FARMERS' KNOWLEDGE ON AGRICULTURAL MACHINERIES

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CERTIFICATE

This is to certify that the thesis entitled **"FARMERS' KNOWLEDGE ON AGRICULTURAL MACHINERIES"** submitted to the department of Agricultural Extension and Information System, Faculty of Agriculture, Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka in partial fulfillment of the requirements for the degree of Master of Science (M.S.) in Agricultural Extension, embodies the result of a piece of bona fide research work carried out by **MD. TUSAR ALI KHAN, Registration No. 18-09270** 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, as has been availed of during the course of this investigation has been duly acknowledged by the Author.

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DEDICATED

TO

MY BELOVED

PARENTS

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ABBREVIATIONS

Ag. Ext. Ed.	Agricultural Extension Education
Ag. Ext. and Info. Sys.	Agricultural Extension and Information System
β	Multiple Regression
BBS	Bangladesh Bureau of Statistics
GDP	Gross Domestic Product
DAE	Department of Agricultural Extension
et al.	All Others
USA	United Nations of America
FAO	Food and Agriculture Organization
HYV	High Yielding Varieties
GoB	Government of Bangladesh
MoA	Ministry of Agriculture
UNO	The United Nations
MoYS	Ministry of Youth and Sports
MoP	Muriate of Potash
BADC	Bangladesh Agricultural Development Corporation
SAAO	Sub Assistant Agriculture Officer
SAU	Sher-e-Bangla Agricultural University
SPSS	Statistical Package for Social Sciences
AMA	Africa and Latin America
BRRI	Bangladesh Rice Research Institute
BER	Bangladesh Economic Review
EFTE	European Federation for Transport and Environment

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TUSAR ALI KHAN

ABSTRACT

Proper selection and utilization of machinery effortlessly would boost up and optimize farm production by minimizing unnecessary breakdown/failure, energy and power losses and mismatching of implements to prime movers. The purpose of the study was to describe the selected socio-economic profile of the farmers; to determine the extent of farmers' use of agricultural machineries; and to explore the contribution among each of the selected characteristics of farmers with their use of agricultural machineries. The study was undertaken purposively in Sundarganj upazila under Gaibandha district. Validated and well-structured interview schedule was used to collect data from 109 farmers during 1st December to 31th December, 2020. Descriptive statistics, multiple regressions were used for the analysis of collected data. The majority (53.21 %) of the respondents had medium knowledge followed by 21.10 percent had low knowledge on agricultural machineries and 25.69 percent of the farmers had high knowledge on agricultural machineries. Among 8 selected characteristics of the farmers 3 characteristics namely, agricultural extension contact, and education had positive significant contribution with their knowledge on agricultural machineries but constrained faced by the farmer in use of agricultural machineries had negative significant contribution with their knowledge on agricultural machineries.

CHAPTER I
INTRODUCTION

1.1 General Background of the Study

Bangladesh is predominately an agricultural country. Agriculture is the mainstay of the economy of Bangladesh. The economic development is inextricably linked with the performance of this sector. The country has a vast delta with a population of 166.50 million encompassing an area of 147,570 sq km (BBS, 2020). About 76.75 percent of total population of this country lives in rural areas (BBS, 2020). Agriculture provides employment to nearly about 45.01 percent of its total labor forces (BER, 2020). Agriculture occupies a key position in the overall economic sphere of the country in terms of its contribution to Gross Domestic Product (GDP). Broad agriculture sector which includes crops, livestock, fisheries and forestry contributes 13.35 percent to the Gross Domestic Product (GDP) as a whole in the FY 2019-20 (BER, 2020).

Agricultural mechanization implies the use of various power sources and improved farm tools and equipment's, for reducing the drudgery of the human beings and drought animals, enhancing the cropping intensity, precision and timeliness of efficiency in utilization of various crop inputs and reducing the losses at different stages of crop production. The term 'farm mechanization' is used as an overall description of the application of the variety of tools, implements, equipment, machinery, power and other mechanical inputs.

The objective of the farm mechanization is to enhance the overall productivity and production with the lowest cost of production. The contribution of agricultural mechanization has been well recognized in enhancing the production together with irrigation, biological and chemical inputs of the high yielding seed varieties, fertilizers, pesticides and mechanical energy. Evidence confirms that there is a strong correlation between farm mechanization and

agricultural productivity. States with a greater availability of farm power show higher productivity as compared to others.

Farm mechanization facilitates 5.22 percent enhancement in cropping intensity, increase in productivity to the extent of 12-34 percent, seed cum fertilizer drill facilitates 20 percent saving of seed and 15-20 percent saving in fertilizers. It increases 23.50 percent in gross income and return of the farmers (Pandey *et al.,* 2006).

Farm mechanization saves time and labour, cuts down crop production costs in the long run, reduces post-harvest losses and boots crop output and farm income. The level of mechanization of different operations in Bangladesh agriculture differs from operation to operation (Singh *et al.,* 2011).

Farm mechanization helps to enhance the overall productivity and production with the lowest cost of production. Farm mechanization can help in 15-20 percent saving in seeds, 15-20 percent saving in fertilizers, 5-20 percent increase in cropping intensity, 20-30 percent saving in time, 20-30 percent reduction in manual labour and 10-15 percent overall increase in farm productivity (Gautam and Kumar, 2014).

1.2 Statement of the Problem

A systematic evaluation study on utilization of farm mechanization by the farmers has not been undertaken till now. Also, very little information is available on knowledge and actual utilization of farm implements and machinery by the farmers in such areas of Bangladesh. All the farmers may not have sufficient knowledge about improved farm implements and may not utilize the improved farm implements at the same time and at the same rate. Mechanization in the country is always associated with some inherent drawbacks like, fragmented lands, poor buying capacity of farmers, lack of

quality machines for farm operation, inadequate knowledge of the users about machines and insufficient awareness building activities, tariff difference on machines and spare parts, financial and institutional constraints. Therefore, the researcher has undertaken the study titled “farmers’ knowledge on agricultural machineries”. In order to make the study manageable the following research questions were taken into consideration:

1. What were the selected characteristics of the farmers that influence their knowledge on agriculture equipment’s?
2. What was the extent of knowledge on agricultural machineries?
3. Is there any contribution of the farmers’ selected characteristics on their knowledge on agricultural machineries?

1.3 Objectives of the Study

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

I. To describe the selected socio-economic profile of the farmers;

II. To determine the extent of farmers’ knowledge on agricultural machineries; and

III. To explore the contribution among each of the selected characteristics of farmers with their knowledge on agricultural machineries.

1.4 Scope of the Study

To sum up, agricultural mechanization studies have shown that farm mechanization led to increase in inputs, increased agricultural productivity and profitability on account of timeliness of operations, better quality of work and more efficient utilization of crop inputs. Undoubtedly, farm mechanization displaced animal labour from 60-100%, but resulted in less time for farm work. Also, mechanization led to increase in the human labour employment for the on-farm and off-farm activities as a result of manufacture, repair, servicing and sales of tractors and improved farm equipments. Several studies have been

conducted on the impact of agricultural mechanization on production, productivity, cropping intensity, human labour employment, as well as, income generation. Different researchers have concluded that farm mechanization enhances the production and productivity of different crops due to timeliness of operations, better quality of operations and precision in the application of the inputs.

The studies regarding effect of agricultural mechanization on human labour employment have shown that agricultural mechanization helped in overall increase in the employment of human labour. The reduction in aggregate labour used on tractor operated farms was quite nominal (1.30-12 %) as compared to bullock operated farms. The increase in employment of casual male labour was reported to be up to 38.55 %. There was slight decline in the employment of casual labour. Different studies have also brought out that farm mechanization greatly helped the farming community in the overall economic upliftment (Verma, 2008).

Equipment for various operations like sowing, irrigation, plant protection, harvesting, threshing and other operations are generally being used by farming community. The fact, however, are those even small farmers utilize selected farm mechanization for efficient farm operations, through custom hiring. In Bangladesh though, this has been in the most uneven manner. Government efforts have mostly been confined to the promotion of manual and animal drawn tools and implements. Power drawn implements have also gained momentum due to the concerted efforts of the Government, credit institutions and industries.

