FARMERS' INNOVATIVENESS TO USE MODERN AGRICULTURAL MACHINERIES UNDER PANCHBIBI UPAZILA, JOYPURHAT

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DHAKA-1207

DECEMBER, 2021

FARMERS' INNOVATIVENESS TO USE MODERN AGRICULTURAL MACHINERIES UNDER PANCHBIBI UPAZILA, JOYPURHAT

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Reg. No. 19-10376

A thesis

Submitted to the faculty of Agriculture

Sher-e-Bangla Agricultural University, Dhaka,

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE (MS)

IN

AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

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This is to certify that thesis entitled, **"FARMERS' INNOVATIVENESS TO USE MODERN AGRICULTURAL MACHINERIES UNDER PANCHBIBI UPAZILA, JOYPURHAT"** *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.* **19-10376** *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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To

My

Beloved Family

ACKNOWLEDGEMENT

All praises are due to almighty the merciful Allah, who enabled the researcher to complete the study successfully. Guidance, help and co-operation have been received from several persons or authority during the tenure of the study, the author is immensely grateful to all of them.

The author with a sense of respect, expresses his heart felt gratitude to his Supervisor Professor Md. Abul Bashar, Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka for his untiring and painstaking guidance, innovative suggestions, continuous supervision, timely instructions and inspirations throughout the tenure of research work.

Heartfelt gratitude and profound respect are due to his Co-supervisor Professor Md. Mahbubul Alam, Ph.D., Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultural University, Dhaka for his constructive criticism, valuable suggestions and co-operation throughout the study period.

The author also expresses his profound respect and sincere gratitude to the chairman, Professor Mohammad Zamshed Alam and all other teachers of Department of Agricultural Extension and Information System, Sher-e-Bangla Agricultura University, Dhaka for their co-operation and suggestions.

The author is also grateful to the Upazila Agriculture Officer and the Agriculture Extension Officer for rendering co-operation during the field work. Special thanks are due to farmers, who were the respondents of the study area an gave their valuable time for interview during collection of data. Last but not the least, author expresses the deepest sense of gratitude and profound respect to his beloved parents, brothers, sisters, relatives and friends for their help and inspiration during the period of the study.

The Author

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LIST OF ABBREVIATIONS AND GLOSSARY

BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau Statistics
et.al.	All Others
GDP	*Gross domestic product*
GoB	Government of Bangladesh
GoS	Grade of Service
IAR4D	Integrated Agricultural Research for Development
IPM	Integrated Pest Management
LLP	Low Lift Pump
MOA	Ministry of Agriculture
NGO	non-governmental organization
SPSS	Statistical Package for Social Science

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ABSTRACT

The objectives of this study were to describe the selected socio-economic characteristics of the farmers, determine innovativeness of the farmers to use modern agricultural machineries and explore the relationships between farmers' selected socio-economic characteristics and their innovativeness of using agricultural machineries. Data were collected from ninety-one (91) randomly selected farmers from Balighata union of Panchbibi upazila under Joypurhat district by using structured interview schedule. It is showed that slightly above than three-fourth (78.0 percent) of the farmers had medium innovativeness as compared to 12.1 and 9.9 percent having low and high innovativeness respectively on modern agricultural machineries. Co-efficient of correlation (r) analysis revealed that farmers' farm size, area under agricultural mechanization, annual family income, training experience, extension media contact and number of machineries used had significant positive relationship with their innovativeness. However, age, education, family size and organizational participation had no significant relationships to their innovativeness of using modern agricultural machineries. The findings may help to formulate policies towards increase of the use of machineries in modernizing agricultural farming practice.

Chapter I
INTRODUCTION

1.1 Background of the Study

Bangladesh, a country that covers an area of 147,570 square kilometer, is one of the predominantly agro -based developing countries in the world. After independence, the agriculture sector was Bangladesh's main economic driving force. Its contribution to GDP was around 60 percent. Agriculture in Bangladesh is vital for people's livelihood, employment, and contributing to GDP; we all know that. Its contribution has reduced over the last decade, going from 17 percent in 2010 to 12.6 percent in 2020. The sector is at the center of our economy, decreasing poverty and ensuring food security. However, with the ever-growing population, going from 147.6 million in 2010 to 164.7 million in 2020, added by the blow of the pandemic and climate change, the sector has continued to be resilient in terms of profitability and productivity. Agriculture of Bangladesh is characterized by overwhelmingly small holdings due to higher population density and nearly 80 percent of its population residing in the rural areas coupled with unabated land fragmentation due to the inheritance laws of the country (Rahman *et.al* 2011).

In recent years, Bangladesh has increased its agricultural modernization initiative. It is still in a pretty early stage of development. The utilization of mechanical agricultural power has quickly increased over the past 20 years. Due to the more than 1.5 million diesel and electric-driven pumps that lift ground and surface water, irrigation is now essentially totally mechanized. According to recent survey reports, power tillers and tractors were used to till about 80% of the land in 2011, and marginal farmers had equal access to these tools thanks to private contractor services. The mechanization of weeding, fertilizer application, spraying, harvesting, threshing, drying, and transporting tasks has also made good progress. Rice hullers and mills have replaced the long hours that women once spent processing rice with the foot-operated "dheki." Without a doubt, Bangladeshi farmers and rural business owners will further mechanize some of these processes horizontally to lower costs and boost production through timely execution. This essay discusses the development of the machinery and spare parts sector, the promotion of agri-machinery in Bangladesh, and trends in agricultural mechanization.

Promotion of custom field equipment rental services and the creation of remotely controlled, low-powered gadgets are also addressed as potential future tactics for cutting costs and human input energy. The government's current mechanization initiatives and policies have been carefully examined in light of the expanding and complex agricultural mechanization.

Mechanization is an operative process through which improved agricultural activities and optimum crop production can be achieved. Currently, the mechanical inputs were used in different farming activities in Bangladesh like as pump, power tiller, subsoiler, weeder, sprayer, combine harvester and thresher for sustainable crop production The cropping intensity and production of crops have recently been increased significantly due to the adoption of mechanized tillage, irrigation, and spraying practices (Rahman, 2018). The main reasons for transformation on to the power source for crop production are potential to expand the cultivation area, ability to maximize production potential, multi-functionality of power applications, compensation for seasonal labor shortages and reduction of the drudgery (FAU,2014).

To keep economic consistency over the shitting of manpower from agriculture to service and industry, it requires tilling up the labor gap in agricultural operations by mechanical interventions (Islam et al., 2016). There is a substantial contribution of mechanization in agricultural operations that made it possible to release agricultural laborers to get into other high-income professions (i.e., business or service). The application of farm mechanization will adversely affect the labor requirement, which will adversely affect the exiting unemployment situation. However, at the same time it is argued that the application of mechanization will boost up the Overall productivity and production with the lowest cost of production (Aurangzeb et al., 2007)**.**

While past efforts on agricultural mechanization in less developed and developing countries had received many criticisms because of some negative consequences deemed anti-developmental Such as labor displacement, indivisibility problem of capital investments and sustainability of government subsidies arguments, mechanization contributed significantly to the industrialization of the more developed economies (Kishida, 2006). Agricultural mechanization is an essential component of agricultural development, which is, regarded a necessary condition for industrialization However, in Bangladesh, mechanization is more likely to decrease labor demand when it enables

more land to be cultivated because of potential production cost savings and reduction in drudgery by substituting manual labor and traditional tools with efficient machineries (Mottaleb et al, 2016). The government of Bangladesh (GoB) has tended encourage mechanization as an avenue to increase rice production and move towards rice self-sufficiency. To facilitate this process, the GoB voluntarily reduced import restrictions and tariffs on select machineries, while also Supplying subsidies to help purchasers offset fixed costs. The GoB first introduced irrigation pumps and tractors in the 1960s (Ahmed, 2001). Four-wheel tractors were initially promoted, which are arguably scale-inappropriate in Bangladesh given the small average farm size at around 0.53 hectares, which is often divided into multiple fields (Hossain et al., 2007), making demand aggregation tor tillage services among farmers, and between-field and -farm transport of tractor equipment problematic.

Farm operations require energy that needs to be supplied either by traditional or mechanized sources. Farm power availability has been adopted as an index to indicate the development of the farming sector in a country. The farm power availability in agriculture also indicates the degree of farm mechanization. The average farm power use in Bangladesh is shown in Figure 1.1. As seen here, the power use in agricultural activities increased from about 0.3 kW/ha in 1960 to 1.82 kW/ha in 2015 (Fig-1.1). The availability of farm power was very low during the early nineties but sharply increased during the later parts (by 8%) due to the changes in government policies (e.g., tax exemption).

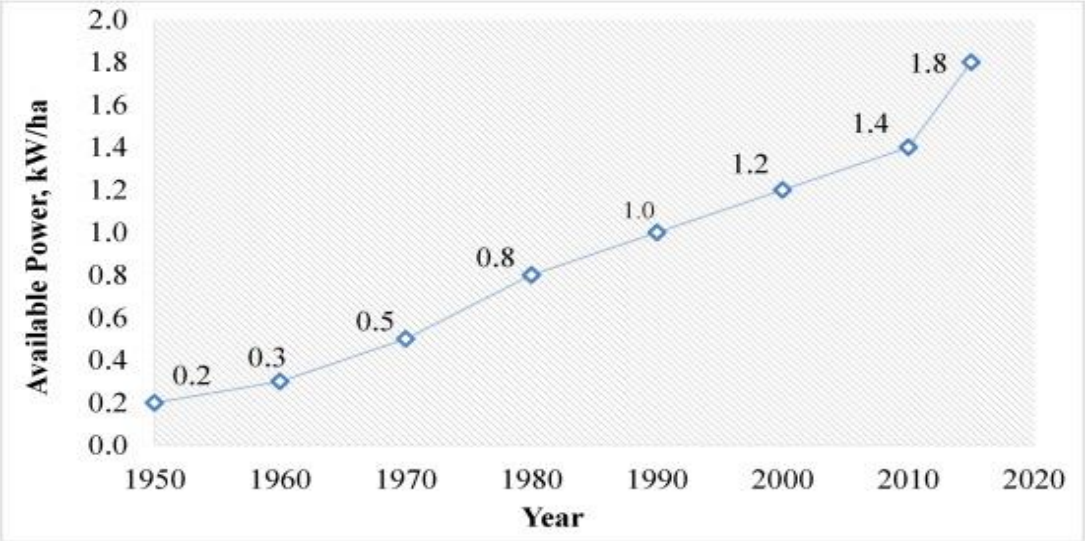


Figure 1.1 Farm power (kW/ha) used in the agriculture sector of Bangladesh (A.K.M.S. Islam, Status of rice farming mechanization in Bangladesh, J. Biosci. Agric. Res. 17 (1) (2018) 1386–1395)

At present, 80% land is prepared by power tiller and 18% by tractor or 2 WTs and/or 4 WTs (lslam, 2018**).** 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 are 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 land holdings, many farmers who own agricultural machines opt for hiring out these machines in addition to operating ton their own land **(**Biggs & Justice, 2015, Kienzie 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). One of the strategies can make double farm production per acre by 2030, for which further mechanization of agricultural processes, particularly harvesting, transplanting and packaging, is a considerable indicator. Table 1.1 presents the existing scenario of agricultural machinery available in Bangladesh.

Table 1.1: Present status of agricultural machinery in Bangladesh.

Name of machine	Quantity, no.	Source
Diesel engine	25,00,000	MoA, 2016
Power tiller	7,00,000	Ahmed, 2014
Tractor	60,000	Ahmed, 2014; Kabir, 2014
Seeder	5,000	Wohab, 2012
Rice transplanter	300	Islam, 2016
Weeder	2,50,000	Ahmed, 2014
Granular urea applicator	800	Ahmed, 2014
Prilled urea applicator	18,000	MoA, 2016
Sprayer	13,00,000	Ahmed, 2014
Reaper	500	Ahmed, 2014
Combine harvester	130	Ahmed, 2014; Kabir, 2014
Open drum thresher	1,50,000	MoA, 2016
Closed drum thresher	2,20,000	MoA, 2016
Winnower	3000	Ahmed, 2014
Power driven pump	1,67,175	MoA, 2016
Deep tube well	35,566	MoA, 2016
Shallow tube well	15,48,711	MoA, 2016

1.2 Statement of the Problem

Agriculture of Bangladesh is characterized by overwhelmingly small holdings due to higher population density and nearly 80 percent of its population residing n the rural areas coupled with unabated land fragmentation due to the inheritance laws of the country (Rahman et al, 2011). The farmers must grow more food within the limited land resources to meet the growing demand. The country aims at increasing productivity to achieve food for raising demand and establish social security of this growing population (Anon, 2015). The agricultural labor force followed decreasing trend (48.3 % in 2002-03 and 40.6 % in 2016-17) due to shifting low Productivity to high productivity sector (Anon, 2018). As a consequence, the availability of agricultural labor force become very limited and cost of crop farming increase with the hike in the wages of labor leading to decrease revenues to the farmers in accessibility of laborers during cultivation period compelled the farmers to delay in harvesting which results in

yield loss, sometimes sustained total loss of field crops due to environmental disaster. It also obstructs the land preparation and sowing operations for the next crop.

