard deviation was 0.206 respectively. Based on their farm size the farmers were classified into two categories as which shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their farm size

Categories (hectare)	Farmers		Mean	SD
	Number	Percent		
Small farm (<1.0)	99	95.2	0.533	0.206
Medium farm (1-3)	5	4.8		

The data in the Table 4.4 revealed that more than majority of the respondents (95.2%) had small farm while 4.8% had medium farm. The findings again revealed that most (95.2%) of the respondents had small farm size. The average farm size of the farmers of the study area was small farm size which is less than that of national average (0.60 ha) of Bangladesh (BBS, 2018)

4.1.4 Family Size

The Computed scores of the farmers number of crops grown ranged from 3 to 8 with a mean of 4.79 and standard deviation of 0.972. On the basis of number of crops grown, the respondents were classified into three categories as follows in Table 4.5

Table 4.5 Distribution of the farmers according to their family size

Categories (N0.)	Farmers		Mean	SD
	Number	Percent		
Small family (up to 4)	42	40.4	4.79	0.972
Medium family (5-6)	56	53.8		
Large family >6	6	5.8		
Total	104	100		

The data in the Table 4.4 revealed that more than majority of the respondents (53.8%) had medium family. While (40.4%) small and (5.8%) had small family. The findings again revealed that most (53.8%) Farmers had small family. The average family size is 4.79 which is consistent with national average of (BBS, 2018)

4.1.5 Annual family income

Annual family income of the farmers ranged from Taka 114-1000 thousand, the mean being 379.31 thousand, standard deviation of 149.69 thousand. On the basis of their annual income scores, the farmers were divided into three categories such as- “Low income” (<230) “medium income” (230-528) and “high income” (>528). The distribution of the farmers according to their annual family income is shown in Table 4.6

Table 4.6 Distribution of the farmers according to their Annual family income

Categories (“000” Taka)	Farmers		Mean	SD
	Number	Percent		
Low income (<230)	7	6.7	379.31	149.69
Medium income (230-528)	85	81.8		
High income (>528)	12	11.5		
Total	104	100		

The data is presented in table 4.5 indicate that the majority (81.8 percent) of the farmers had medium income compared to 6.7 percent had low family income and 11.5 percent had high family income. As well as mean annual income of locale was higher than the national average of \$1909 USD.

4.1.6 Number of crops grown

The Computed scores of the farmers number of crops grown ranged from 2 to 7 with a mean of 3.47 and standard deviation of .859. On the basis of number of crops grown, the respondents were classified into three categories as follows in Table 4.7.

Table 4.7 Distribution of the farmers according to their Number of crops grown

Categories (Number)	Farmers		Mean	SD
	Number	Percent		
Lower (up to 3)	62	59.6	3.47	.859
Moderate (4-5)	40	38.5		
High (>5)	2	1.9		
Total	104	100		

Data contained in Table 4.7 showing that (59.6%) of the farmers had grown <3 crop on last year whereas (38.5%) had grown 4-5 crops and (1.9%) had grown >5 crops on last year. According to farmers it is observed that number of lower crops grown increased instead of moderate and high number of crops grown

4.1.7 Time spend in farms

The score of time spend in farms of the farmers ranged from 7-28hrs/week with a mean and standard deviation of 18.12 and 3.945. On the basis of time spend in farms the respondents were classified into three categories namely, Up to14, 14-22, >22. The scale used for computing the use of modern technology score is presented in the Table 4.8

Table 4.8 Distribution of the farmers according to time spend in farms

Categories (Hours/week)	Farmers		Mean	SD
	Number	Percent		
Lower (up to 14)	30	28.8	18.12	3.945
Moderate (14-22)	66	63.5		
High (>22)	8	7.7		
Total	104	100		

Data presented in Table 4.8 indicate that the highest proportion (63.5%) of the farmers 14-22 hours had worked per week compared to (28.8 percent) had worked lower than 14hrs and (7.7%) had worked greater than 22 hours per week. The majority (63.5%) of the farmers were worked 14-22 hours per week. It is true that the farmers will not be self sufficient if they do not use time properly in the farms .

4.1.8 Number of plots

The Computed scores of the farmers number of plot ranged from 2 to 8 with a mean of 4.87 and standard deviation of 1.488. On the basis of number of plot, the respondents were classified into three categories as follows in Table 4.9

Table 4.9 Distribution of the farmers according to their number of plots

Categories (Number)	Farmers		Mean	SD
	Number	Percent		
Low(<3)	18	17.3	4.87	1.488
Moderate (4-6)	72	69.2		
High (>6)	14	13.5		
Total	104	100		

Data contained in Table 4.9 showing that (69.2%) of the farmers had moderate 4-6 no of plot, (17.3%) had low >3 no of plot and (13.5%) had high >6 no of plot on the study. The findings of the study reveal that majority of the farmers were moderate number of plots.