1.5 Assumptions of the Study

An assumption has been defined as “the supposition that an apparent fact or principle is true in light of the available evidence” (Goode, 1945). An

assumption is taken as a fact or belief to be true without proof. So the following assumptions were in mind of the researcher while carrying out this study:

i) The respondents included in the sample were capable of furnishing proper responses to the questions of the interview schedule.

ii) Views and opinions furnished by the respondents were the representative views and opinions of the whole population of the study.

iii) The responses furnished by the respondents were reliable and they truly expressed their opinions on farmers' knowledge on agricultural machineries.

iv) The data collected by the researcher were free from bias.

v) The researcher who acted as the interviewer was well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished their correct opinions without any hesitation.

vi) The respondents had almost similar background and seemed to be homogenous to a great extent.

vii) The information sought by the researcher revealed the real situation to satisfy the objectives of the study.

viii) The findings were useful in choosing the clients as well as for planning execution and evaluation the extension programme.

1.6 Limitations of the Study

The present study was undertaken to have an understanding of the farmers' knowledge on agricultural machineries and to determine the contribution factors with selected characteristics of the farmers. Considering the time, money and other necessary resources available to the researcher and to make the study manageable and meaningful from the point of view of research, it becomes necessary to impose certain limitations. The limitations were as follows:

i. The study was confined in three unions of Sundarganj upazila under Gaibandha district.

ii. The study was restricted within the farmers who had some cultivable land under their own cultivation.
iii. The population for the study was kept confined to the heads of the family who regularly cultivated their land.
iv. There were many characteristics of the farmers but in the study only nine of them were selected for investigation.
v. For information about the study, the researcher depended on the data furnished by the selected respondents during their interview with him.
vi. Major information, facts and figures supplied by the respondents were applicable to the situation prevailing in the locality during the year 2020.

1.7 Definition of Related Terms

A researcher needs to know the meaning and contents of every term that he uses. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study defined are interpreted as follows:

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

Education: Education referred to the development of desirable knowledge, skill, attitudes, etc. of an individual through the experiences of reading, writing, observation and related matters.

Family size: It refers to the total number of individuals in the beneficiary's family.

Farm size: Farm size referred to the total area on which a farmer's family carries on farming operations, the area being estimated in terms of full benefit to the farmer's family.

Annual family income: Annual income referred to the total annual earnings of all the family members of a respondent from agriculture, livestock and fisheries and other accessible sources (business, service, daily working etc.).

Agricultural extension contact: Agricultural extension contact referred to an individual exposure to different information sources and personalities relate to agriculture for dissemination of new technologies.

Knowledge: knowledge referred to the extent of facts or information about an idea, object or persons knows. Regarding knowledge aspects knowledge occurs when an individual is exposed to technologies existence and gain some understanding of how it functions (Rogers, 1995).

Problem faced: Problem faced in practicing agricultural mechanization meant any difficult situation which require some actions to minimize. The term problem faced referred to different problem faced by the farmers during practicing agricultural machinery.

Respondents: Randomly selected people considered to be representative of the population are known as respondents. They are the people from whom a social research worker usually gets most data required for her research. In this study the respondents were the village level farmers.

Farmers: The persons who were involved in farming activities are called farmers. They participated in different farm and community level activities like crops, livestock, fisheries, other farming activities etc. In this study crop growers were treated as farmers.

Agricultural machinery: Agricultural machinery is machinery used in farming or other agriculture. There are many types of such equipment, from hand tools and power tools to tractors and the countless kinds of farm implements that they tow or operate. Diverse arrays of equipment are used in both organic and nonorganic farming. Especially since the advent of mechanised agriculture, agricultural machinery is an indispensable part of how the world is fed.

CHAPTER II
REVIEW OF LITERATURE

The researcher made an intensive search for available literature on the present study. The review was conveniently presented on the major objectives of the study. This chapter is divided into three major sections. The first section deals with concept of utilization. The second section deals with the relationship between farmers' knowledge on agricultural machineries with their selected characteristics. Third section deals with the conceptual framework of the study. It might be mentioned here that, despite frantic searches, no direct study could be identified on farmers' use of agricultural machineries. Therefore, available literatures' on studied related to farmers' use of agricultural machineries was only presented in this chapter.

2.1 Concept of utilization

"Machinery utilization as the actual use of machinery compared to the potential capacity. In particular, we focus on the number of machinery and working hours on the same scale and the same condition comparison by organization types. In agricultural engineering literature, utilization is often referred to as physical operating time on the field compared to total workable hours (Enache & Stampfer, 2015). According to Oxford dictionary "Utilization is the actual use of an idea, belief, or method as opposed to theories relating to it."

2.2 Relationship between selected characteristics of the respondents and their use of agricultural machineries

2.2.1 Age and knowledge

Ganorkar (1996) in his research on appraisal of factors affecting the acceptance and use of improved agricultural practices, found that age of the farmers was associated with acceptance of improved agricultural practices.

Jalak (2002) revealed that age of the farmers showed a negative and non significant relationship with their adoption of improved farm implements.

Joseph (2007) found that an average farmer with an average age of 44 years and with the other farmers characteristics would almost certainly (99.00 percent) adopt an EFTE. He also reported that regression coefficient for age was positive and statistically significant at the one percent level. The positive and significant contribution of age, suggests that adoption of IFTE was higher among older farmers than younger ones.

Patel (2007) revealed that age of the banana farmers had a negative and highly significant correlation with adoption of tissue culture raised grape cultivation technology.

Sharma (2010) found that there was a positive and non significant relationship between age and adoption of chilli technology by the farmers.

Sabi *et al.* (2014) revealed that age of the farmers showed a positive and significant relationship with their technological gap and adoption.

2.2.2 Education and knowledge

Singh (1983) reported that education of the respondents was positively and significantly related with the level of mechanization.

Bhatia and Singh (1991) concluded that education of the respondents showed a weak, positive but insignificant relationship with adoption level of selected agricultural engineering technologies.

Modak (1992) found that educational level of the farmers had favorable impact on adoption level of farmers.

Salunke (1994) inferred that education level of the farmers and adoption of improved implements was found positively significant.

Jalak (2002) inferred that education level of the farmers and adoption of improved implements was found positively significant.

Singh and Singh (2009) inferred that most important factors influencing production technology of vegetables were education and land holding of the farmers.

2.2.3 Family size and knowledge

Singh (1983) revealed that size of family of the respondents was significantly associated with level of mechanization.

Deshmukh (1991) concluded that size of family of the farmers showed a non significant association with the adoption of tractors.

Salunke (1994) reported that size of family of the farmers showed a non-significant relationship with adoption level of the farmers about improved farm implements.

Jalak (2002) revealed that size of family of the farmers showed a non-significant relationship with adoption level of the farmers about improved farm implements.

Joseph (2007) found that contrary to expectation, family size had a negative influence on the use intensity of IFTE. This suggested that farmers small family size used IFTE more intensively.

2.2.4 Farm size and knowledge

Tripathi (1963) found that larger the size of the farmers, greater was the adoption of improved farm implements.

Satapathy *et al.* (1973) found that the respondents possessed 6-10 acres of land were having comparatively more adoption of improved implements.

Singh (1983) found that size of the land holding of the farmers was positively and significantly related with adoption of farm mechanization.

Salunke (1994) concluded that size of the land holding exhibited significant and positive relationship with adoption of improved farm implements.

Jalak (2002) revealed that there was a significant and positive relationship between size of land holding and adoption of improved farm implements.

Joseph (2007) found that farm size and biological/chemical inputs made the greatest contribution toward level of adoption of IFTE. He also reported that the farm size had a positive and significant impact on the probability of adoption.

Reddy *et al.* (2009) in their study on, utilization pattern of power sources on productivity of groundnut and cotton dryland production systems, reported that the farm size of the farmers had direct influence on the use of mechanical and draft animal power among different farm groups of the farmers.

Singh and Singh (2009) inferred that most important factors influencing production technology of vegetables were the size of farm and education of the farmers.

Lohan *et al.* (2015) in their study on, farm power availability and mechanization in Punjab, inferred that farm mechanization was mainly dependent and correlated upon the size of land holding.

2.2.5 Annual income and knowledge

Tripathi (1963) found a positive relationship between annual income and adoption of improved farm implements.

Satapathy *et al.* (1973) found that the respondents with an annual income of 11500/- were having comparatively more adoption of improved implements.

Modak (1992) concluded that as the annual income increased, there was increase in the adoption of improved implements.

Salunke (1994) concluded that annual income of the farmers exhibited a non-significant and positive relationship with adoption of improved farm implements.

Jalak (2002) concluded that annual income of the farmers was a significant and positive relationship between annual income and adoption of improved farm implements.