The key plank of modern agriculture is agriculture mechanization. Many developed countries modernized by Using agriculture mechanization, which resulted in massive production and productivity increases. However, the circumstances under which it was introduced in those countries vary significantly from Bangladesh context. Mechanization in Bangladesh is always linked with some inherent drawbacks like, fragmented lands, poor buying ability of farmers, lack of quality machines for farm operation, insentient knowledge of the users about machines and the inadequate consciousness building activities. Two of the most crucial situations where the short of labor and large size of farm. But as the stress of population on land is increasing gradually, the solution lies in mechanizing agriculture, which would achieve the goal of reaching targeted food gains production in Bangladesh. The researcher attempted the present study to seek answer to the following research questions:

1. What were the selected socio-economic characteristic of the farmers?

2. What were farmers' innovativeness to use modern agricultural machineries?

3. What were the relationships between selected socio-economic characteristics of the farmers and their innovativeness of using agricultural machineries.

1.3 Specific Objectives of the Study

1. To describe some selected socio-economic characteristics of the farmers.
2. To determine innovativeness of the farmers to use modern agricultural machineries.
3. To explore the relationships between farmers' selected socio-economic characteristic and their innovativeness of using agricultural machineries.

1.4 Justification and Scope of the Study

The nation is currently on the verge of becoming self-sufficient in the production of cereal. This is because irrigation technology has advanced and other agricultural processes have partially been mechanized. However, an additional 5 million tons of food grain must be generated from the steadily shrinking agricultural lands in order to meet the country's food needs in 2015. There is no better way to meet this goal than to enhance crop intensity and productivity per unit of land. The most significant benefit will therefore be the quicker development of agricultural mechanization as well as variety development in order to boost production and cropping intensity. It is necessary to establish and expand efficient mechanized farming to replace the conventional ineffective agricultural implements. The good news is that the government has already attributed due importance to agricultural mechanization in the National Agricultural Policy (MOA, 2013). In the Policy (Draft 5) it is included that "The Government will encourage production and manufacturing of agricultural machinery adaptive to our socio-economic context. Manufacturing workshops and industries engaged in agricultural mechanization activities will be provided with appropriate support." Government and non-government organizations are currently putting effort and allocating resources for increasing uses of agricultural machinery and also encouraging both rural and urban people to adopt and practice agricultural machinery. So, evaluation of knowledge, attitude and utilization of the concerned farmers is necessary for the further development of agricultural mechanization in Bangladesh.

Panchbibi Upazila under Joypurhat District had high scope of agricultural mechanization, availability & fertility of lands, investigator's familiarity of the area and favorable language and culture of the people. Considering the above fact, the researcher felt a necessity to undertake a study to determine the innovativeness of the farmers on modern agricultural machineries under Panchbibi Upazila, Joypurhat.

1.5 Assumptions of the Study

An assumption is the supposition that an apparent fact or principle is true in the light of the available evidence (Goode, 1945). In this study, the following assumptions were taken into consideration while undertaking this study.

1. The participants who were chosen for this study were competent enough to reply well to the interview schedule's questions.
2. The respondents' thoughts and points of view were indicative of all the farmers in that region.
3. The respondents' responses were valid and trustworthy.
4. The researcher's data was impartially gathered.
5. The researcher who was conducting the interviews was acclimated to the local culture and environment. As a result, there was no bias in the information gathered from the respondents.
6. The research's broad conclusions will apply to other regions of the nation that have the same socioeconomic, cultural, and personal circumstances as the study location.
7. Data were normally and independently distributed.
8. 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

Considering the time, money, and other resources available to the researcher and to make the study meaningful, it became necessary to impose certain limitations as noted below:

1. The research was conducted to a confined area of Balighata union of Panchbibi upazila under Joypurhat district.
2. The characteristics of the respondents' farmers in the study area were many and varied but only 10 characteristics were selected tor examining their contribution on use of agricultural machinery.
3. Data were gathered from the selected farmers furnished by them from their recollection during interview.
4. For some cases, the researcher faced unexpected interference from the over interested side-talkers while collecting data from the target populations.

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 several key terms used through the study are defined below

Farmers: They are the persons who were involved in farming activities. 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.

Age: Age of a farmer referred to the span of his/her life in years from his/her birth to the time of interview.

Education: Education referred to the ability of the respondents to read and write or having formal education received up to a certain level from educational institute at the time of interview. It was measured on the basis of classes a farmer has passed from a formal educational institution.

Family Size: Refers to the number of persons in the family. Economic family refers to a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law union, adoption or a foster relationship.

Farm Size: The land owned. plus, the land rented-in minus the land rented-out. But since we are interested in the productivity in crop production, we have measured farm size by the net. amount of land under crop cultivation in acres.

Annual Family Income: The term annual family income referred to the total amount of money earned by the earning members of a farm family from agriculture, livestock, fisheries and other accessible sources (business, service, daily labor etc.) during a year. It was expressed Thousand in Taka.

Training Experience: It is knowledge or skill in a particular job or activity, which you have gained because you have done that job or activity for a long time.

Organizational Participation: Means an organization which elects to offer coverage under a Policy by completing a participation agreement that has been accepted by the Company.

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

Machine: Refers to mechanical or electrical device that transmits or modifies energy to perform or assist in the performance of human task.

Agricultural Machinery: Refers to use agricultural machinery to mechanize the work of agriculture, greatly increasing farm worker productivity.

Innovation: An innovation is an idea or practice as new by the individual. It is the newness of the idea to the individual that determines his reaction to it.

Innovativeness: Innovativeness is the degree to which an individual is relatively earlier in adopting agricultural innovations, new ideas, practices, and things than the other members of a social system (Rogers, 1995). This was comprehended by the quickness of accepting innovations by an individual in relation to others and was measured based on time dimension.

Modern Agricultural Machineries: Modern Agricultural Machineries are used to develop a wide range of production practices employed by farmers. Some of the essential and most used machineries are tractor, power tiller, combined harvester, thresher, fertilizer, sprayer, reaper etc.

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. The researcher made an elaborate search of available literature for the research. Available literature was extensively reviewed to find out work in Bangladesh as well as abroad. The reviews are conveniently presented passed on the major objectives of the study. This chapter is divided into five major sections. The first section deals with the innovativeness and their roles to use improved practices. The second section deals with review of literature on general context on innovativeness on technologies. The third section deals with the relationships between farmers selected socio-economic characteristic and their innovativeness of using agricultural machineries and the fourth section deals with the conceptual framework of the study. However, a brief review of the available literature has been incorporated in the light of the objectives of this study under the following heads:

2.1 Innovativeness and Their Roles to Use Improved Practices

Agricultural innovation is essential to address environmental problems in a world that must soon support more than 9 billion humans. Poverty and food insecurity go hand in hand. For the 2 billion malnourished poor in developing countries, short-term food security is inevitably a higher priority than long-term environmental sustainability. A large proportion of rural poor in the tropics live in regions with marginal land and climate for agriculture or in areas with more favorable climate that lie at the interface between agriculture and remaining carbon-rich and biodiverse natural ecosystems such as rainforests, wetlands, grasslands, and savannas. Feeding 9 billion people and lifting rural poor out of poverty is a prerequisite for maintaining the planet's environment. Many people are leaving rural areas and seeking employment in manufacturing and services in cities. However, this opportunity is not open to all. Large numbers of poor farmers continue to practice extensive agriculture. Inevitably they will continue to encroach on hitherto uncultivated lands unless they can adopt innovative systems that

allow for agricultural intensification and development of agricultural equipment industries, farm inputs, and food processing capacities.

To this end, much agricultural research continues to focus on how to increase productivity on this existing farm land. Improved efficiency in the use of land and agricultural inputs is already contributing to environmental goals. Quantifying food production capacity of currently farmed land has focused on estimating "yield gaps" (i.e., the difference between current farm yields and the potential that can be achieved with good crop and soil management). Yield gap analysis allows the identification of regions with the greatest potential for higher yields. Need for more precise and geospatially explicit yield gap estimates are the target of the Global Yield Gap Atlas (www.yieldgap.org). However, increasing productivity is necessary but not sufficient to ensure food security, reduce poverty, improve nutrition, and maintain the natural resource base for sustainable development. Innovations across a broader spectrum of policies and technologies are needed to confront the complex array of challenges at the agriculture–environment nexus.

Many practicing agricultural scientists are working to solve immediate problems of poor farmers. A marked shift is occurring in the way agricultural research is conducted. In particular, there has been a move from single-factor, mainly on-station research toward active engagement with farmers and farm communities to encourage experimentation and innovation. A recurring theme is the use of concepts such as Integrated Agricultural Research for Development (IAR4D). This "systems science" approach and a number of similar concepts share much with the underlying principles of Sustainability Science. IAR4D attempts to harness science to address complex multifunctional agricultural objectives and to engage farmers and their communities in the process. It seeks to influence multiple drivers of change in agricultural landscapes. There is broad consensus among agricultural researchers that such integrated approaches are needed although the empirical evidence for their impact is still weak.

Agarwal et al. (2017) define constraint-based innovations as "an approach to the whole innovation process, which is based on prescriptive variables driving two central dimensions: cost-effectiveness and ease-of-use" (Fig. 1). Additionally, most recent research has focused solely on the final product or business model (Bendul et al., 2017; Rosca et al., 2017), while attributes in early phases are studied less (Agarwal et al.,

2017). These attributes are grouped into design process, innovativeness and scale of production.

In agriculture, innovativeness can be defined as to develop or try out an innovation (Reij and Waters-Bayer, 2001) by members of a farming community. Innovations are the new ideas, practices or techniques used for achieving sustained increases in farm productivity and income (Adams, 1992). A farm innovation can either be generated from research stations or from growers' fields. This can be a discovery of a completely different way of doing something or a modification of an existing technology (Yohnnnes, 2001). Therefore, innovativeness refers to a unique characteristic of a farmer which drives him to try out new technology, idea or practice relatively earlier than his peers or other members of a social system.

In the late 1990s, several studies in innovation diffusion research, marketing, and social and individual psychology investigated the effect of personal traits on adoption behavior as an internal motivation stimulus (June et al, 2005). Innovativeness is a unique trait that shows individuals willingness to adopt an innovative technology. Therefore, unlike other traits, innovativeness is a stronger predictor of individual's innovation adoption. Moreover, determining innovativeness, one can easily identify which member of a farming community is likely to adopt an innovation once available for use (Agarwal & Prasad, 1998, Hung, Ku, &Chang, 2003, Yang, 2005) In other words, innovativeness can be treated as a 'proxy' of adoption intention of members of a farming community assuming that persons high in innovativeness scale is highly likely use improved practices for their farming.

2.2 General Context on Innovativeness on Technologies

Hasan (2015) found that more than half of the respondents (56.1 percent) had medium adoption where 15.9 percent had low adoption and only 24.3 percent had high adoption of modern practices for rice cultivation. There were 3.7 percent respondents were in no adoption of selected modern practices for rice cultivation.

Shakirullah and Ramzan (2006) in their study on extent 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.

Kabir (2015) reveal that 44.4 percent respondents had medium adoption where 24.I percent had low adoption and 31.5 percent had high adoption of commonly used IPM practices in rice cultivation.

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.

Mou (2015) found that half (50.00 percent) of the farmers had low adoption while 40.20 percent had medium adoption and 9.80 percent had high adoption of improved practices in vegetable cultivation.

Deshmukh and Bariya (2014) found that majority (65.83 percent) of the farmers had medium adoption while 19.17 percent had low adoption and 15.00 percent had high adoption of recommended Kharif groundnut practices.

Rao and Singh (2014) observed that majority (65.33 percent) of the farmers had medium adoption while 10.0 percent had low adoption and 24.67 percent had high adoption of recommended pineapple cultivation practices.

Wang zhicai (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%).

Afroz (2013) found that highest 40.48 percent of the respondents had low adoption of wheat cultivation, while 34.92 percent had medium adoption and the rest 24.60 percent had high adoption of wheat cultivation.

Chouhan and Singh (2013) reported that majority (74.16 percent) of the farmers had medium adoption while 12.50 percent had low adoption and 13.34 percent had high adoption of improved sugarcane cultivation practices.

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 percent of the respondents adopted mechanization, which 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.

Mehta and Sonawane (2012) revealed that 73.00 percent of the farmers had medium adoption while 10 percent had low adoption and 17.0 percent had high adoption of recommended mango cultivation practices.

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 trans planters including walking and ride on types are operated in the country and all the trans planters 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 Relationships between Farmers' Selected Socio-Economic Characteristics and Their Innovativeness of Using Modern Agricultural Machineries

2.3.1 Age and innovativeness

Khatun (2016) revealed that age of the growers did not show any significant relationship with their innovativeness to use improved practices in betel leaf cultivation.

Hasan (2015) found that age was significant contribution on modern practices tor rice cultivation.

Kabir (2015) reveal that age was significant contribution on adoption of IPM practices in rice cultivation.

Mou (2015) found that age did not show any significant contribution on the adoption of improved practices in vegetable cultivation of the farmers.

Rao and Singh (2014) observed that age of the famers show negative and significant relationship with their adoption of pineapple cultivation practices.