4.1.9 Extension media contact

The observed extension media contact scores of the farmers engaged in farm mechanization ranged from 7 to 14 against the possible range from 0 to 20, the mean and standard deviation were 10.03 and 1.390 respectively. Based on this score, the farmers were classified into three categories which is presented in Table 4.10

Table 4.10 Distribution of the farmers according to their extension media contact

Categories (Score)	Farmers		Mean	SD
	Number	Percent		
Low contact (Up to 9)	36	34.6	10.03	1.390
Medium contact (>9-11)	51	49.1		
High contact (>11)	17	16.3		
Total	104	100		

Data presented in table 4.10 showed that highest proportion (49.1 percent) of the farmers had medium extension contact compared to 34.6 percent of them had low media contact and 16.3 percent of them had high media contact.

4.2 Use of mechanization

Agricultural mechanization observed scores ranged from 14-63 and possible range 0-100, the mean being 47.97 and standard deviation 10.272. Based on the scores (3 equal deviation of the possible score), the farmers were classified into two categories which is shown in Table 4.11

Table 4.11 Distribution of the farmers according to use of mechanization

Categories (score)	Farmers		Mean	SD
	Number	Percent		
Low use	40	38.5	47.97	10.272
Medium use	64	61.5		
Total	104	100		

Data presented in table 4.11 showed that majority proportion (61.5%) of the farmers had medium use compared to (38.5%) of them had low use. From this table, it might be concluded that majority of the farmers had medium use on agriculture machineries. The finding was interesting but logical because in general the farmers in the rural areas of Bangladesh are faced moderate barrier for farm implements handling as well as maintenance.

4.3 Relationship between the Selected Characteristics of the Farmers and their use of mechanization

The purpose of this section is to explore the contribution of the selected characteristics of the farmers to their use of mechanization. To achieve their regression analysis was used which is shown in the Table 4.12

Table:4.12 Regression coefficients relation between selected characteristics and farmers use of mechanization (n=104)

Dependent variable	Independent Variables	β	S.E.	t-value	Sig.
Use of Mechanization	Age of Respondent	-.076	.104	-.719	.474
	Education of Respondent	-.020	.228	-.195	.846
	Farm size	-.004	6.898	-.029	.977
	Family size	-.063	.994	-.671	.504
	Number of crops grown	-.037	1.177	-.376	.708
	Annual Family income	.234	.008	2.047	.043*
	Time spend in farms	.432	.282	3.997	.000*
	Number of plots	.004	.776	.034	.973
	Extension Media contact	.244	.672	2.685	.009*

** Significant at $p < 0.01$;

*Significant at $p < 0.05$

$R^2 = 0.372$; Adj. $R^2 = 0.311$; $F = 6.17^{**}$

Table 4.12 shows that annual family income, time spend in farm and Extension media contact of the respondents had significant positive relation with the use of agricultural mechanization. Of these, annual family income, time spend in farms and Extension media contact were important contributing factors (significant at 5% level of significant).

The value of R^2 is a measure of how of the variability in the dependent variable is accounted by the independent variables. So, the value of $R^2= 0.372$ means that independent variables accounts for 37% of the variation with their relation of the use of mechanization. The F ratio is 6.17 which is highly significant ($p<0$).

However, each predictor may explain some of the variance in respondents their contribution of the use of mechanization by chanced. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but value 0.311 is still show that variance is farmers relation of the farm in maintaining their use of mechanization can be attributed to the predictor variables rather than by chanced (Table 4.13). In summary, the models suggest that the respective authority should be considers the farmers annual family income, time spend in farms and extension media contact on their relation of the farm mechanization and in this connection some predictive importance has been discussed below:

4.3.1 Annual family income and use of mechanization

From the multiple regression, it was concluded that the annual family income of the farmers and their use of mechanization was measured by the testing the following null hypothesis;

“There is positive relation of annual family income of the farmers and their use of mechanization.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- ❖ The annual family income was significant at 5% level (0.043)
- ❖ So, the null hypothesis could be rejected.
- ❖ The direction between annual family income was positive.
- ❖ The b-value of annual family income is (.016). So, it can be stated that annual family income increased by one unit and farms mechanization increased by 0.016 units.