Prasad *et al.* (2009) reported that mechanization was directly dependent on the economic condition of the lac growing farmers.

Reddy *et al.* (2009) in their study on, economical condition of the farmers had a direct effect on n the investment on crop production activities of groundnut and cotton production systems.

Tarde *et al.* (2010) inferred that the relationship between annual income of the small farmers and their adoption level of paddy cultivation technology was positive and significant.

2.2.6 Extension contact and knowledge

Kher *et al.* (1991) reported that mass media participation was positively and significantly associated with the level of adoption.

Jalak (2002) reported that source of information use by the farmers had a positive and significant relationship with adoption of improved farm implements.

Dange (2012) reported that mass media used by the sugarcane growers had a negative and significant correlation with adoption gap of mechanization.

2.2.7 Possession of agricultural implements and knowledge

Possession of the implements is the paternity or ownership of an implements for farming activities. If a person possess implements (like Tractor, power tiller, etc.), he / she will be able to perform framing operation easily through use it. No findings were noticed directly on this aspect to the researcher at the time of reviewing literature.

2.3 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 variable”. This study is concerned with the farmers’ knowledge on agricultural machineries. So, the use of agricultural machineries was the dependent variables of the study. Farmers’ knowledge on agricultural machineries and affected through interacting forces of many independent variables. It is not possible to deal with all the variables in a single study. After

consulting with the relevant experts and reviewing of past related literatures, nine selected characteristics of the farmers' were considered for the study as the independent variables, which might have contribution on use of agricultural machineries. Based on this discussion the conceptual framework of this study has been formulated as shown in figure 2.1.

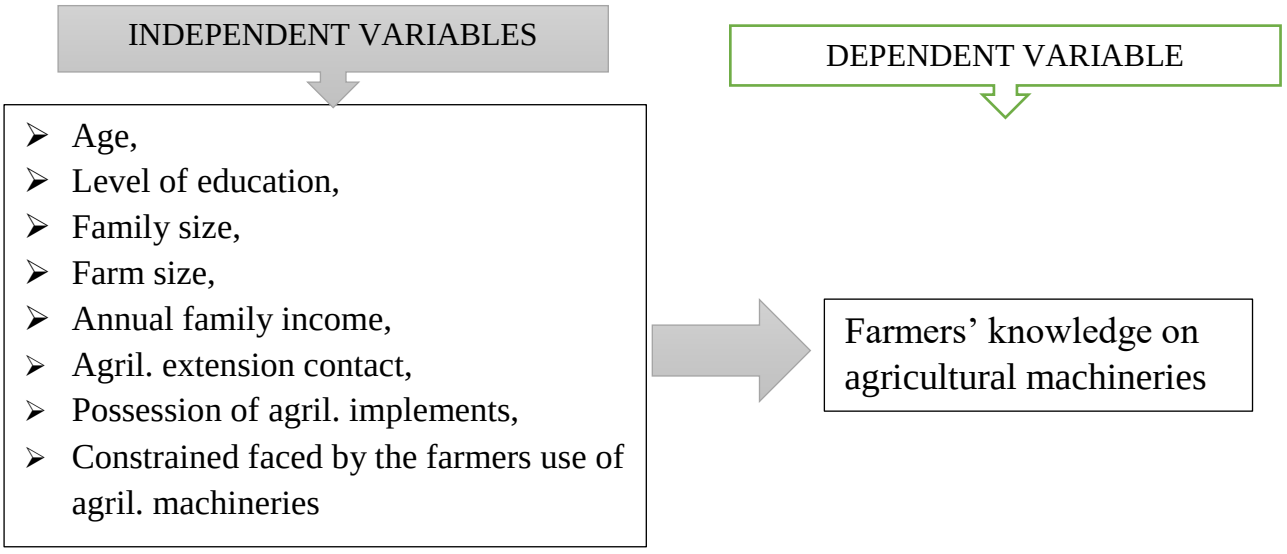

Figure 2.1: The Conceptual Framework of the Study

CHAPTER III
METHODOLOGY

Methodology enables the researcher to collect valid information. It is impossible to conduct research work smoothly without proper methodology and it is very difficult to address the objectives with a scientific manner. It requires a very careful consideration on the part of the researcher to collect valid and reliable data and to analyze the same for meaningful conclusion. A sequential description of the methodologies was followed in conducting this research work has been presented in this chapter.

3.1 Locale of the Study

The study was conducted in Shundhorganj Upazila under Gaibandha district. Out of 15 unions, six villages were selected purposively taking two villages from each of the unions. Sundarganj upazila has 15 unions and out of 15 unions three unions was selected randomly as the locale of the study. Sundarganj Upazila (gaibandha district) area is 426.52 sq km, located in between 25°24' and 25°39' north latitudes and in between 89°24' and 89°43' east longitudes. It is bounded by pirgachha, ulipur and chilmari upazilas on the north, gaibandha sadar and sadullapur upazilas on the south, Chilmari and char rajibpur upazilas on the east, Pirgachha, mithapukur and Sadullapur upazilas on the west. Population total is 398588; male 202270, female 196318; Muslim 363607, Hindu 34416, Buddhist 65, Christian 79 and others 421. A map of Gaibandha distric and Sundarganj Upazila are presented in Figure 3.1 and 3.2.

3.2 Population and Sampling Procedure

The study location was in Sundarganj upazila. Separate lists of farmers of the study villages were prepared by the researcher with the help of Sub-Assistant Agriculture Officer (SAAO) of Sundarganj Upazila agriculture Office. Total farmers of this area who are completely or partly involve in farm

mechanization were 905, which constituted the population of this study. Among 905 farmers, 109 farmers were selected following Yamane's formula (1967). Proportionate random sampling technique was used in order to select the respondents. An appropriate sample reserve list was determined to avoid the uncertainty related with the availability of sample during data collection. As indicated by Yamane's (1967) formula, the sample size was resolved as 109.

The formula is shown below:

$$n = \frac{z^2 P(1-P)}{z P(1-P)+N(e)^2}$$

Where,

n = sample size

N = population size

e = the level of precision (9%)

z = the value of the standard normal variable given the chosen (99%) confidence level (1.96)

p = the proportion or degree of variability (1-P)

Then 109 farmers were selected from the population by using proportionate random sampling technique. A reserve list of 11 (10% of total sample size) farmers was also prepared. Farmers in the reserve list were used only when a respondent in the original list was not available. The distribution of the sample farmers and those in the reserved list from the villages is shown in the table 3.1.