Afroz (2013) found that age of the farmers showed non-significant positive relationships with the adoption of wheat cultivation.

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. These personal factors can affect the innovativeness of an individual and thus contribute to determining the rate at which farmers‟ will adopt new technology.

(Adesina and Zinnah,1992; Deressa et al., 2009; Spence, 1994). Older farmers may be less interested because they have less need for extra 16 income.

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

Chouhan and Singh (2013) reported that age of the farmers shows significant relationship with their adoption of improved sugarcane cultivation practices.

Mehta and Sonawane (2012) revealed that age of the farmers shows negative relationship with their adoption of recommended mango cultivation practices.

Bedasso (2008) reported a positive and significant relationship between age an innovativeness to use new practice.

2.3.2 Education and innovativeness

Khatun (2016) revealed that education of the growers did not show any significant relationship with their innovativeness to use improved practices in betel leaf cultivation.

Hasan (2015) found that education was significant contribution on modern practices for rice cultivation.

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.

Mou (2015) found that education showed significant and positive contribution to adoption of improved practices in vegetable cultivation.

Rao and Singh (2014) found that education of the farmers showed significant and positive relationship with their adoption of pineapple cultivation practices.

Afroz (2013) found that education of the farmers showed significant positive relationships with the adoption of wheat cultivation.

Chouhan and Singh (2013) revealed that education of the farmers shows significant relationship with their adoption of improved sugarcane cultivation practices.

Mehta and Sonawane (2012) observed that education of the farmers showed significant relationship with their adoption of recommended mango cultivation practices.

2.3.3 Family Size and innovativeness

Rao and Singh (2014) observed that family size of the farmers did not show any significant relationship with their adoption of pineapple cultivation practices.

Chouhan and Singh (2013) reported that family size of the farmers did not show any significant relationship with their adoption of improved sugarcane cultivation practices.

Mehta and Sonawane (2012) found that family size of the farmers showed negative relationship with their adoption of recommended mango cultivation practices.

Singh and Priyadarshi (2010) reported that family size of the farmers showed negative significant relationship with their adoption of improved mango production practices.

2.3.4 Farm Size and innovativeness

Khatun (2016) revealed that farm size showed positive significant relationship with their innovativeness to use improved practices.

Kabir (2015) reveal that farm size was significant contribution on adoption of IPM practices in rice cultivation.

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

Mou (2015) found that farm size did not show any significant contribution on the adoption of improved practices in vegetable cultivation of the farmers.

Rao and Singh (2014) reported that fam size of the farmers showed positive and significant relationship with their adoption of pineapple cultivation practices.

Afroz (2013) found that farm size of the farmers showed non-significant positive relationships with the adoption of wheat cultivation.

Chouhan and Singh (2013) observed that farm size of the farmers shows significant relationship with their adoption of improved sugarcane cultivation practices.

2.3.5 Area under agricultural mechanization and innovativeness

Area under agricultural mechanization might give positive or negative relationships with farmers innovativeness that would be significant or non-significant. Large and mechanization-based area may give positive significant impact on farmers innovativeness.

2.3.6 Annual family income and innovativeness

Khatun (2016) revealed that annual family income of the growers did not show any significant relationship with their innovativeness to use improved practices in betel leaf cultivation.

Mou (2015) found that annual income showed significant and positive contribution to their adoption of improved practices in vegetable cultivation.

Rao and Singh (2014) found that annual income of the famers had positive and significant relationship with their adoption of pineapple cultivation practices.

Afroz (2013) found that annual income of the farmers showed non-significant positive relationships with the adoption of wheat cultivation.

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.

Chouhan and Singh (2013) observed that annual income of the farmers showed significant relationship with their adoption of improved sugarcane cultivation practices.

Mehta and Sonawane (2012) found that annual income of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Hartwich and Scheidegger (2010) also confirmed in their findings that income level is significantly related to innovativeness.

2.3.7 Training experience and innovativeness

Khatun (2016) revealed that agricultural training of the growers did not show any significant relationship with their innovativeness to use improved practices in betel leaf cultivation

Mou(2015) found that training experiences showed significant and positive contribution to Their adoption of improved practices in vegetable cultivation.

Kabir (2015) reveal that training exposure was significant contribution on adoption of IPM practices in rice cultivation.

Islam (2002) conducted a study on famers knowledge and adoption of ecological agricultural practices under the supervision of Proshika. The researcher that agricultural training exposure of the farmers had no significant relationship with their adoption of ecological agricultural practices.

Rahman (2001) observed in study that training received of the farmers had a significant and positive relationship with their adoption regarding Aalok-6201 hybrid rice.

2.3.8 Organizational participation and innovativeness

Mou (2015) found that organizational participation did not show any significant contribution on the adoption of improved practices in vegetable cultivation of the farmers.

Rahman (2005) observe that the organizational participation of the farmers had no significant relationship with their adoption of modern rice varieties.

Sardar (2002) in a study on IPM practices found that organizational participation of the farmers had no significant relationship with their adoption of IPM practices.

Hussein (2001) in a study on the farmers' knowledge and adoption of modern sugarcane cultivation practices observe that organizational participation of the growers had significant positive relationship with their adoption of modern sugarcane cultivation practices.

2.3.9 Extension media contact and innovativeness

Mou (2015) found that extension media contact did not show any significant contribution on the adoption of improved practices in vegetable cultivation of the farmers.

Hasan (2015) found that extension contact was significant contribution on modern practices for rice cultivation.

Rao and Singh (2014) found that extension contact of the famers showed positive and Significant relationship with their adoption of pineapple cultivation practices.

Afroz (2013) found that Extension media contact of the farmers showed significant positive relationships with the adoption of wheat cultivation.

Islam (2018) reported that the extension contacts 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.

Chouhan and Singh (2013) revealed that extension on contact of the farmers showed significant relationship with their adoption of improved sugarcane cultivation practices.

Mehta and Sonawane (2012) found that extension contact of the farmers showed positive and highly significant relationship with their adoption of recommended mango cultivation practices.

Singh and Barman (2011) observed that extension contact of the farmers showed significant relationship with their adoption of tomato and cauliflower cultivation technologies.

2.3.10 Number of machineries used and innovativeness

The number of machineries used highly impacts on farmers innovativeness. Variable number of machineries used might give positive or negative relationships with farmers innovativeness that would be significant or non-significant.

2.4 Conceptual Framework of the Study

Conceptual frameworks are a type of intermediate theory that attempt to connect to all aspects of inquiry (e.g. problem definition, purpose, literature review, methodology, data collection and analysis). Conceptual frameworks can act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem (Wikipedia, 2014).

In this study, the researcher mainly attempted to highlight two concepts, namely farmers selected characteristics (age, education, family size, farm size, area under agricultural mechanization, annual family income, training experience, organizational participation, extension media contact and number of machineries used) and innovativeness of farmers on modern agricultural machineries. It was expected that the selected characteristics would be intertwined and consistent with the focus issue of the study. That will show in Fig 2.1.

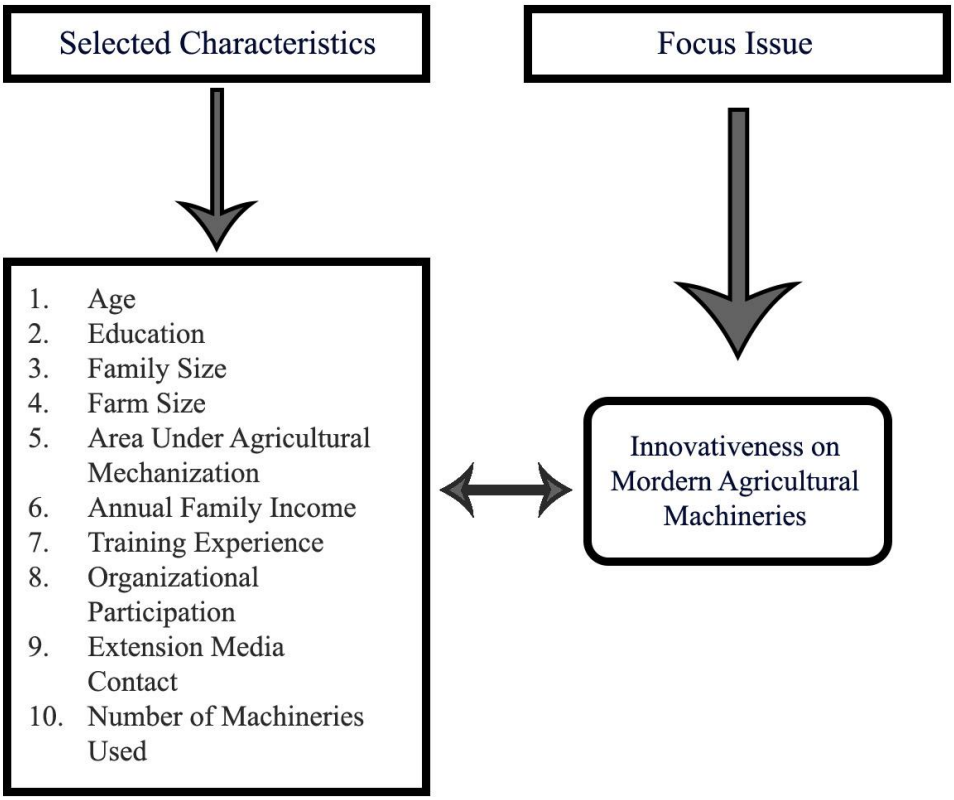


Figure 2.1 Conceptual Framework of the Study

Chapter III
METHODOLOGY

This Chapter deals with the presentation of methods and procedures followed to operationalize the study, specifically measurement of variables. The discussion also contains the method of collecting information and statistical analysis of data.

* *https://www.phdassistance.com/blog/steps-for-preparing-research-methodology*

3.1 Locale of the Study

The study was conducted in Balighata union of Panchbibi upazila under Joypurhat district.There are eight (8) unions of Panchbibi upazila, among which major occupation of the farmers was farming and few people are service holders and businessmen. Panchbibi Upazila is bounded by Hakimpur and Ghoraghat upazilas and West Bengal of India on the north, Joypurhat sadar upazila on the south, Gobindaganj and Kalai upazilas on the east, Joypurhat Sadar upazila and West Bengal of India on the west. Main rivers are Little Jamuna, Tulshiganga and Harabati.

Panchbibi Upazila (JOYPURHAT DISTRICT) area 278.53 sq. km, located in between 25°08' and 25°17' north latitudes and in between 88°56' and 89°13' east longitudes. Panchbibi (Town) consists of 9 wards and 13 mahallas. The area of the town

is 5.83 sq km. The town has a population of 20120; male 52.30%, female 47.70%. The density of population is 3451 per sq km. The literacy rate among the town people is 52.2%. The town has a dakbungalow. Panchbibi thana, now an upazila, was established in 1868. It consists of one municipality, 9 wards, 8 union parishads, 222 mouzas, 257 villages. A map of Bangladesh, a map of Panchbibi Upazila, and Balighata union showing the sampling area in Figure 3.1 and 3.2, 3.3 respectively.