Based on the above finding, it can be said that farmers had more annual family income increased in use of mechanization. So, annual family income have high significantly to the farmers and use of mechanization. Annual family income makes the farmers self-dependent which helps use of mechanization. Thus, the annual family income of the farmers had positive significant relationship with their use of mechanization. Rahman (2018) observed the similar findings in his studies.

4.3.2 Time spend in farms and use of mechanization

From the regression analysis, it was concluded that the time spend in farms and their use of mechanization was measured by the testing the following null hypothesis;

“There is positive relation of time spend in farms and their use of mechanization”.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- ❖ There is positive of the time spend in farm was significant at 5% level (.000)
- ❖ So, the null hypothesis could be rejected.
- ❖ The direction between time spend in farm and use of mechanization was positive.
- ❖ The b-value of time is (1.125). So, it can be stated that time spend increased by one unit, Farmers use of mechanization increased by 1.125 units.

Based on the above finding, it can be said that farmers had more time increased in use of mechanization. So, time has high significantly to the farmers profitability of use of mechanization. Rahman (2018) observed the similar findings in his studies. The findings indicates that rice farmers more time spending, that means their more involvement, dedication and seriousness leads to more use of mechanization in the study area.

4.3.3 Extension media contact and use of mechanization

From the multiple regression, it was concluded that the extension media contact of the farmers and their use of mechanization was measured by the testing the following null hypothesis;

“There is positive relation of extension media contact of the farmers and their use of mechanization”.

The following observations were made on the basis of the value of the concerned variable of the study under consideration.

- ❖ The relationship of the time spend in farm was significant at 5% level (.009)
- ❖ So, the null hypothesis could be rejected.
- ❖ The direction between extension media contact and their use of mechanization was positive.
- ❖ The b-value of extension media contact is (1.805). So, it can be stated that extension media contact increased by one unit, Farmers use of mechanization increased by 1.805 units.

The findings indicate that agricultural extension media contact of farmers had a significant positive relationship with their use of mechanization.

Thus, majority (83.7 percent) of the farmer had low to medium extension contact. Rahman (2018) found almost similar findings. This may be due to

socio-economic conditions of the farmers. It was found that low income farmers had low extension media contact in the study area. Their involvement in day labor, small vendors, reluctance to extension media contact, etc. may be some reasons behind small to medium extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies. So extension contact should be increased for betterment of our agriculture.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The study was conducted in the Rangpur Sadar Upazila under Rangpur district to find out the use of mechanization by the rice growers. Total 1043 rice farmers were selected from the study area as the population and the respondents comprised of 104 constituted the sample of the study. A well-structured interview schedule was developed based on objectives of the study for collecting information. The independent variables were: age, education, farm size, family size, annual family income, number of plots, number of crops grown, time spend in farms and extension media contact. Various statistical measures such as frequency counts, percentage distribution, mean and standard deviation were used in describing data. In order to estimate the relationship of the selected characteristics of the respondents to their use of mechanization by the rice growers, regression analysis was used. The major findings of the study are summarized below:

5.1 Summary of the Findings

Findings different aspects of the study are summarized below:

5.1.1 Selected characteristics of the farmers

Age: The highest proportions (46.2%) of the respondents were in the old aged category compared to 13.5 percent young and 40.3 percent middle-aged category.

Educational qualification: A large proportion (35.6%) of the respondents fall under the category of “Secondary education” compared to 6.7 percent “illiterate”, 30.8 percent having “can sign only”, 15.4 percent having “primary education”, 11.5 percent having “higher secondary and above higher secondary education”.

Farm size: More than the respondent (95.1%) had small farm and 4.8 percent had medium farm.

Family size: Most of the family size (53.8%) medium family, 40.4 percent small family and 5.8 percent having large family size.

Annual family income: The majority (81.8%) of the farmers had medium income compared to 6.7 percent low income and 11.5 percent had high income.

No. of crops grown: The majority of the proportion (59.6%) had lower crops grown, compared to 38.5 percent medium crops grown in farm, and 1.9 percent high crops grown in agricultural mechanized area.

Time spend in farms: The highest proportion of time (63.5%) had moderate time spend in farm compared to 28.8 percent low time spend and 7.7 percent in high time spend in farm.

No. of plots: The majority of the proportion (69.2%) had moderate no of plot, compared to 17.3 percent low and 13.5 percent high no of plot in agricultural mechanized area.

Extension media contact: A proportion of 49.1 percent of the farmers had medium extension media contact compared to 34.6 percent of them having low media contact and 16.3 percent of them having high media contact.