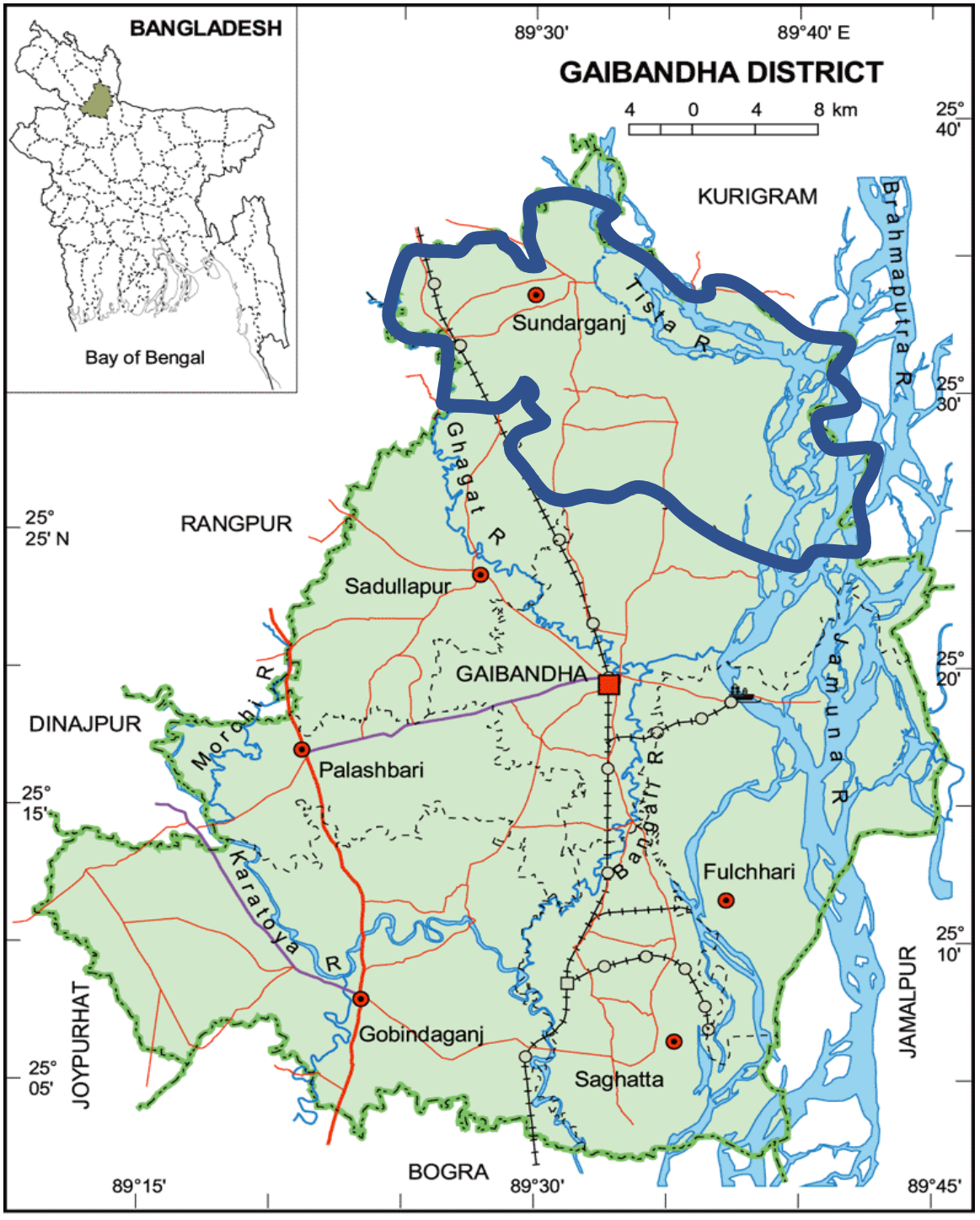

Figure 3.1: A map of Gaibandha District showing Sundarganj Upazila

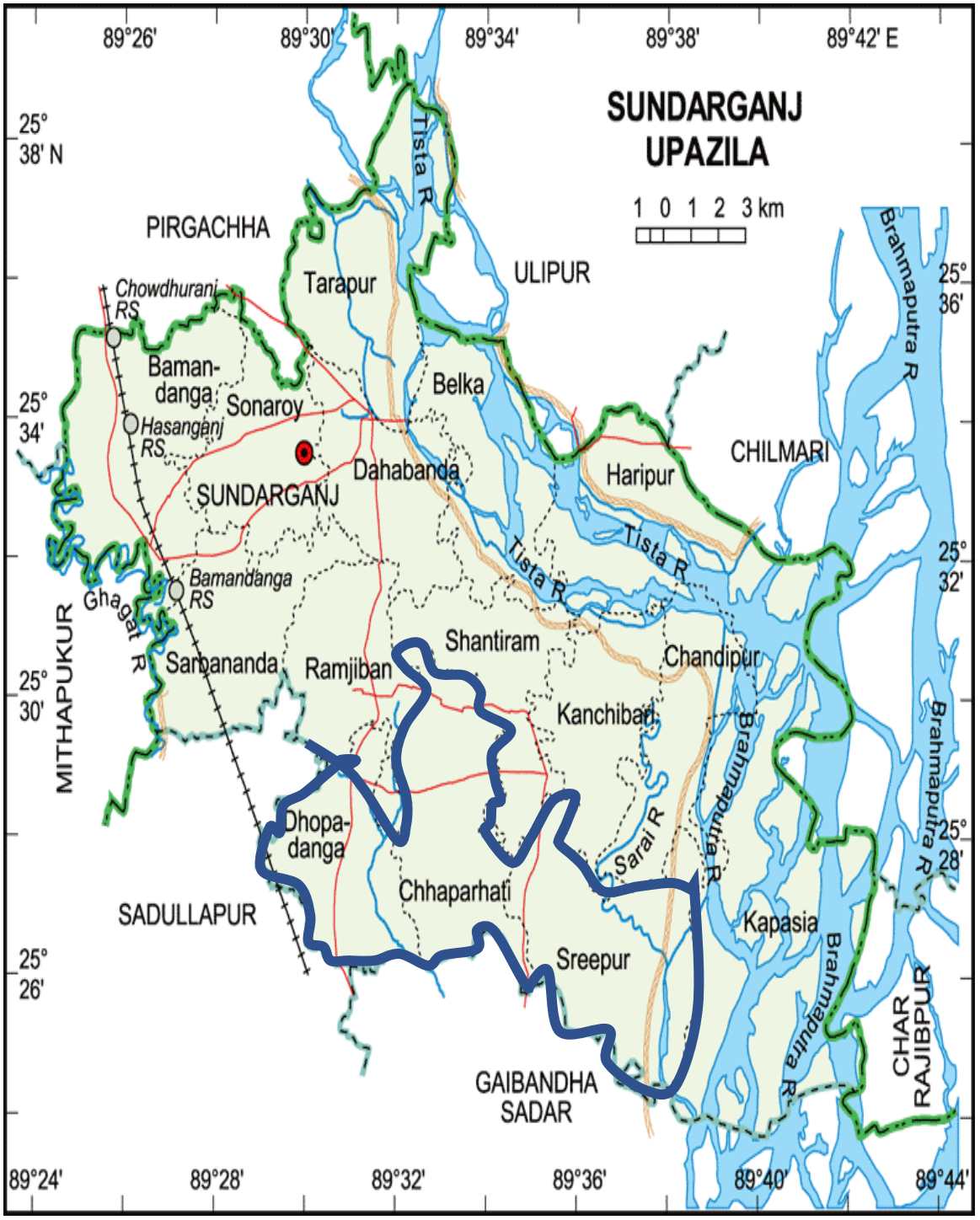

Figure 3.2: A map of Sundarganj Upazila showing the study area

Table 3.1 Distribution of population and sample of farmers of the selected villages

Name of the unions	Name of the villages	Population	Sample size	Reserve list
Chaparhati	Pacchim chaparhati	124	15	2
	purba chaparhati	150	18	2
Sreepur	Uttar shamash	166	20	2
	Dhokkin shamash	108	13	1
Dhopadanga	Uttar Razibpur	183	22	2
	Dhakkin Razibpur	174	20	2
Total		**905**	**109**	**11**

3.3 The research instruments

A well-structured interview schedule was developed based on objectives of the study. Direct and simple questions were exerted in open form and close form keeping in view the dependent and independent variables. Appropriate scales were developed to measure both independent and dependent variables.

The questionnaire was pre-tested with 15 farmers in actual situation before preparing the final draft. Necessary corrections, additions, alternations, rearrangements and adjustments were made in the interview schedule based on pretest experience. The questionnaire was then multiplied by printing in its final form. A copy of the interview schedule is presented into Appendix I.

3.4 Measurement of variables

The variable is a characteristic, which can assume varying, or different values in successive individual cases. A research work usually contains at least two important variables viz. independent and dependent variables. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationship to an observed phenomenon. A dependent variable is that factor which appears, disappears or varies as the researcher introduces, removes or varies the independent variable (Townsend, 1953). In the scientific research, the selection and measurement of variable constitute a significant

task. Following this conception, the researcher reviewed literature to widen this understanding about the natures and scopes of the variables relevant to this research. At last, 8 independent variables (the selected characteristics) and one dependent variable were selected for the study. The independent variables were: age, level of education, family size, farm size, annual family income, agril. extension contact, possession of agril. implements, and constrained faced by the farmers use in agril. machineries. The dependent variable of this study was the Farmers' knowledge on agricultural machineries. The methods and procedures in measuring these variables are presented below:

3.5 Measurement of independent variables

The 8 characteristics of the farmers mentioned above constitute the independent variables of this study. The following procedures were followed for measuring the independent variables.

3.5.1 Age

Age of a respondent was measured by the period of time from his/her birth to the interview and it was measured in terms of complete years on the basis of their response. A score of one (1) was assigned for each year age.

3.5.2 Level of education

Level of education was measured in terms of class passed by respondent. If a respondent received education from the school, their education was assessed in terms of year of schooling, i.e., one (1) score was given for one year of schooling. For example, if the respondent passed the final examination of class V, his/her education score was taken as 5. If the respondent had education outside school and the level of education was equivalent to class V of the school than his education score was taken as 5. Each illiterate person was given a score of zero.

3.5.3 Family size

The family size of a respondent was measured in terms of total number of members in his family including himself, spouse, children, brothers, sisters, parents and other person who jointly live and ate together.