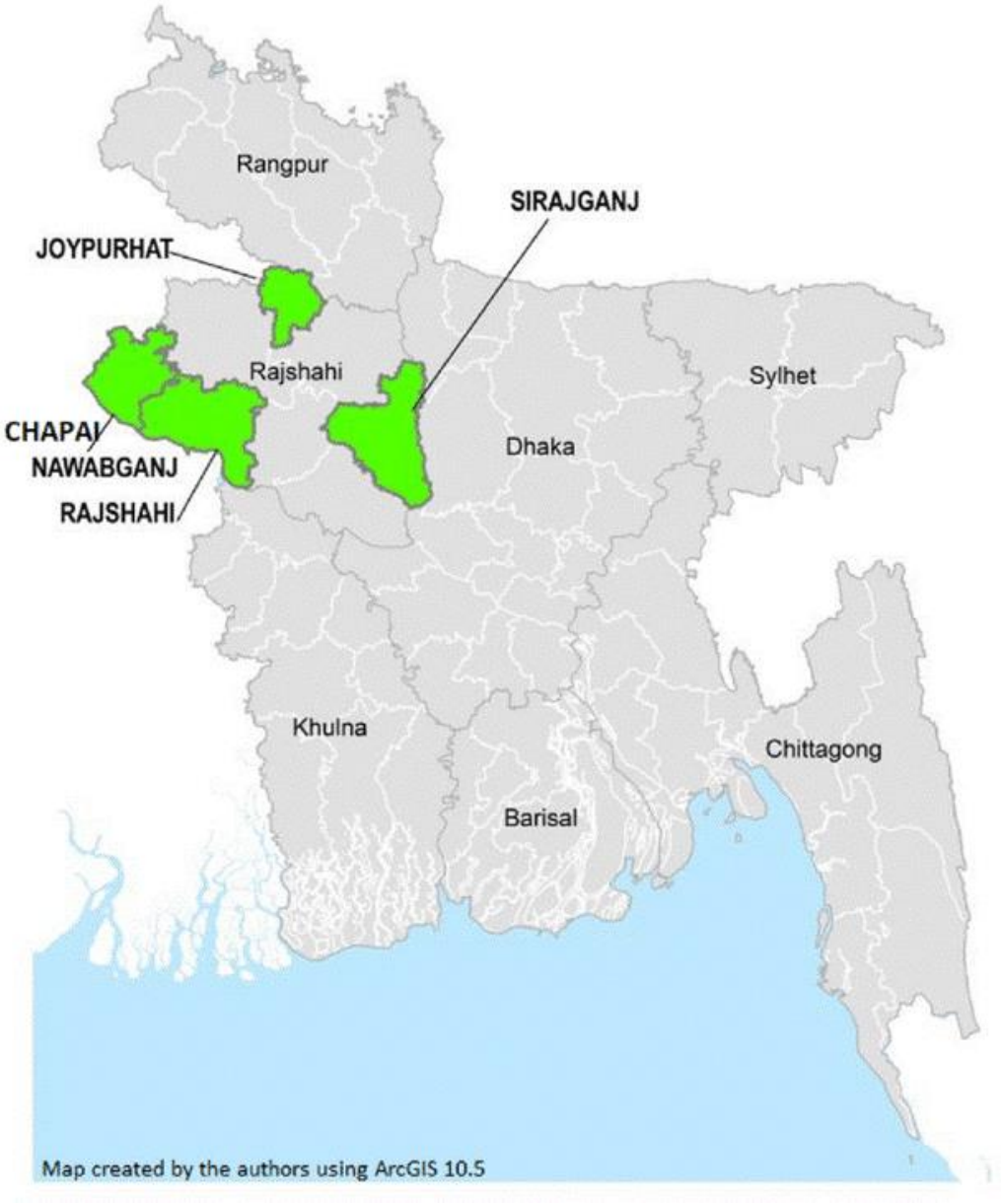


Figure 3.1 Map of Bangladesh showing Joypurhat district

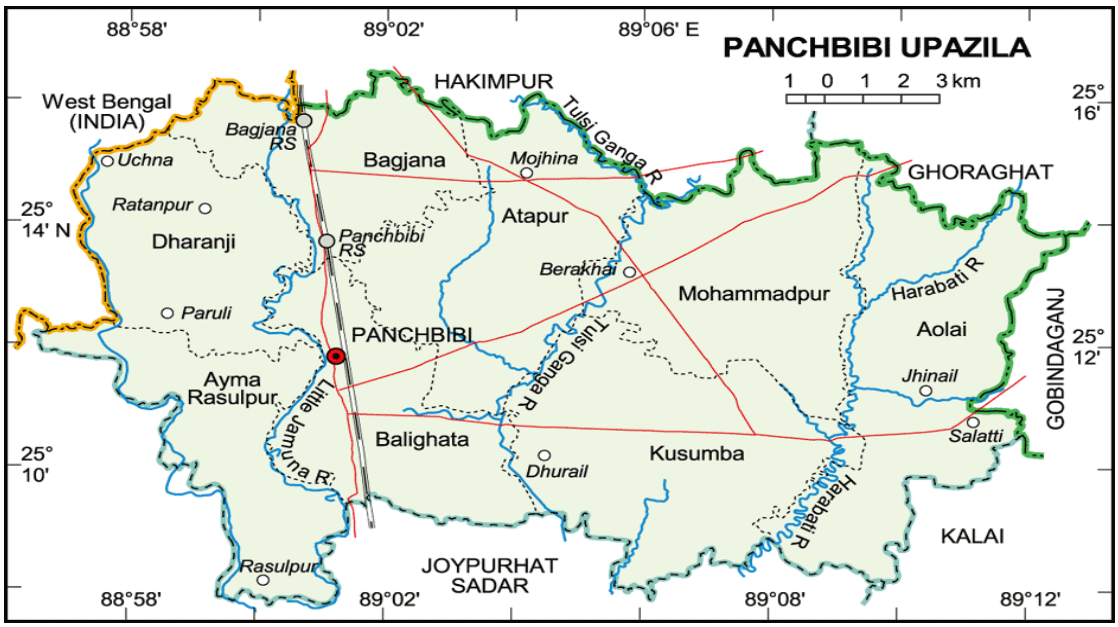


Figure 3.2 Map of Panchbibi Upazilla showing study area.

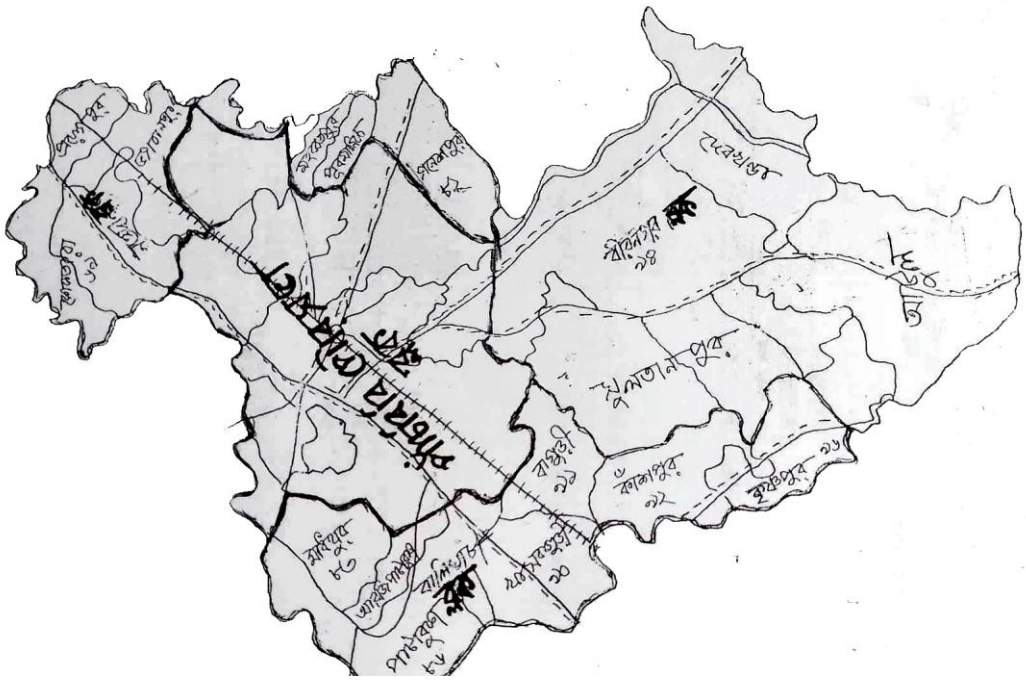


Figure 3.3 Map of Balighata union showing main study area

3.2 Population and Sample

The farmers of Panchbibi upazila were the target population of the study. Panchbibi upazila was purposively selected due to investigator's familiarity of the area, language and culture of the people. There are eight unions under Panchbibi upazila. Among them Balighata union was selected by random sampling procedure. Four villages of Balighata union were selected by random sampling procedure. An updated list of 910 farmers were collected from Upazila Agriculture Office. Out of them a sample of 91 farmers (About 10 percent) was selected by random sampling method. Simultaneously a reserve list of 9 farmers was made in order to use in case of non-availability of sampled farmers.

Table 3.2 Village wise distribution of the population and sample

Name of the village	Population	Sample	Reserve list
Sultanpur	300	30	3
Kashpur	370	37	2
Bagri	120	12	2
Debkhonda	320	32	2
Total	910	91	9

3.3 Research Instrument

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 questions. A draft interview schedule was prepared in advance before using the same for the 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 adjustments ware made afterwards in the schedule based on the pre-test results.

3.4 Measurement of Selected Socio-Economic Characteristics of the Farmers

The ten characteristics of the respondents namely age, education, family size, farm size, area under agricultural mechanization, annual family income, training experience, organizational participation, extension media contact and no of machinery used constituted the selected characteristics of this study. The measurement procedure of these selected characteristics discussed below,

3.4.1 Age

Age of the respondent was measured in terms of years from his/her birthday to the time of interview which will be found based on response. A unit score was assigned for each year of one's age. The characteristic appears in the item number 1 in the interview schedule (Appendix A).

3.4.2 Education

Education was measured as the ability of an individual farmer to read and write, or formal education received up to a certain standard. Education of a respondent was measured in terms of one's year of schooling. One score was given for passing each level in an educational institution (Mondol, 2009). For example, if a respondent passed the final examination of class V his/her education score was taken as five (5). If a respondent did not know how to read and write, his education score was given as '0'. A score of 0.5 was given to that respondent who could sign his/her name only. The characteristic appears in the item number 2 in the interview schedule (Appendix A).

3.4.3 Family size

Family size was measured by the total number of members in the family of a respondent. The family members included the respondent himself, his wife, children, and other dependent members who lived and ate together. A unit score was assigned for each member of the family. If a respondent had five members in his/her family, then family size score was given as 5 (Khan,2004). The characteristic appears in the item number 3 in the interview schedule (Appendix A).

3.4.4 Farm size

Farm size was measured by the area of the raised land in which the household of the respondent had its entire dwelling unit including homestead area under cultivation (Rahaman, 2020). It was expressed in hectare. The total areas of land thus obtained have been considered as farm size of the respondent. The characteristic appears in the item number 4 in the interview schedule (Appendix A). It was measured using the following formula:

Fam size =a+b+½(c+d)+e+f+g

Where,

a = Homestead (including garden and fallow land)

b = Own land under own, cultivation

c = Land given to others on borga

d = Land taken from others on borga

e = Land taken from others on lease

f = Pond area

g = Others (if any)

3.4.5 Area under agricultural mechanization

The area under agricultural mechanization was measured by the area of the land in which the different agricultural mechanizations are used. The characteristic appears in the item No. 5 in the interview schedule (Appendix A).

3.4.6 Annual income

Annual income of a respondent was measured based on total yearly earning by the respondent himself and other family members. The value of all the sources encompassing rice, wheat, maize, potato, vegetables, fruits, dairy and poultry, fish culture, service, business, and day labor etc. were taken into consideration. For calculation of income score, one (1) was assigned for each one thousand takas. The characteristic appears in the item No. 6 in the interview schedule (Appendix A).

3.4.7 Training experience

Training experience was determined by the total number of days of training received by the farmers from any organization during the last three years. if a respondent took three days training on agriculture from GOs, NGOs or any other organization, then his training exposure score was 3 and so on. The characteristic appears in the item number 7 in the interview schedule (Appendix A).

3.4.8 Organizational participation

Organizational participation scores of a respondent were computed based on his/her participation in different organizations operating in the study area. The researcher considered 8 such organizations and assigned a score of 0, 1, 2 and 3 for 'no participation, 'as a member, as a general secretary' and 'as a chairmen' president' respectively (Goswami, 2015). Thus, the Organizational participation score could range from 0 to 24 where 0 indicating no participation and 24 indicating highest participation in organizations. The characteristic appears in the item number 8 in the interview schedule (Appendix A).

3.4.9 Extension media contact

Extension contact may be defined as one's extent of exposure to different extension media. Each respondent was asked to indicate the extent of his contact with each of the selected media. With four alternative responses as regularly, occasionally, rarely, and not at all basis and scores were assigned as 3, 2, 1 and 0 respectively (Rahaman, 2020). The extension media contact score of a respondent was measured by summing up his/her scores for contact with all the selected media. Thus, possible extension contact score could range from zero (0) to 36, where zero (0) indicated no extension contact and 36 indicated the highest extension contact. The characteristic appears in the item number 9 in the interview schedule (Appendix A).

3.4.10 Number of machineries used

Number of machineries used may be measured by the total number of machineries used by the respondent. A unit score was assigned for each number of machines. If a respondent used five number of machines in his/her farm, then score was given as 5 and accordingly will have score zero (0) is no machine is used at all (Khan,2004). The characteristic appears in the item number 10 in the interview schedule (Appendix A).

3.5 Measurement of Focus Issue

Innovativeness of the farmers to use modern agricultural machineries was focus issue of the study. Innovativeness of a respondent was measured by computing an innovativeness score based on his/her adoption of 10 selected modern agricultural machineries. Scoring was assigned based on time required by a farmer to adopt each of the modern agricultural machineries. Innovativeness was measured according to the methodology followed by Khatun (2016), where score was given to the length of adoption or non-adoption of a modern agricultural machinery as follows:

Duration of adoption	Score assigned
Within 1 year after hearing	4
Within 2 years after hearing	3
Within 3 years after hearing	2
Above 3 years after hearing	1
Do not use after hearing	0

The score assigned to each of the 10 modern agricultural machineries were added together to obtain the total innovativeness score of a respondent. Thus, innovativeness score of the respondents could range from 0 to 40. Here, 0 indicates no innovativeness and 40 indicated very high innovativeness.

3.6 Hypothesis of the Study

Hypothesis leads to an empirical test. Hypotheses are always in declarative sentence form, and they relate either generally of specifically variables to 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.