5.1.2 Use of mechanization:

Majority (61.5%) of the farmers had medium use and 38.5 percent farmers had low use use of mechanization.

5.1.3 Result of Hypothesis Testing

Out of nine selected characteristics of the farmer's annual family income, time spend in farms and extension media contact had significant positive relationship with their use of mechanization.

5.3 Conclusions

On the basis of findings, discussion and logical interpretations, the following conclusions have been drawn:

1. All the respondents had low to medium use of use of mechanization. Therefore, it may concluded that there is further scope for increasing the use of using agricultural machineries.
2. Annual family income of farmers had a significant positive relationship with their use of agricultural mechanization. It may be concluded that the annual family income of the farmers was an important factor of use of mechanization.
3. The farmers who spend more time have more mechanization. It indicates that use of mechanization is somehow dependent with the time spend in a farm by the farmers.
4. Extension media contact had significant and positive relationship with their use of mechanization. It was thus proved that use of mechanization can be increased with the increases of extension media contact.

5.4 Recommendations

5.4.1 Recommendations for policy implications

On the basis of observation and conclusions drawn from the findings of the study, following recommendations are made:

1. The machines, which are usually used by the farmers in rice cultivation are costly. Therefore, DAE and agricultural ministry can take initiative to increase subsidize on the machineries.
2. Initiative should be taken by the government to import variety of machineries so that the farmers can use machine from transplanting to harvesting in each operations.

3. The extension agent and other stakeholders should motivate more the farmers who spent less time in farming for the use of machineries.

4. The extension agent should motivate farmers to use farm machineries through various approaches like formation of group or co-operatives, rent, etc.

5.4.2 Recommendations for further study

On the basis of scope and limitations of the present study and observation made by the researcher, the following recommendations are made for future study.

- It is recommended that similar studies should be conducted in other areas of Bangladesh.
- It is recommended that further study should be conducted with other characteristics of the farmers with their use level of mechanization.
- Studies need to be undertaken to ascertain the principles and procedures for installation, patronization of nursing association in rural areas of Bangladesh.
- It is therefore suggested that future studies should be included more reliable measurement of concerned variable.
- The study was based on the farmers “Use of mechanization by the rice growers”. Further studies may be conducted in respect of use of specific modern agricultural mechanization.
- Similar studies can be conducted in other areas of the country where farm mechanization use large scale which will be helpful for effective policy implementation.

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APPENDIX-I

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University, Dhaka-1207

An interview schedule for a research study entitled:
Use of mechanization by the rice growers

Sl. No.

Name of the respondent:

Village:

Union:

Upazila:

District:

Mobile number:

(Please answer the following questions)

1. Age

How old are you? Years

2. Education

Please mention your educational level from the followings-

- Illiterate.....
- I can sign only.....
- I read up to class.....

3. Farm size

Please furnish information about your farm size:

Sl. No.	Land type	Area	
		Local unit (Decimal)	Hectare
1.	Homestead area including pond(A)		
2.	Own land under own cultivation(B)		
3.	Land given to others as barga(C)		
4.	Land taken from others as barga (D)		
5.	Land taken from others as lease(E)		
Total=A+B+1/2(C+D) +E			

4. Family size

Please mention your family size

Ans:

5. Annual family income

Please state the income from different sources during the last year:

Sl. No.	Sources of income	Total price (Tk)
A. On farm income		
1	Agriculture	
2	Fisheries	
3	Livestock	
B. Off farm income		
1	Business	
2	Services	
3	Daily labor	
4	Remittance	
5	Others (if any)	
Total=(A+B)		

Total annual income= A+B=.....TK

6. Number of plot

Please mention your plot number

Ans:.....

7. No. of crops grown

Q. How many crops did you cultivate on last year?

Ans:

8. Time spend in farms

Q. How much time do you spend in at your farm in a hrs/week?

Ans:

9. Extension media contact

Please indicate the use of your contact

S.L	Source of media	Use of contact				
		Not at all (0)	Rarely(1)	Occasionally(2)	Often(3)	Regularly(4)
1	UAO/AEO					
2	SAAO					
3	Model farmer					
4	NGO worker					
5	Field day/group discussion					

10. Use of mechanization by the rice growers

Please mention your level of mechanization from the followings-

SL NO	Farming Operation	Mechanized	
		Yes	No
1	Land preparation		
2	Planting		
3	Weeding		
4	Fertilizer application		
5	Pesticide application		
6	Irrigation		
7	Harvesting		
8	Threshing		

Average= $\frac{\sum \text{All/item}}{\text{item}}$ =%

Thank you

Signature of the interviewer