3.5.4 Farm Size

The total farm size of a respondent referred to the total area of land, on which his family carried out farming operations, the area being estimated in terms of full benefit to the farmers. A farm was considered to have full benefit from the cultivated area either owned by him or obtained on lease from others and half benefit from the area which was either cultivated by him on borga or given others for cultivation on borga basis. The land possession was measured for each respondent in terms of hectare by using the following formula:

FS=A+B+ 1/2 (C+D) +E

Where,

FS = Farm size

A = Homestead area

B = Own land under own cultivation

C = Land given to others as borga

D = Land taken from others as borga

E = Land taken from others as lease

3.5.5 Annual family income

The term annual income refers to the annual gross income of a respondent himself and the members of his family from different sources. It was expressed in taka. In measuring this variable, total earning in taka of an individual respondent was converted into score. A score of one was given for every one thousand takas. The total annual income was determined by summing up of incomes from all the sources such as agriculture, business, jobs and labor wage etc.

3.5.6 Agricultural extension contact

Extension contact of a respondent was measured by respondent's extent of contact with communication channels used by extension services. The degrees of contact were 'regularly', 'often', 'occasionally', 'rarely', 'not at all' against suitable scores are assigned as 4, 3, 2, 1 and 0 respectively.

Degree of contact	Score
Regularly	4
Often	3
Occasionally	2
Rarely	1
Not at all	0

If the number of communication channels are eight (8), then an individual respondent can obtain highest score 28 and minimum score 0 (zero).

3.5.7 Possession of agricultural implements

Agricultural implements are normally owned by individuals, government, group of individuals, etc. ownership of the agricultural implements is the paternity or possession of a implements for agricultural farming activities. possession here means the act of owning. Possession of agricultural implements were measured on the basis of their spent for agricultural implements. Possession of agricultural implements were calculated in '000' taka.

3.5.8 Problem faced by the farmers in use of agricultural machineries

After thorough consultation with relevant experts, farmers and relevant a variable literature, 11 problems were selected related to use of agricultural machineries for the study. A list of 11 probable problems that farmers could face in different aspects were listed and asked to indicate the extent of their problem faced by the farmers in use of agricultural machineries. It was measured by using a four-point rating scale. For each problem score of 3, 2, 1 and 0 were assigned to indicate extent of problems as high, medium, low and

no problem respectively. The problems score was computed for each respondent by adding his/her scores for all 11 problems. The possible range of problem scores thus could be 0 and 33. A total score of 33 indicated highest problems in respect of use of agricultural machineries, while a score of 0 indicated no problems faced by the farmers in use of agricultural machineries.

To ascertain the comparison among the problem, Problem Faced Index (PFI) was computed using the following formula:

$PFI=P_h*3 + P_m*2 + P_l*1 +P_n*0$

Where,

PFI = Problem Faced Index

P_h= Percent of use of agricultural machineries having high problem

P_m= Percent of use of agricultural machineries having medium problem

P_l= Percent of use of agricultural machineries having little problem

P_n = Percent of use of agricultural machineries having no problem at all

Thus, PFI is an item which could range from 0 to 327, where 0 indicated no problem at all and 327 indicated high problem faced by the farmers in use of agricultural machineries.

3.6 Measurement of Dependent Variable

Knowledge on agricultural machineries was the dependent variable of the study. Knowledge refers to the ability of a respondent to recall or recognize items of information related to anything. It was measured based on knowledge on agricultural machineries. The knowledge on agricultural machineries was determined by computing a knowledge score based on the responses against 10 questions regarding knowledge on agricultural machineries. These statements were collected after thorough consulting with relevant experts reviewing of

existing literatures and searching websites. Each of the statements carried a full weight of 2 (two). For correct answer respondents was given full marks. If, the respondents are unable to provide the answer than he or she got zero mark. Thus, knowledge score of a farmer could range from 0 to 20, where '0' indicated no knowledge and 20 indicated highest level of knowledge on agricultural machineries. This variable appears in item number 8 in the interview schedule as presented in Appendix-I.

3.7 Statement of Hypothesis

As defined by Goode and Hatt (1952), "A hypothesis is a proposition which can be put to a test to determine its validity. It was seemed to be 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". A hypothesis simply means a mere assumption or some supposition to be proved or disproved. But for a researcher, hypothesis is a formal question that he intends to resolve. According to Kerlinger (1973), "A hypothesis is a conjectural statement of the relation between two or more variables. Hypothesis is always in declarative sentence form, and they relate either generally or specifically variables to variables". Hypothesis may be broadly divided into two categories, namely, research hypothesis and null hypothesis. In studying relationships between variables, an investigator first formulates research hypothesis which states anticipated relationships between the variables. However, for statistical test it becomes necessary to formulate null hypothesis. A null hypothesis states that there is no relationship between concerned variables.

The null hypothesis was developed in this study to explore the relationships between dependent and independent variables. There are eight independent variables and a single depended variable. The null hypotheses were formulated to explore the contribution each of the characteristics of farmers and their knowledge on agricultural machineries. Then null hypotheses were developed

in the following manner:

"There is no contribution of the selected characteristics of the farmers with their knowledge on agricultural machineries".

3.8 Data collection procedure

The researcher himself collected the data from the sample respondents through face-to-face contact with the help a pre-tested interview schedule. Whenever any respondent faced difficulty in understanding questions, more attention was taken to explain the same with a view to enabling the respondent's local opinion leaders to answer properly. No serious problem was faced by the investigator during data collection but obtained cooperation from the respondents. Data collection was started in 1st December, 2020 and completed in 31 December, 2020.

3.9 Data processing

For data processing and analysis, the following steps were followed:

3.9.1 Compilation of data

After completion of field survey all the interview schedule were compiled, tabulated and analyzed according to the objectives of the study. In this process all the responses in the interview schedule were given numerical coded values. The responses to the question in the interview schedule were transferred to a master sheet to facilitate tabulation. Tabulation was done on the basis of categories developed by the investigator himself.

3.9.2 Categorization of respondents

For describing the various independent and dependent variables the respondents were classified into various categories. In developing categories, the researcher was guided by the nature of data and general consideration prevailing on the social system. The procedures have been discussed while describing the variable in the sub-sequent sections of next chapter.

3.10 Statistical analysis

Data collected from the respondents were complied, coded, tabulated and analyzed in accordance with the objectives of the study. Various statistical measures such as frequency counts, percentage distribution, average, and standard deviation were used in describing data. SPSS (version 20.0) computer program were used for analyzing the data. The categories and tables were used in describing data. The categories and tables were also used in presenting data for better understanding.

For determining the contributions of the selected characteristics of the respondents' knowledge on agricultural machineries in selected area of Gaibandha district in Bangladesh, Multiple regressions analysis was used. Standardized Coefficients which are expressed in b. Five percent (0.05) level of probability was used as the basis for rejecting any null hypothesis.

3.11 Analytical Model

The specified regression model is used in the study to investigate the knowledge on agricultural machineries was as follows:

The model is explicitly specified as follows;

$$\mathbf{Yi = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + e}$$

Where:

Y_i = knowledge on agricultural machineries,

x_1 = the farmer's age,

x_2 = educational background,

x_3 = family size,

x_4 = farm size,

x_5 = annual family income,

x_6 = extension contact,

x_7 = possession of agril. implements,

x_8 = Constrained faced by the farmers in use of agril. machineries

On the other hand, b_1.....b_8 are regression coefficients of the corresponding independent variables, and "e" is random error, which is normally and independently distributed with zero (0) mean and constant variance.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter deals with the result and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. However, for convenience of the discussions, the findings are systematically presented in the following sections.

4.1 Characteristics of the Farmers

This section deals with the selected characteristics of farmers which were assumed to be associated with the use of agricultural machineries. Different farmers possess different characteristics which are focused by his/her behavior. In these section nine characteristics have been discussed. The selected characteristics of the farmers were; age, level of education, family size, farm size, annual family income, agricultural extension contact, possession of agricultural implements and constrained faced by the farmers use in agricultural machineries. Measuring unit, range, mean and standard deviations of those characteristics of farmers were described in this section. Table 4.1 provides a summary profile of farmers' characteristics.