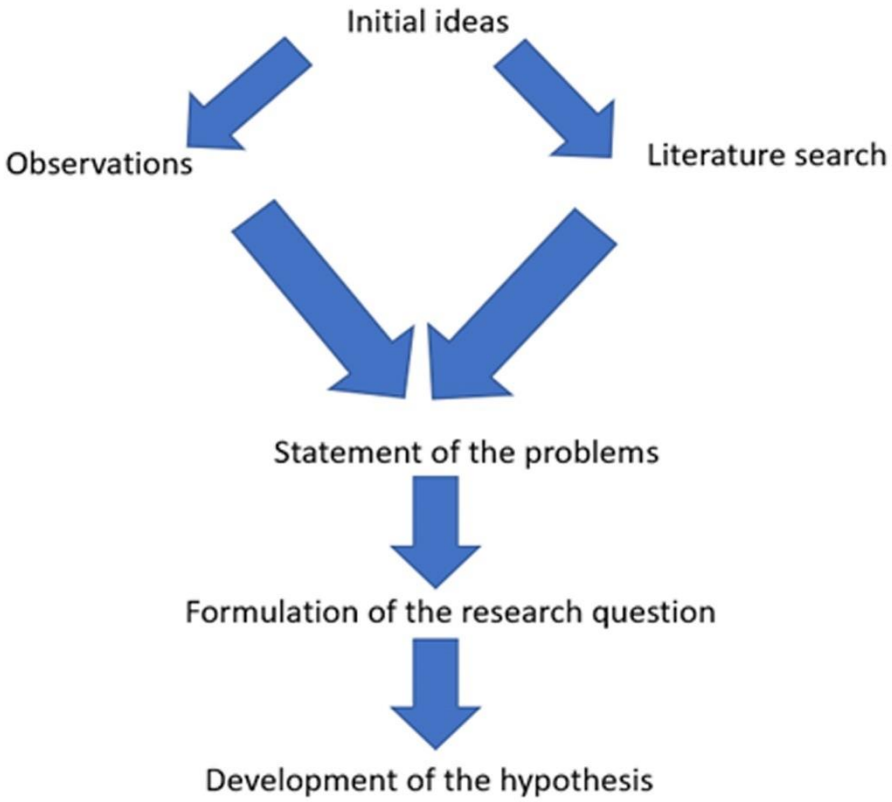


Figure 3.4 Development of the hypothesis

3.6.1 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 ten characteristics (i.e., age, education, family size, farm size, area under agricultural mechanization, annual family income, training experience, organizational participation, extension media contact, no of machinery used) of the farmers and innovativeness on modern agricultural machineries. However, when a researcher tries to perform statistical tests, then it becomes necessary to formulate null hypothesis.

3.6.2 Null hypothesis

Null hypothesis: There was no significant relationship between the selected ten characteristics (i.e., age, education, family size, farm size area under agricultural mechanization, annual family income, training experience, organizational participation, extension media contact and no of machinery used) of farmers and their innovativeness on modern agricultural machineries.

3.7 Collection of Data

Data were collected personally by the researcher himself through face-to-face interview. To familiarize with the study area and for getting local support, the researcher took help from the local leaders and the field staffs of Upazila Agriculture Office. The researcher made all possible efforts to explain the purpose of the study to the farmers. Rapport was established with the farmers prior to interview and the objectives were clearly explained by using local language as far as possible. Data were collected during the period of 10 to 30 August 2021.

3.8 Data Processing

3.8.1 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.

3.8.2 Coding and tabulation

Having consulted with the research supervisor and co-supervisor, the investigator prepared a detailed coding plan. In case of qualitative data, suitable scoring techniques were followed by putting proper weight age against each of the traits to transform data into quantitative forms. These were then tabulated in accordance with the objective of the study.

3.8.3 Categorization of data

Following coding operation, the collected raw data as well as the respondents were classified into various categories to facilitate the description of variables. These

categories were developed for each of the variables by considering the nature of distribution of data and extensive literature review.

3.9 Statistical Analysis

The Statistical Package for Social Science (SPSS) 20.0 computer program was used for analyzing the data. Various descriptive statistical measures such as frequency, number percentage, mean, standard deviation and rank order was used for categorization and describing the variables. Pearson's Product Moment Correlation Coefficient (r) was used for testing the relationships between the concerned variables. At least 5.0 percent (P-0.05) level of probability was used as a basis for rejection of the null-hypotheses throughout the study.

CHAPTER IV
RESULTS AND DISCUSSION

In this Chapter the findings of the study and interpretation of the results have been presented in three sections according to the objectives of the study. The first section deals with the selected socio-economic characteristics of the farmers. The second section deals with farmers innovativeness to use modern agricultural machineries. The third section deals with the relationships between farmer's selected socio-economic characteristic and their innovativeness of using agricultural machineries.

4.1 Selected Socio-Economic Characteristics of the Farmers

Ten characteristics of the farmers were selected to find out their relationships with their innovativeness on modern agricultural machineries. The selected characteristics included their age, education, family size, farm size, area under agricultural mechanization, annual family income, training experience, organizational participation, extension media contact and numbers of machineries used. These characteristics of the farmers are described in this section. Results of Table 4.1 reveal the main features and categorization of the farmers in order to have an overall picture of these characteristics.

4.1.1 Age

Age of the respondents ranged from 18 to 62 years with an average of 44.41 and standard deviation of 9.76. However, based on their age the respondents were classified into three categories as "young aged" (≤35), "middle aged" (36-50) and "old aged"(≥ 51). Their distribution according to the age of the respondents is as shown in Table 4.1.

Results of Table 4.1 indicate that majority (51.6) percent of the famers were under middle aged category compared to (28.6) percent under old aged and (19.8) percent under young aged category. These findings indicated that a large proportion (80.2 percent) of the farmers of the study area were middle to old aged. Their percentage according to the age of the farmers is as shown in Figure 4.1. Rahman (2018) also found the similar result in his study. It might be due to young to middle aged people are generally receptive to new ideas and things. They are more innovative than old,

aged people. They have a favorable attitude towards trying new ideas. It means that agricultural machinery in the study area is being managed by young to middle aged farmers.

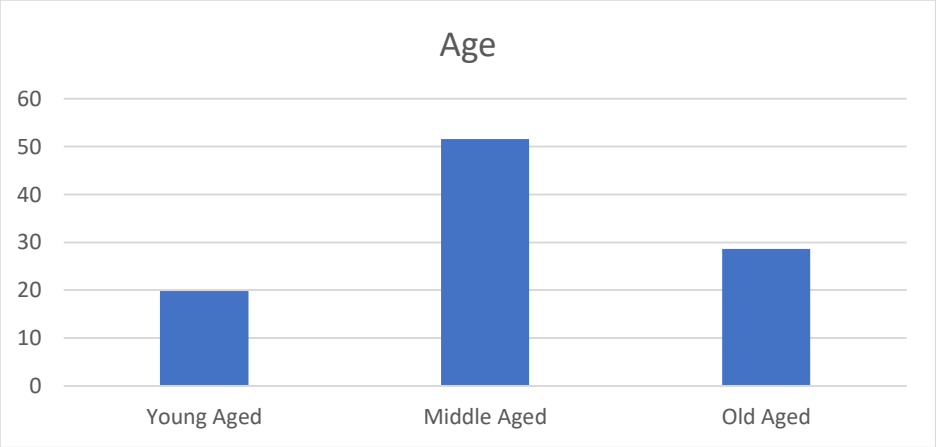


Figure 4.1 Distribution of the respondents according to their age

4.1.2 Education

The education score of the farmers ranged from 0-15, with the mean value of 6.05 and standard deviation of 5.04. Based on their education scores, the farmers five categories namely "illiterate (0)" "can sign only"(0.5), "primary education" (1-5), "secondary education" (6-10) and "above secondary (>11). The distribution of the farmers according to their education is shown in Table 4.1.

Slightly near half (40.7 percent) of the farmers had education up to secondary level compared to (7.7 percent) having primary level education. About 14.3 percent of the farmers were above secondary level educated, 27.5 percent of them can sign only and 9.9 percent of illiterate. Thus, the overwhelming majority (92.8 percent) of the farmers had education ranging from primary to above secondary level. Their percentage according to the education of the farmers is as shown in Figure 4.2. Rahman (2018) also found the similar result in his study. Education helps persons to become cogent, aware and to get effective information to solve their daily working difficulties through different sources of information. Educations expand our knowledge and help to face hostile illness.

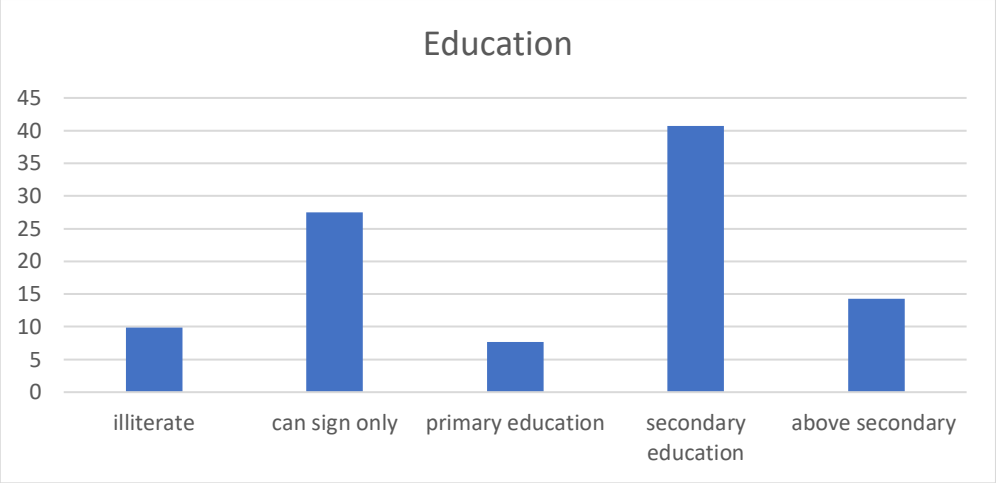


Figure 4.2 Distribution of the respondents according to their education

Table 4.1 Main Features and Categorization of the Farmers (N=91)

Characteristics	Scoring Method	Range		Categories	Respondents		Mean	SD
		Possible	Observed		No	Percent		
Age	No of Year	Unknown	18-62	Young (≤35)	18	19.8	44.41	9.76
				Middle Aged (36-50)	47	51.6		
				Old (≥51)	26	28.6		
Education	Year of Schooling	Unknown	0-15	Illiterate (0)	9	9.9	6.05	5.04
				Can Sign Only (0.5)	25	27.5		
				Primary Level (1-5)	7	7.7		
				Secondary Level (6-10)	37	40.7		
				Above Secondary (≥11)	13	14.3		
Family Size	No of Members	Unknown	2-12	Small (≤4)	35	38.5	5.417	2.19
				Medium (5-7)	41	45.0		
				Large (≥8)	15	16.5		
Farm Size	Hectare	Unknown	0.08-5.92	Marginal (0.08-0.50)	4	4.4	1.102	0.991
				Small (0.51-1.0)	55	60.4		
				Medium (1.01-2.99)	27	29.7		
				Large (≥3)	5	5.5		
Area Under Agricultural Mechanization	Hectare	Unknown	0.06-5.02	Small (0.06-1.0)	29	31.9	1.0524	0.885
				Medium (1.01-2.99)	46	50.5		
				Large (≥3.0)	16	17.6		
Annual Family Income	('000' Tk.)	Unknown	30-2605	Low (≤150)	29	31.9	397.8	482.76
				Medium (151-300)	15	16.5		
				High (≥301)	47	51.6		
Training Experience	Days	Unknown	0-35	No (0)	63	69.2	5.2527	9.771
				Low (1-8)	5	5.5		
				Medium (9-16)	12	13.2		
				High (≥17)	11	12.1		
Organizational Participation	Score	0-24	0-7	No (0)	39	42.9	1.2747	1.592
				Low (0-2)	36	39.6		
				Medium (3-5)	14	15.4		
				High (>5)	2	2.2		
Extension Media Contact	Score	0-36	8-32	Low (<12)	16	17.6	17.41	5.3
				Medium (12-24)	58	63.7		
				High (>24)	17	18.7		
Number of Machine Used	Score	0-11	1-10	Low (≤3)	33	36.3	4.78	2.14
				Medium (4-8)	46	50.5		
				High (>8)	12	13.2		

4.1.3 Family size

The family size of the farmers ranged from 2 to 12 having mean value of 5.417 and standard deviation of 2.19. Based on their family size, they were classified into three categories as "small " (≤4), "medium" (5-7) and "large" (≥8) are presented in Table 4.1.

Figure 4.3 indicate that slightly near half (45.0 percent) of the farmers had medium sized families. On the other hand, 38.5 percent had small family and only 16.5 percent had large family. Islam (2020) also found the similar result in his study. The national average family size in Bangladesh is 4.3 (BBS, 2019) which was less than the mean value of the present study (5.417). Family is a fundamental social unit or social groupings. The members of which are joint by bonds of kinship. The importance of the family in determining the character and structure of the society is fabulous. Family background directly or indirectly impacts a person's behavior, social position and outlook of life.