Table 4.1 Characteristics profile of the respondents

Sl. No.	Characteristics (with measuring unit)	Range		Mean	Standard deviation
		Possible	Observed		
01	Age (years)	Unknown	25 – 65	40.32	8.76
02	Level of education (schooling years)	Unknown	0.0 – 16	7.49	5.26
03	Family size (number of members)	Unknown	2-7	4.17	1.12
04	Farm size (hectare)	Unknown	.17 - 2.45	1.08	0.57
05	Annual family income (‘000’BDT)	Unknown	30–450	166.86	80.36
06	Agricultural extension contact (Score)	Unknown	2–21	7.71	3.81
07	Possession of agricultural implements (‘000’BDT)	Unknown	1– 450	87.03	69.17
08	Constrained faced by the farmer (Score)	0 - 44	12–26	18.07	3.12

4.1.1 Age

Age of the respondents varied from 25 to 65 years, the average being 40.32 years with the standard deviation of 8.76. 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). The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Basis of categorization (year)	Respondents	
		Numbers	Percent
Young aged	Up to 35	38	34.86
Middle aged	36-50	57	52.29
Old aged	Above 50	14	12.84
Total		109	100

Data represented in Table 4.2 indicate that the middle-aged farmers comprised the majority proportion (52.29 percent) of the farmers followed by young old aged category (34.86 percent) and the lowest proportion were made by the old category (12.84 percent). Data also indicate that the young to middle aged respondents constitute almost 87.14 percent of total respondents. Ahmmed (2016) found almost similar findings.

4.1.2 Level of education

Education level of the respondents ranged from 0-16 in accordance with year of schooling. The average education score of the respondents was 7.49 with a standard deviation of 5.26. Based on their level of education, the respondents were grouped into five categories according to Hoque, 2016 and Masud, 2007 such as-, “Illiterate” (0.0.5), "Primary education" (1-5), "Secondary education" (6-10), “Higher secondary” (11-12) and “above higher secondary” (>12) as shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their level of education

Categories	Basis of Categorization (schooling years)	Respondents	
		Number	Percent
Illiterate	0-0.5	14	12.84
Primary	1-5	24	22.02
Secondary	6-10	35	32.11
Higher secondary	11 -12	26	23.85
Above higher secondary	Above 12	10	9.17
Total		109	100

Data shown in the Table 4.3 indicates that the highest proportion (32.11 percent) of the respondent was secondary level of education followed by primary education category (22.02 percent). On the other hand, the lowest proportion (9.17 percent) of the farmers was above higher secondary education category followed by higher secondary education category (23.85 percent) and 12.84 percent of the farmers was illiterate. Ahmmed (2016) and Hasan (2015) found almost similar findings.

4.1.3 Family size

The number of family members of the respondents ranged from 2 to 7 with an average of 4.17 and standard deviation of 1.12. Based on the family size the respondents were classified into three categories as small, medium and large family as shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their family size

Categories (No. of members)	Basis of categorization (No. of family member)	Respondents	
		Numbers	Percent
Small family	Up to 3	24	22.02
Medium family	4-5	74	67.89
Large family	Above 5	11	10.09
Total		109	100

Data furnished in the Table 4.4 indicated that the highest proportion (67.89 percent) of the respondents had medium family size consisting up to 3 members, while 22.02 percent of the respondents belonged to the category of small family compared to 10.09 percent of them having large family size. Ahmmed (2016) and Hasan (2015) found almost similar findings. Such findings are quite normal as per the situation of Bangladesh (BBS, 2020). The trend of nuclear family has been rising in the study area and subsequent the family member becoming smaller than the extended family.

4.1.4 Farm Size

Farm size of the respondents ranged from 0.17 hectare to 2.45 hectares with the mean of 1.08 and standard deviation of 0.57. On the basis of their farm size, the farmers were classified into three categories followed by DAE (1999) as shown in Table 4.5.

Table 4.5 Distribution of the farmers according to their farm size

Categories	Basis of categorization (ha)	Respondents	
		Number	Percent
Marginal farm	Up to 0.2	4	3.67
Small farm	0.2 – 1.0	54	49.54
Medium farm	1.01 – 3.0	51	46.79
Total		109	100

Data presented in the Table 4.5 demonstrated that highest proportion (49.54 percent) of the farmers had small farm compared to 3.67 percent having

marginal farm and 46.79 percent of the farmers had medium farm. The findings indicated that overwhelming majority (96.33 percent) of the farmers had small to medium farm size. In Bangladesh most of the farmers live on below a subsistence level. This in one of the vital reasons for not adopting improved farming practices in their farm as well as having lower skill on marketing practices.

4.1.5 Annual family income

Annual family income of the respondents ranged from 30 to 450 thousand taka. The mean was 166.86 thousand taka and standard deviation was 80.36. On the basis of annual family income, the respondents were categorized into three groups as shown in Table 4.6.

Table 4.6 Distribution of the farmers regarding annual family income

Categories	Basis of categorization ('000' BDT)	Respondents	
		Number	Percent
Low income	Up to 86	18	16.51
Medium income	87-246	72	66.06
High income	Above 246	19	17.43
Total		109	100

Data shown in Table 4.6 presented that the highest proportion (66.06 percent) of the respondents had medium family income while 16.51 and 17.43 percent of the respondents had low and high annual family income respectively. The gross annual family income of a farmer is an important indicator of how much s/he can invest in his farming. Generally higher income encourages one's integrity to achieve better performance and to show his/her individual better status in the society. The higher income increases the risk-taking capacity of the farmers' use of agricultural machineries. Farmers with low income generally invest less in their farms.

4.1.6 Agricultural extension contact

The observed extension contact scores of the farmers ranged from 2 to 21

against the possible range from 0 to 32, the mean and standard deviation were 7.71 and 3.81 respectively. Based on this score, the farmers were classified into three categories according to BRRI, 2015 which is presented in Table 4.7.

Table 4.7 Distribution of the farmers according to their extension contact

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Low extension contact	Up to 4	22	20.18
Medium extension contact	5-10	68	62.39
High extension contact	Above 10	19	17.43
Total		109	100

Data presented in the Table 4.7 showed that a proportion of 62.39 percent of the farmers had medium extension contact compared to 20.18 percent of them having low extension contact. Only 17.43 percent of the farmers had high contact. Thus, overwhelming majority (82.57 percent) of farmers had low to medium extension contact. Bhuiyan (2008) found almost similar findings. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies. The status of no or having low and medium contacts might have significant impacts on use of agricultural machineries.

4.1.7 Possession of agricultural implements

The observed possession scores of the farmers ranged from 1 to 450 thousand taka, the mean and standard deviation were 87.03 and 69.17 respectively. According to this score, the farmers were classified into three categories: “low possession” (up to 18), “medium possession” (19-156) and “high possession” (above 156). The distribution of the farmers according to their possession is shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their possession

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Low possession	Up to 18	16	14.68
Medium possession	19-156	84	77.06
High possession	Above 156	9	8.26
Total		109	100

Data presented in the Table 4.8 showed that above three-fourths (77.06 percent) of the farmers had medium possession of agricultural implements compared to 9.26 percent of them having high possession of agricultural implements and 14.68 percent of the farmers had low possession of agricultural implements. Thus, overwhelming majority (85.32 percent) of the farmers had medium to high possession of agricultural implements.

4.1.8 Constraints faced by the farmer

Constraint means the threat or use of force to prevent, restrict, or dictate the action or thought of others. Constraint defined by Matthew Arnold is the state of being checked, restricted, or compelled to avoid or perform some action. Constraint faced, therefore, refers to the extent to which individual faces restricted situations about which something needs to be done. The scores of constraints faced by the respondents ranged from 12 to 26 against the possible range of 0 – 33 with an average of 18.07 and standard deviation of 3.12. Based on this score, the farmers were classified into three categories according to Shamabadi, 2012 which is presented in Table 4.9.

Table 4.9 Distribution of the farmers according to constraint faced

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Low constraints	Up to 15	25	22.94
Medium constraints	16-21	66	60.55
High constraints	Above 21	18	16.51
Total		109	100.0

Data of Table 4.9 show that among the respondents the highest 60.55 percent of the farmers belong to the group of medium constraints faced and the lowest 16.51 percent of the farmers had high constraints faced followed by low constraints faced (22.94) percent of the farmers. Among the farmers, majority of them (83.49 percent) of the farmers had low to medium constraints faced in use of agricultural machineries. Hossain (2016) also found similar findings.

4.2 Knowledge on agricultural machineries

Knowledge on agricultural machineries score of the respondents ranged from 5 to 14 against the possible range of 0–20 having an average of 10.35 and standard deviation of 1.79. Based on the theoretical scores, the farmers were classified into three categories according to Vinod *et al.,* 2011 such as 'low knowledge', 'medium knowledge' and 'high knowledge'. The distribution of the respondents according to their knowledge on agricultural equipment's is given in Table 4.10.

Table 4.10 Distribution of the farmers according to their knowledge

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Low knowledge	Up to 9	23	21.10
Medium knowledge	10-11	58	53.21
High knowledge	Above 11	28	25.69
Total		109	100.0

Data of Table 4.10 show that majority (53.21 percent) of the respondents had medium knowledge category followed by 25.69 percent of the farmers had high knowledge category and 21.10 percent of the farmers had low knowledge. Among the farmers, majority of them (79.90 percent) of the farmers had medium to high knowledge on agricultural machineries. Farouk *et al.* (2015) found almost similar findings. Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding use of agricultural

machineries. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he may have to face in future. It makes individuals to become rational and conscious about related field. To perform optimum production and marketing, farmers should have adequate knowledge and skill on different aspects of cultivation.

4.3 Contribution of the Selected Characteristics of the Respondents to Their Knowledge on Agricultural Machineries

In order to estimate the knowledge on agricultural machineries, the multiple regression analysis was used which is shown in the Table 4.11**.**

Table 4.11 Co-efficient of multiple regressions analysis showing contribution of the selected characteristics of the farmers with their knowledge on agricultural machineries

Dependent variable	Independent variables	*B*	*SE B*	β	T	Sig.	R^2	Ad. R^2	F-ratio
Knowledge on agricultural machineries	Age	.003	.017	.018	.198	.844^{NS}	0.357	0.301	4.823
	Level of	.060	.029	.186	2.058	.042*			
	Family size	.037	.157	.026	.236	.814^{NS}			
	Farm size	.069	.299	.026	.231	.818^{NS}			
	Annual	.002	.002	.088	.842	.402^{NS}			
	Agricultural extension	.131	.047	.314	2.773	.007**			
	Possession of agricultural	.000	.003	.006	.059	.953^{NS}			
	Constrained faced by the	-.096	.045	-.202	-2.143	.035*			

NS Not significant; * Significant at 0.05 level of probability and ** Significant at 0.01 level of probability

Results presented in the Table 4.11 show that agricultural extension contact and education of the respondents had significant positive contribution with their knowledge on agricultural machineries but constrained faced by the farmer in use of agricultural machineries of the respondents had significant negative contribution with their knowledge on agricultural machineries. Of these,

agricultural extension contact and education were the most important contributing factors (significant at the 1% level of significant) and constrained faced by the farmer in use of agricultural machineries of the respondents were less important contributing factors (significant at 5% level of significant). Coefficients of other selected variables don't have any contribution on their knowledge on agricultural machineries.

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 $R^2 = 0.357$ means that independent variables account for 35.7% of the variation with their knowledge on agricultural machineries. The F ratio is 4.823 which is highly significant ($p<0$).

However, each predictor may explain some of the variance in respondents their knowledge on agricultural machineries simply by chanced. The adjusted R^2 value penalizes the addition of extraneous predictors in the model, but value 0.301 is still show that variance is farmers their knowledge on agricultural machineries can be attributed to the predictor variables rather than by chanced (Table 4.11). In summary, the models suggest that the respective authority should be considers the farmers' agricultural extension contact, education and constrained faced by the farmer in use of agricultural machineries of the farmers in knowledge on agricultural machineries and in this connection some predictive importance has been discussed below:

4.3.1 Significant contribution of agricultural extension contact to their knowledge on agricultural machineries

From the multiple regression, it was concluded that the contribution of agricultural extension contact to their knowledge on agricultural machineries was measured by the testing the following null hypothesis;

“There is no contribution of agricultural extension contact to their knowledge on agricultural machineries”.

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

a. The contribution of the extension contact was significant at 1% level (.007)

b. So, the null hypothesis could be rejected.

c. The direction between extension contact and knowledge on agricultural machineries was positive.

The β-value of extension contact was (0.314). So, it can be stated that as extension contact increased by one unit, farmers’ knowledge on agricultural machineries increased by 0.314 units.

Based on the above finding, it can be said that farmers had more extension contact increased farmers’ knowledge on agricultural machineries. So, extension contact has high significantly contributed to the farmers’ knowledge on agricultural machineries increased.

4.3.2 Significant contribution of education of the farmers to their knowledge on agricultural machineries

The contribution of education of the farmers to their knowledge on agricultural machineries was measured by the testing the following null hypothesis;

“There is no contribution of education of the farmers to their knowledge on agricultural machineries”.

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

a. The contribution of the education was at 5% significance level (.042).

b. So, the null hypothesis could be rejected.

The direction between education and knowledge on agricultural machineries was positive.

The β-value of level education is (0.186). So, it can be stated that as education increased by one unit, farmers' knowledge on agricultural machineries increased by 0.186 units.

Based on the above finding, it can be said that farmers' education increased the farmers' knowledge on agricultural machineries. So, education has significantly contributed to the farmers' knowledge on agricultural machineries. Education plays an important role to reduce problems in knowledge on agricultural machineries in many cases. Education enhances knowledge on many aspects such as training, participation, extension contact and so on.

4.3.4 Significant contribution of constrained faced by the farmer to their knowledge on agricultural machineries

From the multiple regression, it was concluded that the contribution of constrained faced by the farmer to their knowledge on agricultural machineries was measured by the testing the following null hypothesis;

"There is no contribution of constrained faced by the farmer to their knowledge on agricultural machineries".

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

a. The contribution of the constrained faced by the farmer was significant at 5% level (0.035)
b. So, the null hypothesis could be rejected.

c. The direction between constrained faced by the farmer and knowledge on agricultural machineries was negatives.

The β-value of constrained faced by the farmer was (-0.202). So, it can be stated that as constrained faced by the farmer increased by one unit, farmers' knowledge on agricultural machineries decreased by 0.202 units.

Based on the above finding, it can be said that farmers had higher constrained faced by the farmer decreased the knowledge on agricultural machineries. So, constrained faced by the farmer in use of agricultural machineries has high significantly contributed to the farmers' knowledge on agricultural machineries.

CHAPTER V
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

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 middle-aged farmers comprised the highest proportion (52.29 percent) followed by young old aged category (34.86 percent) and the lowest proportion were made by the old category (12.84 percent).

Education: The highest proportion (32.11 percent) of the respondent was secondary level of education followed by primary education category (22.02 percent). On the other hand, the lowest proportion (9.17 percent) of the farmers was above higher secondary education category followed by higher secondary education category (23.85 percent) and 12.84 percent of the farmers was illiterate.

Family size: The highest proportion (67.89 percent) of the respondents had medium family size consisting up to 3 members, while 22.02 percent of the respondents belonged to the category of small family compared to 10.09 percent of them having large family size.

Farm size: The highest proportion (49.54 percent) of the farmers had small farm compared to 3.67 percent having marginal farm and 46.79 percent of the farmers had medium farm.

Annual family income: The highest proportion (66.06 percent) of the respondents had medium family income while 16.51 and 17.43 percent of the respondents had low and high annual family income respectively.

Agricultural extension contact: The highest proportion 62.39 percent of the farmers had medium extension contact compared to 20.18 percent of them having low extension contact. Only 17.43 percent of the farmers had high contact.

Possession of agricultural implements: The highest proportion 77.06 percent of the farmers had medium possession of agricultural implements compared to 9.26 percent of them having high possession of agricultural implements and 14.68 percent of the farmers had low possession of agricultural implements.

Constraints faced by the farmer in use of agricultural machineries: The highest 60.55 percent of the farmers belong to the group of medium constraints faced and the lowest 16.51 percent of the farmers had high constraints faced followed by low constraints faced (22.94) percent of the farmers.

5.1.2 Farmers knowledge on agricultural machineries

Knowledge on agricultural machineries score of the respondents ranged from 5 to 14 against the possible range of 0–20 having an average of 10.35 and standard deviation of 1.79. The majority 53.21 percent of the respondents had medium knowledge category followed by 25.69 percent of the farmers had high knowledge category and 21.10 percent of the farmers had low knowledge.

5.1.3 Contribution of the selected characteristics of the respondents to their knowledge on agricultural machineries

Among eight selected characteristics of the farmers three characteristics namely, agricultural extension contact, education and constrained faced by the farmer in use of agricultural machineries of the respondents had significant positive contribution with their knowledge on agricultural machineries but constrained faced by the farmer in use of agricultural machineries of the respondents had significant negative contribution with their knowledge on

agricultural machineries and the rest five characteristics namely, age, family size, farm size, annual family income, and possession of agricultural implements of the farmers had no significant contribution with their knowledge on agricultural machineries.