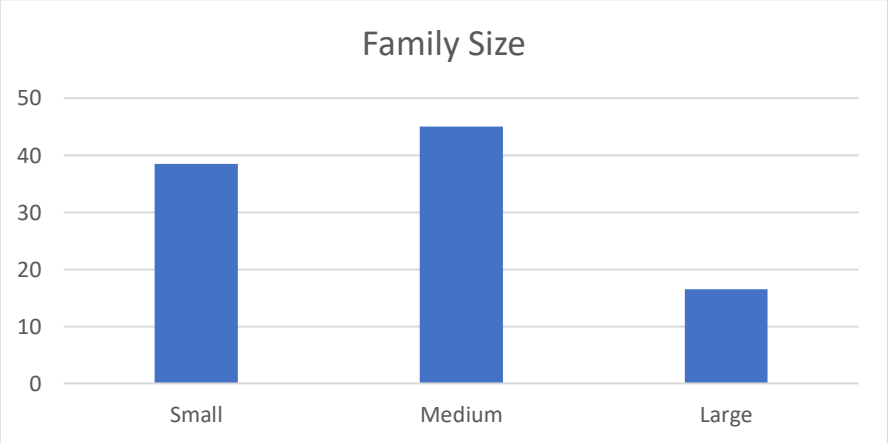


Figure 4.3 Distribution of the respondents according to their family size

4.1.4 Farm size

The farm size of the farmers ranged from 0.08 to 5.92 and the mean was 1.102 with standard deviation of 0.991. The farmers were classified into four categories as "marginal" (0.08-0.50), "small" (0.51-1.0), "medium" (1.01-2.99) and "large" (≥3.0) as shown in Table 4.1.

Data showed in Table 4.1 that majority (60.4 percent) of the farmers were under small farm size category followed by 4.4 percent, 29.7 percent and only 5.5 percent under marginal, medium and large farm size category respectively. Their percentage

according to the farm size of the farmers is as shown in Figure 4.4. The average farm size of the study area (1.102) was higher than that of national average (0.60 ha) of Bangladesh (BRS, 2014). Islam (2020) support this result. To have a reasonable standard of living these farmers must be able to have high yield of crops per hectare and increase their cultivation intensity. For this reason, the farmers need adequate knowledge and skill in increasing production through the adoption of innovation.

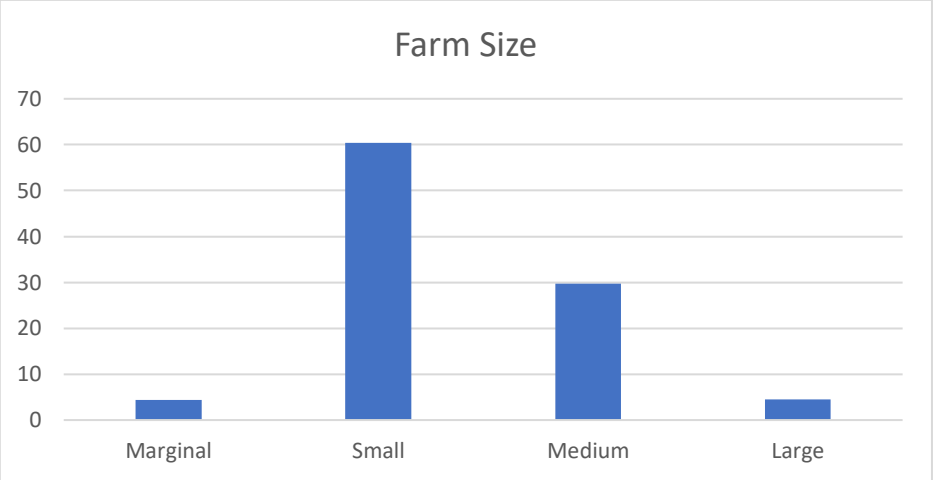


Figure 4.4 Distribution of the respondents according to their farm size

4.1.5 Area under agricultural mechanization

The area under agricultural mechanization of the farmers ranged from 0.06 to 5.02 hectares and the mean was 1.0524 hectares with standard deviation of 0.885. According to the area under agricultural mechanization of the farmers, they were classified into three categories as "small" (0.06-1.0) and "medium" (1.01-2.99) and large (≥3.0). The distribution of the farmers according to their area under agricultural mechanization is shown in Table 4.1.

Figure 4.5 indicates that slightly above half (50.5 percent) of the farmers were under medium agricultural mechanization area category followed by 31.9 percent under small and only 17.6 percent under large agricultural mechanization area category. Thus, the overwhelming majority (82.4 percent) of the farmers had small to medium agricultural mechanization area.

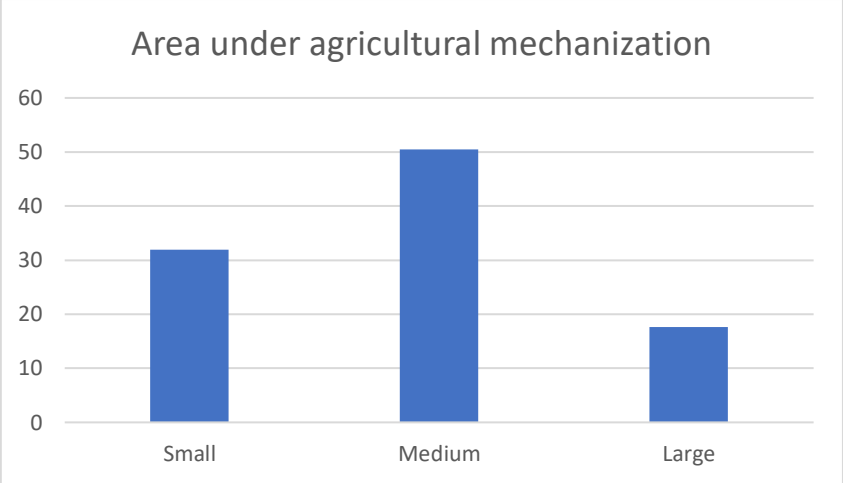


Figure 4.5 Distribution of the respondents according to their area under agricultural mechanization

4.1.6 Annual Family income

Annual family income of the farmers ranged from (30 to 2605)tk, the mean being 397.80 thousand tk. and standard deviation 482.76. Based on their family income scores, the farmers were divided into three categories: "low" (≤150) "medium" (151-300) and "high" (≥301). The distribution of the farmers according to their family income is shown in Table 4.1.

The highest proportion (51.6 percent) of the farmers had high income compared to 16.5 percent of them having medium income and 31.9 percent had low income. Islam (2020) support this result. Their percentage according to the annual income of the farmers is as shown in Figure 4.6.

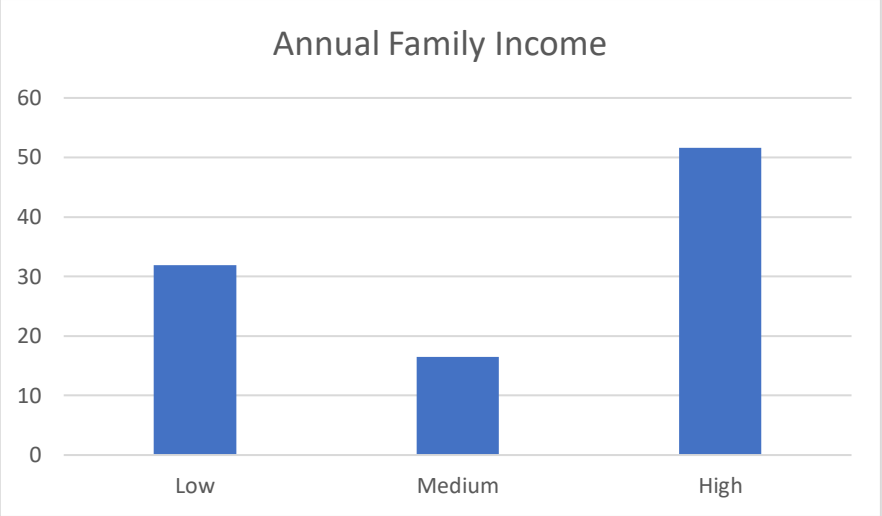
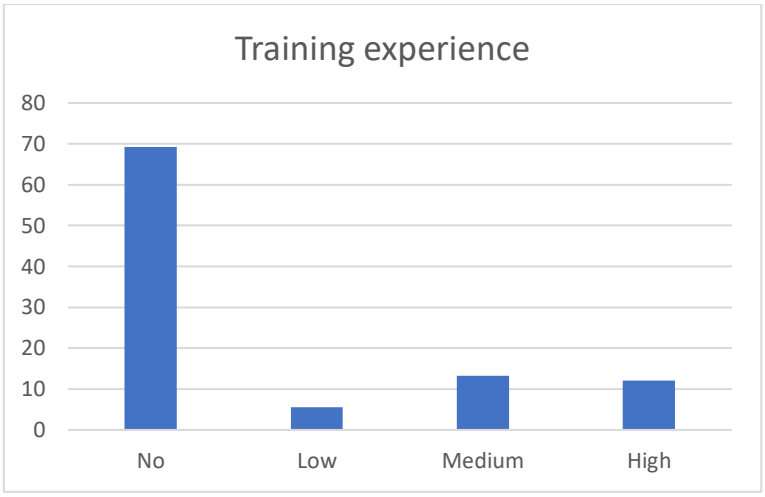


Figure 4.6 Distribution of the respondents according to their annual family income

4.1.7 Training experience

The observed training experience scores of the respondents ranged from 0 to 35 days with mean value 5.2527 day and a standard deviation of 9.771. Based on their observed training experience scores, the farmers were classified into four categories: "no (0), "low (1-8), "medium"(9-16) and " high" (≥17). The distribution of the farmers according to their training experience is shown in Table 4.1.

Figure 4.7 indicates that majority (69.2 percent) of the farmers had no training experience compared to 5.5, 13.2 and 12.1 percent having low, medium and high training experience respectively. Islam (2020) also found the similar finding in his study. Training increases knowledge and skills of the farmers in a specific subject matter area. Individuals who gain high training experiences are likely to be more competent in performing in different agricultural mechanization activities. But the fact that overwhelming majority of the farmers did not receive any training or received low training, this may be due to inadequate applied training facilities, reluctance of the farmers to receive and adopt training on agricultural mechanization etc. So, it is badly needing consideration of the authorities of extension services (GOs and NGOs) in the country. Providing adequate training on proper subject matter is likely to increase the innovativeness of different agricultural machinery.



Figureb 4.7 Distribution of the respondents according to their training experience

4.1.8 Organizational participation

Organizational participation score of the respondents ranged from 0 to 7 with a mean of 1.2747 and standard deviation of 1.592. From the participation level, the respondents were divided into four categories: “no” (0) "low" (0-2), "medium" (3-5) and "high" (>5). The distribution of the farmers according to their organizational participation is shown in Table 4.1.

The findings revealed that highest proportion (42.9 percent) of the respondents had no participation in organization, 39.6 percent low, 15.3 percent medium and only 2.2 percent had high organizational participation. Their percentage according to the of the farmers is as shown in Figure 4.8. Participation makes the farmers proficient and helps them to obtain profound knowledge about the respected aspects. Organizational participated farmers can face any kind of disputes about the difficult condition in their cultivation as well as adoption of innovation.

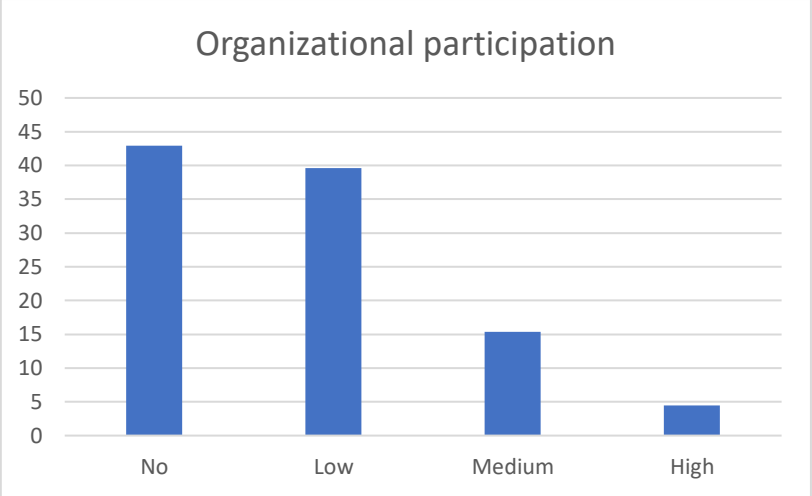


Figure 4.8 Distribution of the respondents according to their Organizational participation

4.1.9 Extension media contact

The observed extension media contact scores of the respondents ranged from 8 to 32 against the possible range of 0 to 36. The average was 17.41 and the standard deviation was 5.30. Based on their extension media contact scores, the respondents were classified into three categories: "low" (<12), "medium" (12-24) and "high" (>24). The distribution of the respondents according to their extension contact is shown in Table 4.1.

Figure 4.9 indicates that slightly less than one fifth (17.6 percent) of the farmers had low extension contact as compared to 63.7 and 18.7 percent having medium and high extension contact respectively. Thus, whole (81.3 percent) of the farmers had low to medium extension contact. Extension contact is a very efficient and effective source of receiving information about various innovations and cultivation practices. The status of no or having low and medium contacts might have significant impacts on the knowledge and innovativeness of the farmers.