5.2 Conclusions

Following conclusions were drawn on the basis of findings, logical interpretation and other relevant facts of the study:

1. Among the farmers, the majority 53.21 percent of the respondents had medium knowledge category followed by 25.69 percent of the farmers had high knowledge category and 21.10 percent of the farmers had low knowledge. Therefore, it may be concluded that there is scope to increase the extant of knowledge on agricultural machineries by the farmers.
2. Almost 85.32 percent of the farmers had medium to high extension media contact. Findings expressed that extension media contact of the farmers had significant positive contribution with their knowledge on agricultural machineries. So, it may be concluded that if the farmer come in more contact of extension provider, electronics, and printed media, they will face less problems in knowledge on agricultural machineries.
3. About 12.84 percent of the farmers were illiterate. There existed a positive significant contribution with their knowledge on agricultural machineries. Therefore, it may be concluded that an appreciable proportion of the farmers will not continue to face problems in use of agricultural machineries, if suitable steps are taken to remove illiteracy from the farmers.
4. Constraints faced by the farmers in use of agricultural machineries showed negative significant contribution with their knowledge on agricultural machineries in the study area. About 83.49 percent of the farmers had low to medium constraints faced by the farmers in use of

agricultural machineries. This means the lower the constraints faced by the farmers; the higher be their knowledge on agricultural machineries.

5.3 Recommendations

Recommendations based on the findings and conclusions of the study have been presented below:

5.3.1 Recommendation for policy implication

1. The level of knowledge on agricultural machineries was encouraging. However, there is a need of efforts for even wide knowledge on agricultural machineries by the farmers. So, it may be recommended that favorable initiated taken by the concerned authorities like DAE, BADC and other private providers may lead to more knowledge on agricultural machineries by farmers.

2. The findings extension media contact had a significant positive contribution with their knowledge on agricultural machineries. So, it may be recommended that the extension workers of the concerned authority should increase the contact with farmers personally and motivate them to be connected with electronic and printed media that can help them to exchange related information which will reduce their problems in use of agricultural machineries and thereby knowledge on agricultural machineries will increased.

3. The findings of the study indicated that education had significant positive contribution with their knowledge on agricultural machineries. Therefore, it may be recommended that the concerned authorities should take the special mass education program for the illiterate and low lettered farmers for solving their problems in knowledge on agricultural machineries.

4. Constraints faced by the farmers in use of agricultural machineries of the farmers had significant negative contribution with their knowledge on agricultural machineries. It is a fact that if constraints faced by the farmers in

use of agricultural machineries will increased, farmers' knowledge on agricultural machineries will be decreased.

5.3.2 Recommendations for further study

1. The study was conducted on the farmers of only one selected area of Sundarganj upazila under Gaibandha district. Finding of the study need verification by similar research in other areas of the country including areas where knowledge on agricultural machineries is yet to get popularity.

2. Contributions of nine characteristics of farmers with their knowledge on agricultural machineries have been investigated in this study. Further research should be conducted to find out contribution of the other personal characteristics of the farmers with their others problems.

3. In addition to knowledge on agricultural machineries, those might have other factors relative to their social, economic, housing, sanitation, nutrition and domestic etc. Therefore, it may be recommended that research should be conducted relation to other factors of the farmers.

4. Research should also be undertaken to identify the factors causing hindrance knowledge on agricultural machineries. Further research should be taken related to other issues.

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APPENDIX-A

(English version of the interview schedule)

Department of Agricultural Extension and Information System

Sher-e-Bangla Agricultural University

Dhaka-1207

Interview schedule for the data collection for the research on

Farmers' knowledge on agricultural machineries

Sl. No. ……. Date: ……..

Name of the respondent:

…….....

Address:

Village: ……... Union: ……..

Upazila: …….. District: ……

Please answer the following question:

1. Age: How old are you? .....

2. Level of Education: Please mention your educational status.

a. I don't know how to read and write ()

b. I can sign only ()

c. I have studied up to class…….

3. Family Size

Please mention the number of your family members including yourself. (…….. persons)

4. Farm size: Please mention your land possession size.

Sl No.	Types of land use	Land area	
		Local unit	Hectare
1.	Homestead area (A)		
2.	Own land under own cultivation (B)		
3.	Given to others as borga (C)		
4.	Taken from others as borga (D)		
5.	Taken lease from others(E)		
	Total=A+B+1/2(C+D)+E		

5. Annual family income: Please mention your annual family income.

Sl. No.	Source of Income	Amount (Tk)/year
1	Agriculture	
2	Fisheries	
3	Livestock	
4	Forestry	
5	Business	

6	Service	
7	Others	
Total		

6. Agril. Extension contact:
Please mention the extent of your contact with the following extension media.

Sl. No.	Sources (of information)	Extent of contact				
		Regularly (4)	**Often (3)**	**Occasionally (2)**	**Rarely (1)**	**Never (0)**
1	Model farmers	>5 times or more/ month ()	4-5 times /month ( )	2-3 times/ month ( )	Once/ month ()	Never ()
2	Agril. Input dealers	>5 times or more/ month ( )	4-5 times /month ( )	2-3 times/ month ( )	Once/ month ( )	Never ()
3	Agril. NGO workers	3 times or more/ month ( )	1-2 times /2 month ( )	1-2 times/3 month ( )	Once/ Quarter ( )	Never ()
4	Sub-Assistant Agricultural Officer (SAAO)	2 or more times/ month ( )	1-2 times /2 month ( )	1-2 times/3 month ( )	Once/ Quarter ( )	Never ( )
5	Upazilla level Agricultural Officers/AEO	>5 times or more /year ()	4-5 times/ year ()	2-3 times/ year ()	Once/ year ()	Never ()
6	Mass media (Television program/Radio)	>5 times or more/ month ()	4-5 times /month ()	2-3 times/ month ()	Once / month ()	Never ()
7	Farm Publications (e.g.Krishi katha, poster, leaflet)	>5 times/ year ( )	4-5 times/ year ( )	2-3 times/ year ( )	Once/ year ()	Never ()
8	Mobile phone/Internet / Call Centre, etc.	1-2 times/ week ( )	1-3 times/ Month ( )	1-3 times/ season ( )	1-3 times/ 6 month ( )	Never ()

7. Possession of Agril. Implements: Please mention your possession of farming Agril. implements.

Sl. No.	Implements	Value ('000' Tk)
1	Tractor	
2	Power tiller	
3	Fertilizer drill	
4	Power weeder	
5	Sprayer	
6	Irrigation machine/ Electric motor	
7	Seed cum Fertilizer Drill	
8	Seed drill machine	

9	Leveller	
10	Combine harvester	
11	Power thresher	
12	Peddle thresher	
13	Grain winnower	

8. Constrained faced by the farmer

What are the problems do you face during to use Agricultural Machineries?

Sl. No.	**Problems**	**Extent of problems**			
		High (3)	**Medium (2)**	**Low (1)**	**Not at all (0)**
1	High cost of agril. Machineries				
2	Not useable in small farm land				
3	Maintenance cost high in case of repairing				
4	Unsuitable for cultivating all type crops				
5	Limited scope of modernization the Agril. Equipments				
6	High price of diesel, lubricant oil etc.				
7	Weather related issues (operating wet, muddy etc.) causes the hamper of spoiled machinery equipments				
8	Unavailable of skilled person for repairing/operating or lack training can result in abused machinery & costly breakdown				
9	Inadequate govt. assistance				
10	Lack of viability of Agril machineries/equipments				
11	Lack of information on Agril. equipments				

9. Farmers' knowledge on agriculture equipment's: Please mention your level of knowledge of using the following agriculture equipment's.

Sl. No.	**Statements**	Knowledge	
		Full Mark (2)	**Obtain Mark**
1	Mention two machineries name that is used in land preparation & sowing		
2	Mention two major problems to adopt farm machinery		
3	State two major functions of diesel engine?		
4	Mention two sprayer names		
5	State two precautions of spraying		
6	Mention two major functions of thresher?		
7	Mention two disadvantages of agricultural mechanization		
8	Mention two major functions of combine harvester		

9	Mention two machineries name that is used in harvesting & post harvesting		
10	Mention two company that is worked with Agricultural Mechanization?		

Thank you for nice co-operation

Signature of the Interviewer :…….

Date:…….