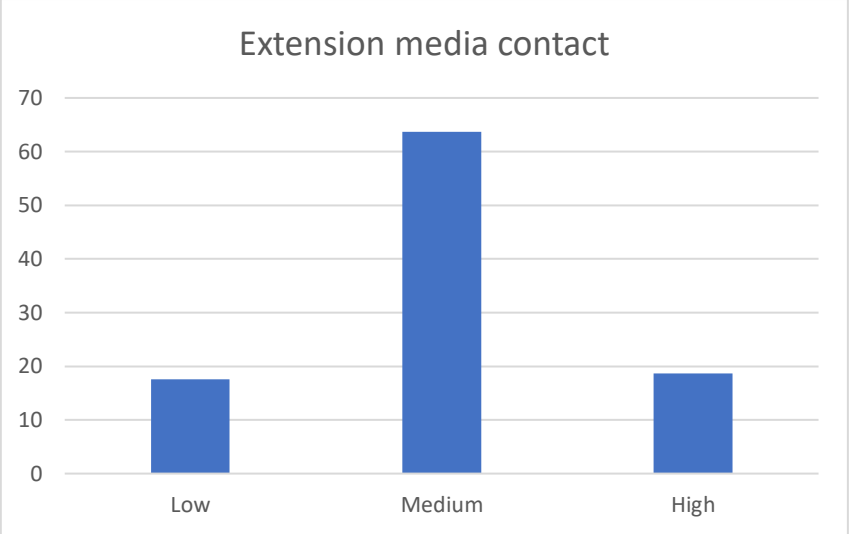


Figure 4.9 Distribution of the respondents according to their extension media contact

4.10 Number of machineries used

The observed number of machineries used score of the respondents ranged from 1 to 10 against the possible range of 0 to 11. The average was 4.78 and the standard deviation was 2.14. Based on their number of machineries used scores, the respondents were classified into three categories: "low" (<3), "medium" (4-8) and "high" (>8). The distribution of the respondents according to their number of machineries used is shown in Table 4.1.

Figure 4.10 indicates that slightly half (50.5 percent) of the farmers had medium number of machineries used as compared to 36.3 and 13.2 percent having low and high number of machineries used respectively. The number of machineries used have significant impacts on the production quantity and overall potential use of land of the farmers.

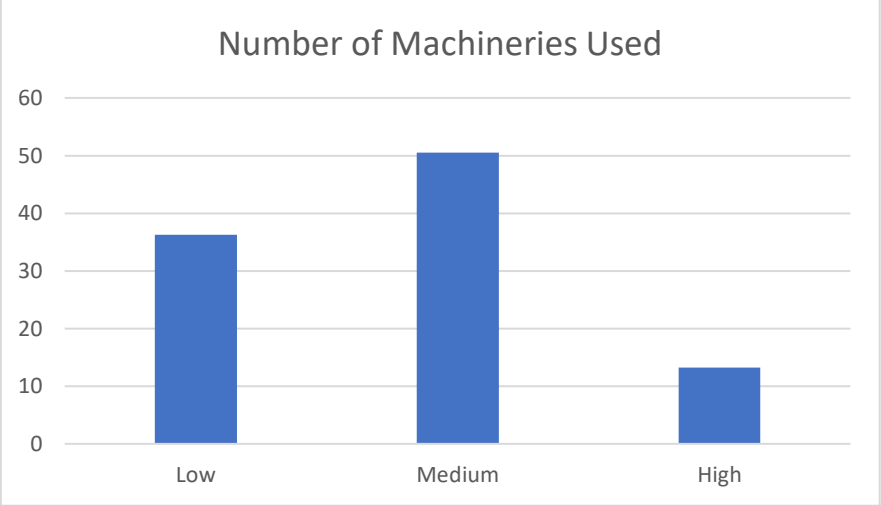


Figure 4.10 Distribution of the respondents according to their number of machineries used

4.2 Farmers Innovativeness to Use Modern Agricultural Machineries

The observed innovativeness on modern agricultural machineries of the respondents ranged from 3 to 31 against the possible range of 0 to 40. The mean score was 14.31 with the standard deviation of 6.198. Based on the observed access to innovativeness, the respondents were classified into three categories as low" (<13), "medium" (14-26) and "high" (>26) innovativeness on modern agricultural machineries. The distribution of the respondents according to their number of machineries used is shown in Table 4.2.

Table 4.2 Distribution of the respondents according to their innovativeness to use modern agricultural machineries.

Observed Range	Categories (Based on possible score)	Respondents		Mean	Standard deviation (SD)
		Number	Percent		
3-31	Low (<13)	11	12.1	14.31	6.198
	Medium (14-26)	71	78.0		
	High (>26)	9	9.9		
Total =		91	100		

Figure 4.11 indicates that slightly above three-fifths (78.0 percent) of the farmers had medium innovativeness as compared to 12.1 and 9.9 percent having low and high innovativeness on modern agricultural machineries respectively. Thus, huge majority (90.1 percent) of the farmers had low to medium innovativeness on modern agricultural machineries. This is due to that the farmers had lack of proper training facilities, lack of knowledge on agricultural machinery, available credit, easy terms, and condition for buying agricultural machinery etc.

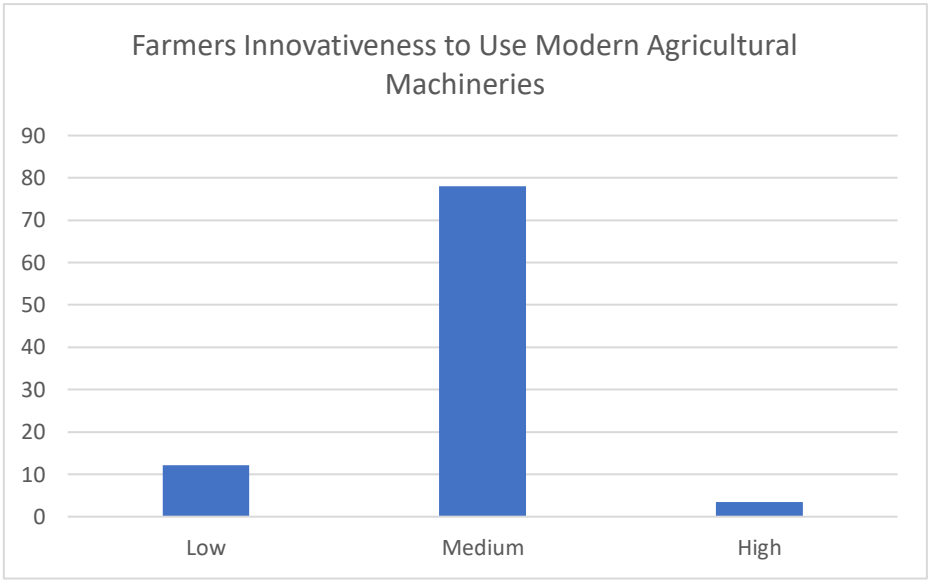


Figure 4.11 Distribution of the respondents according to their innovativeness

4.3 Relationships Between Farmer's Selected Socio-Economic Characteristic and Their Innovativeness of Using Agricultural Machineries

The purpose of this section is to explore the relationships between each of the selected characteristics of the farmers and their innovativeness on modern agricultural machineries. The selected characteristics constituted independent variables and the focus issue was considered their innovativeness on modern agricultural machineries. Pearson's Product Moment Correlation Co-efficient was used to test the null hypothesis concerning the relationship between any two variables. The summary results of test of correlation coefficient are shown in Table 4.3 However, a correlation matrix for focus issue and selected characteristics were presented in Appendix B.

Table 4.3 Correlation between focus issue and selected characteristics

Focus Issue	Selected Characteristics	Correlation co-efficient values "r"	Tabulated value of "r" with 89 *df*	
	Age	-0.087^{NS}	At 0.05 level	At 0.01 level
Innovativeness on Modern Agricultural Machineries	Education	0.101 ^{NS}	.217	.283
	Family size	0.076 ^{NS}		
	Farm size	0.365**		
	Area under agricultural mechanization	0.336**		
	Annual income	0.294**		
	Training experience	0.269*		
	Organizational participation	0.078 ^{NS}		
	Extension media contact	0.374**		
	Number of machineries used	0.941**		

NS= Not Significant

*Significant at 0.05 level of probability

** Significant at 0.01 level of probability

4.3.1 Age and innovativeness on modern agricultural machineries

According to the computed 'r‘(-0.087) value as shown in Table 4.3 the relationship between age and innovativeness on modern agricultural machineries was not significant. Hence, the concerned null hypothesis could not be rejected. The finding indicated that age of the famers had no significant relationship with their innovativeness on modern agricultural machineries. Khatun (2016), Mou (2015), and Afroz (2013) found similar results in their respective studies.

4.3.2 Education and innovativeness on modern agricultural machineries

According to the computed 'r’ (0.101) value as shown in Table 4.3 the relationship between education and innovativeness on modern agricultural machineries was not significant. Hence, the concerned null hypothesis could not be rejected. The finding indicated that education of the farmers had no significant relationship with their innovativeness on modern agricultural machineries. Khatun (2016) found similar results in her respective studies.

4.3.3 Family size and innovativeness on modern agricultural machineries

According to the computed 'r’ (0.076) value as shown in Table 4.3 the relationship between family size and innovativeness on modern agricultural machineries was not significant. Hence, the concerned null hypothesis could not be rejected. The finding indicated that family size of the farmers had no significant relationship with their innovativeness on modern agricultural machineries. Rao and Singh (2014) and Chouhan and Singh (2013 found similar results in their respective studies

4.3.4 Farm size and innovativeness on modern agricultural machineries

According to the computed 'r' (0.365) value as shown in Table 4.3 the relationship between farm size and innovativeness on modern agricultural machineries was statistically significant with 89 degrees of freedom at 0.01 level of significance Hence, the concerned null hypothesis could be rejected. The finding indicated that farm size of the farmers had positive significant relationship with their innovativeness on modern agricultural machineries. Khatun(2016), Kabir (2015), Rao and Singh (2014), and Chouhan and Singh 2013) found similar results in their respective studies.

4.3.5 Area under agricultural mechanization and innovativeness on modern agricultural machineries

According to the computed 'r' (0.336) value as shown in Table 4.3 the relationship between area under agricultural mechanization and innovativeness on modem agricultural machineries was statistically significant with 89 degrees of freedom at 0.01 level of significance. Hence, the concerned null hypothesis could be rejected. The finding indicated that area under agricultural of the farmers had positive significant relationship with their innovativeness on modern agricultural machineries.

4.3.6 Annual income and innovativeness on modern agricultural machineries

According to the computed 'r' (0.294) value as shown in Table 4.3 the relationship between annual income and innovativeness on modern agricultural machineries was statistically significant with 89 degrees of freedom at 0.01 level of significance. Hence, the concerned null hypothesis could be rejected. The finding indicated that annual income of the farmers had positive "significant relationship with their innovativeness on modern agricultural machineries. Mou (2015), Rao and Singh (2014), Chouhan and Singh (2013), and Mehta and Sonawane (2012) found similar results in their respective studies.

4.3.7 Training experience and innovativeness on modern agricultural machineries

According to the computed 'r' (0.269) value as shown in Table 4.3 the relationship between training experience and innovativeness on modern agricultural machineries was statistically significant with 89 degrees of freedom at 0.05 level of significance. Hence, the concerned null hypothesis could be rejected. The finding indicated that training experience of the farmers had positive significant relationship with their innovativeness on modern agricultural machineries. Mou (2015), Kabir (2015), and Rahman (2001) found similar results in their respective studies.

4.3.8 Organizational participation and innovativeness on modern agricultural machineries

According to the computed 'r' (0.078) value as shown in Table 4.3 the relationship between organizational participation and innovativeness on modern agricultural machineries was not significant. Hence, the concerned null hypothesis could not be rejected. The finding indicated that organizational participation of the farmers had no significant relationship with their innovativeness on modern agricultural machineries. Mou (2015), Rahman (2005) and Hussein (2001) found similar results in their respective studies.

4.3.9 Extension media contact and innovativeness on modern agricultural machineries

According to the computed 'r' (0.374) value as shown in Table 4.3 the relationship between extension media contact and innovativeness on modern agricultural machineries was statistically significant with 89 degrees of freedom at 0.01 level of significance. Hence, the concerned null hypothesis could be rejected. The finding indicated that extension media contact of the farmers had positive 'significant relationship with their innovativeness on modern agricultural machineries. Hasan (2015), Rao and Singh (2014), Afroz (2013) Chouhan and Singh (2013) and Mehta and Sonawane (2012) found similar results in their respective studies.

4.3.10 Number of machineries used and innovativeness on modern agricultural machineries

According to the computed 'r' (0.941) value as shown in Table 4.3 the relationship between machineries used of the farmers and innovativeness on modern agricultural machineries was statistically significant with 89 degrees of freedom at 0.01 level of significance. Hence, the concerned null hypothesis could be rejected. The finding indicated that number of machineries used of the farmers had positive 'significant relationship with their innovativeness on modern agricultural machineries.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the Findings

This chapter presents the summary of the major findings, conclusions and recommendations of the study.

5.1.1 Selected socio-economic characteristics of the farmers

Age of the respondents ranged from 18 to 62 years with an average of 44.41 and standard deviation of 9.76. Majority (51.6) percent of the famers were under middle aged category compared to (28.6) percent under old aged and (19.8) percent under young aged category. These findings indicated that a large proportion (80.2 percent) of the farmers of the study area were middle to old aged.

The education score of the farmers ranged from 0.00-15, with the mean value of 6.05 and standard deviation of 5.04. Slightly near half (40.7 percent) of the farmers had education up to secondary level compared to (7.7 percent) having primary level education. About 14.3 percent of the farmers were above secondary level educated, 27.5 percent of them can sign only and 9.9 percent of illiterate. Thus, the overwhelming majority (92.8 percent) of the farmers had education ranging from primary to above secondary level.

The family size of the farmers ranged from 2 to 12 having mean value of 5.417 and standard deviation of 2.19. Slightly near about 45.0 percent of the farmers had medium sized families. On the other hand, 38.5 percent had small family and only 16.5 percent had large family.

The farm size of the farmers ranged from 0.08 to 5.92 and the mean was 1.102 with standard deviation of 0.991. that majority (60.4 percent) of the farmers were under small farm size category followed by 4.4 percent, 29.7 percent and only 5.5 percent under marginal, medium and large farm size category respectively.

The area under agricultural mechanization of the farmers ranged from 0.06 to 5.02 hectares and the mean was 1.0524 hectares with standard deviation of 0. 885.Slightly above half (50.5 percent) of the farmers were under medium agricultural mechanization

area category followed by 31.9 percent under small and only 17.6 percent under large agricultural mechanization area category.

Annual income of the farmers ranged from 30 to 2605, the mean being 397.80 thousand tk. and standard deviation 482.76. The distribution of the farmers according to their family income is shown in Table 4.1. The highest proportion (51.6 percent) of the farmers had high income compared to 16.5 percent of them having medium income and 31.9 percent had low income.

The observed training experience scores of the respondents ranged from 0 to 35 with mean value 5.2527 and a standard deviation of 9.771. Majority (69.2 percent) of the farmers had no training experience compared to 5.5, 13.2 and 12.1 percent having low, medium and high training experience respectively.

Organizational participation scores of the respondents ranged from 0 to 7 with a mean of 1.2747 and standard deviation of 1.592. Highest proportion (42.9 percent) of the respondents had no participation in organization, 39.6 percent low, 15.4 percent medium and only 2.2 percent had high organizational participation.

Extension media contact scores of the respondents ranged from 8 to 32 against the possible range of 0 to 36. The average was 17.41 and the standard deviation was 5.30. Slightly less than one fifth (17.6 percent) of the farmers had low extension contact as compared to 63.7 and 18.7 percent having medium and high extension contact respectively.

Number of machineries used scores of the respondents ranged from 1 to 10 against the possible range of 0 to 11. The average was 4.78 and the standard deviation was 2.14. Slightly half (50.5 percent) of the farmers had medium number of machineries used as compared to 36.3 and 13.2 percent having low and high number of machineries used respectively. The number of machineries used have significant impacts on the production quantity and overall potential use of land of the farmers.

5.1.2 Farmer's innovativeness to use modern agricultural machineries

The observed innovativeness on modern agricultural machineries of the respondents ranged from 3 to 31 against the possible range of 0 to 40. The mean score was 14.31 with the standard deviation of 6.198. that slightly above three-fifths (78.0 percent) of the farmers had medium innovativeness as compared to 12.1 and 9.9 percent having low and high innovativeness on modern agricultural machineries respectively. Thus, huge majority (90.1 percent) of the farmers had low to medium innovativeness on modern agricultural machineries.

5.1.3 Contribution of Farmers Selected Socio-Economic Characteristics to Their Innovativeness of Using Agricultural Machineries

It was observed that out of ten selected characteristics of the farmers' farm size, area under agricultural mechanization, annual family income, training experience, and extension media contact, number of machineries used had significant positive relationship with their innovativeness on modern agricultural machineries. However, age, education, family size and organizational participation had no significant relationships with their innovativeness on modern agricultural machineries.

5.2 Conclusions

Based on the above findings the following conclusions were drawn:

1. Majority of the farmers had low to medium innovativeness on modern agricultural machineries. Therefore, it can be concluded that innovativeness of the farmers to use modern agricultural machineries is moderately satisfactory level. There is further scope for increasing the farmers innovativeness by using agricultural machineries. So, DAE and other concern authorities should take step to influence farmers to adopt modern agricultural machineries.
2. So, it could be concluded that larger farm size farmers had more innovativeness on modern agricultural machineries. Therefore, it might be concluded that higher economic condition of the farmers had more innovativeness on modern agricultural machineries.
3. From the result it can be said that, more training experience of the farmers would be the most important factor for adoption of modern agricultural machineries, the farmers with low extension media contact had low innovativeness and the

farmers with high extension media contact showed high innovativeness on modern agricultural machineries.

4. The number of machineries used, have significant impacts on the production quantity and overall potential use of land of the farmers. Age, education, family sizeand organizational participation had no significant relationships with their innovativeness on modern agricultural machineries. It may be concluded that innovativeness on modern agricultural machineries of the farmers is independent with these selected characteristics.

5.3 Recommendations

5.3.1 Recommendations for policy implication

The following recommendations are made for future research:

1. Slightly above three-fifths (78.0 percent) of the farmers had medium innovativeness on modern agricultural machineries So, the concerned GOs and NGOS should take necessary steps to increase innovativeness of the famers on modern agricultural machineries.
2. Training experience of the farmers had positive significant relationship with their innovativeness on modern agricultural machineries. Therefore, it may be recommended that concern authority should take necessary motivational program like training on modern agricultural machineries so that the farmers could increase their knowledge on agricultural machineries.
3. Extension media contact of the farmers had positive significant relationship with their innovativeness on modern agricultural machineries. Extension workers need to provide adequate information about the benefits and know-how of agricultural innovations among the farmers to develop innovativeness which, in turn, help development of opinion leadership.
4. There is need for establishing various kinds of organizations in the rural areas according to the needs of the farmers. Such organizations will help to disseminate improved agricultural technologies among the farmers. In view of the consistent positive relationship between different farm size of the farmers and their use of agricultural machinery, improved technologies should be initiated according to their socioeconomic condition and farm size which can be adopted as cost effective. It is recommended that DAE should undertake a

program of farm mechanization throughout the country. It is further recommended that farm mechanization should be incorporated in the upazila annual agriculture development plan.

5.3.2 Recommendations for further study

1. The present study was conducted at Panchbibi upazilla in Joypurhat district. So, findings of the study need to verification by conducting similar research in other parts of the district of the country.
2. Respondents have many characteristics. Only ten characteristics were selected. Therefore, it is recommended that further study should be conducted involving other characteristics.
3. The relationships between ten selected characteristics of the respondents with their innovativeness on modern agricultural machineries were determined by using only correlation co-efficient. Therefore, it is recommended that further study may be conducted using sophisticated research design like regression coefficient, path analysis etc.
4. Out of ten selected characteristics of the farmers farm size, area under agricultural mechanization, annual family income, training experience, extension media contact and number of machineries used had significant positive relationship with their innovativeness on modern agricultural machineries. Hence, further investigation is necessary to find out such relationships between the concern variables to authentic the present study.
5. Out of ten selected characteristics of the age, education, family size and organizational participation had no significant relationships with their innovativeness on modern agricultural machineries. In this connection, further investigation is necessary to find out such relationship between the concern variables to authentic the present study.

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APPENDIX A

Department of Agricultural Extension & Information System

Sher-e-Bangla Nagar, Dhaka-1207

A Schedule of Interview

On

Farmers Innovativeness to Use Modern Agricultural Machineries Under Panchbibi Upazilla, Joypurhat

Date: Serial No:

Name of Respondent : Father's Name :

Village : Union : Mob. No :

(Please answer the following Questions)

1. **Age:**

2. **Education:**

(Mention your educational qualification)

a.	Do not read and write	
b.	Can sign Name only	
c.	Educated up to (class)	

3. **Family Size:**

(Mention your family members including you)

a.	Male	:	
b.	Female	:	
Total Members		:	

4. Area of Land: *(Indicate the area of land in your possession)*

Sl. No.	Nature of Holding	Area		
		Bigha	Decimal	Hectre
A	Homestead (incl. garden and fallow land)			
B	Own land self-cultivated			
C	Land given to others on share (বর্গা)			
D	Land taken from others on share (বর্গা)			
E	Land taken from others on Lease			
F	Pond Area (পুকুর)			
G	Others - if any (অন্যান্য-প্রযোজ্য ক্ষেত্রে)			
TOTAL [A+B+½(C+D)+E+F+G] =				

5. Area Under Agricultural Mechanization:

(Please indicate your cultivation area under agricultural mechanization)

Total		Hectre

6. Family Income Per Annum:

(Give particulars about your total family income of last year)

Sl. No.	Source of Income	Production	Market Price (BDT)	Total (BDT)
1	Rice			
2	Wheat			
3	Maize			
4	Potato			
5	Vegetables			
6	Fruits			
7	Dairy and Poltry			
8	Fish Culture			
9	Service			
10	Business			
11	Day Labor			
12	Others (if any)			
Total (BDT)				

7. Training Experience:

Yes		No	

If yes, furnish the following information:

Sl. No.	Name of Organization	Duration (Days)
1.		
2.		
3.		
4.		
5.		
6.		

8. Organizational Participation:

(Indicate your involvement in the following organizations)

Sl. No.	Name of Organization	No Participation	Types of Participation		
			Member	General Secretary	Chairman/ President
1.	School/Madrasah Committee				
2.	Mosque/Mandir Committee				
3.	Village Development Committee				
4.	Youth Club				
5.	Bazar Committee				
6.	Co-operative association				
7.	Union parishad				
8.	Others (if any)				

9. Extension Media Contact:

(Indicate the extent of your contact with following extension media)

Name of Extension media		Frequency of Contact			
		Regularly	Occasionally	Rarely	Not At All
Individual Contact	Neighbors and Friends	5-6 times/ months	3-4times/ months	1-2 times/ months	
	Sub-assistant Agriculture Officer	5-6 times/ months	3-4times/ months	1-2 times/ months	
	Upazilla Agriculture Officer	4-5 times/ months	2-3 times/ months	1-2 times/ months	
	Agricultural Extension Officer	4-5 times/ months	2-3 times/ months	1-2 times/ months	
	NGO Personnel	5-6 times/ weeks	3-4times/ weeks	1-2 times/ weeks	
	Agricultural Product Dealer	4-5 times/ weeks	2-3 times/ weeks	1-2 times/ weeks	
Group Contact	Result Demonstration	2-3 times/ year	2 times/ year	1 time/ year	
	Group Discussion	5-6 times/ months	3-4times/ months	1-2 times/ months	
	Farmer's field day	1 time/ year	1 time/ 2 years	1 time/ 3 years	
Indirect Contact	Listening Agricultural program on Radio	5-7 times/ weeks	3-4times/ weeks	1-2 times/ weeks	
	Watching Agricultural Program on Television	4-5 times/ weeks	2-3 times/ weeks	1-2 times/ weeks	
	Reading Agricultural Publications, Poster Newspaper, Leaflet	4-5 times/ weeks	2-3 times/ weeks	1-2 times/ weeks	

10. No of Machineries Used: *(Total no of Machineries used within last 05 years)*

Number of Machineries (As Discussed Above)	Put Tick (✓) Mark
0-2 Machines	
3-5 Machines	
6-8 Machines	
9-11 Machines	

11. Innovativeness of Using Modern Agricultural Machineries:

(When you used the machine for the first time after being introduced to it)

Sl. No.	Name of the Agricultural Machineries	Degree of Earliness of Use				
		Within 1 year after hearing	Within 2 years after hearing	Within 3 years after hearing	Above 3 years safter hearing	Do not use after hearing
1	Power Tiller					
2	Tractor					
3	Power Operated Rice Thresher					
4	Paddle Thresher					
5	Electric Pump					
6	Deep Well pump					
7	Diesel operated low lift pump					
8	Power sprayer					
9	Hand Operated sprayer					
10	Combined Harvester					

Thanking You for the Questionnaire

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(Signature of the Interviewer)

APPENDIX-B

Correlation Matrix between Focus Issue and Selected Characteristics of the Farmers

	Age	Education	Family Size	Farm Size	Area under agricultural mechanization	Annual Family income	Training experience	Organizational participation	Extension media contact	Number of machineries used	Innovativeness
Age	1	*									
Education	-.340**	1									
Family Size	-.204	.156	1								
Farm Size	.015	.121	.392**	1							
Area under agricultural mechanization	.045	.158	.301**	.937**	1						
Annual Family income	-.011	.067	.439**	.883**	.812**	1					
Training experience	-.017	.114	.355**	.495**	.510**	.506**	1				
Organizational participation	.112	.135	.403**	.450**	.357**	.527**	.445**	1			
Extension media contact	-.231*	.316**	.072	.401**	.435**	.354**	.239*	.113	1		
Number of machineries used	-.051	.093	.020	.328**	.343**	.236*	.246*	.044	.361**	1	
Innovativeness	-.087	.101	.076	.365**	.336**	.294**	.269*	.078	.374**	.941**	1

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

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