FARMERS' KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS AGRICULTURAL MECHANIZATION OF BABUGANJ UPAZILLA UNDER BARISHAL DISTRICT

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CERTIFICATE

This is to certify that the thesis entitled, **"FARMERS' KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS AGRICULTURAL MECHANIZATION OF BABUGANJ UPAZILLA UNDER BARISHAL DISTRICT"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree of **Master of Science (MS) in Agricultural Extension**, embodies the result of a piece of bona-fide research work conducted by **MD. MOSTAFIZUR RAHMAN, Registration no. 17-08274** under my supervision and guidance. No part of this thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this study has been dully acknowledgement by him.

Dated: DECEMBER, 2018

Dhaka, Bangladesh

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Dedicated

To

My beloved Parents

A C K N O W L E D G E M E N T S

One of the satisfied snapshots of composing this note of acknowledgement is to think back the whole voyage of my investigation and recollect every one of the general population, beginning from my supervisor, co-supervisor to course instructors, friends and family, or more all Almighty Allah.

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The Author

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ACRONYMS AND ABBREVIATIONS

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

FARMERS' KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS AGRICULTURAL MECHANIZATION OF BABUGANJ UPAZILLA UNDER BARISHAL DISTRICT

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ABSTRACT

Mechanization is a process through which agricultural activities can be improved and optimum crop production can be achieved. The objectives of this study were to describe the selected socio-economic profile of the farmers, to determine the extent of farmers' knowledge, attitude and practice against agricultural mechanization, to explore the correlation among each of selected characteristics of farmers and their knowledge, attitude and practice towards agricultural mechanization. The study was undertaken purposively in Babuganj upazilla under Barishal district. Validated and well-structured interview schedule was used to collect data. The statistical measures such as range, means, standard deviation, number and percentage distribution were used to describe the selected variables. Pearson's Product Moment Coefficient of Correlation (r) was used in order to explore the relationships between the concerned variables. The findings of the study showed that 86.8% of the farmers had poor to moderate knowledge, 63.21% of them had low favorable attitude and 77.4% had medium level of practice of agricultural mechanization. The findings also implies that the educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, agricultural machinery using experience had significant relationship with their knowledge, attitude and practice towards agricultural mechanization. Bangladesh agriculture is currently facing several challenges like ageing farmers, feminization of agriculture, farm labor shortage, shrinking land, degradation of natural resources, soaring prices, and vulnerability to climate change, etc. To face these problems there is no other better option than practicing agricultural mechanization. It is concluded that adequate technical support, cooperative farming system, credit availability, extension media contact, training facilities need to be extended to enhance farmers' knowledge, attitude and practice towards agricultural mechanization.

Chapter 1

Introduction

1.1 Background of the Study

Mechanization is a process through which agricultural activities can be improved and optimum crop production can be achieved. Tools, implements and powered machinery, are essential and major inputs to agriculture. The term "Farm Mechanization" is generally used as an overall description of the application of these inputs in crop cultivation. Different mechanical inputs currently practiced in different farming activities in Bangladesh. The cropping intensity and production of food crops has recently been increased significantly due to adoption of mechanized tillage, irrigation, and spraying operations (Sarker, 2000). Bangladesh agriculture is currently faced with range of challenges like ageing farmers, feminization of agriculture, farm labor shortage, shrinking land, degradation of natural resources, soaring prices, and vulnerability to climate change. In the face of these challenges, we need knowledge-intensive green revolution that combines advances in science and agricultural engineering with the unique traditional knowledge to make agriculture more environmentally resilient (ESCAP Social and Economic Survey, 2016). To feed ever increasing population in our country, it is therefore essential for production to keep up with increasing demand in a sustainable way. However, additional increases in agricultural production are difficult to achieve due to resource constrains, especially on land and water. While gains from increased area cultivated are hardly achievable, over utilization of inputs (such as fertilizers and pesticides) is already undermining soil quality and fertility. Thus, improved agricultural technology holds the key to increasing food production. Technology-driven agricultural growth can contribute significantly to growth in national income and poverty alleviation. Among many agricultural inputs, agricultural machinery plays an important role in promoting crop production to a targeted level to sustain self-sufficiency in cereal production in the country which has increased more than three folds over the last two decades to 38.50 million tons (Ahmmed *et al*., 2016). Farm mechanization has seen a rather slow progress over the years. The demand of important agricultural equipment like tractors, power tillers, combine harvesters, irrigation pump sets, diesel engines, has shown an increasing trend. The progress of farm mechanization in terms of demand of

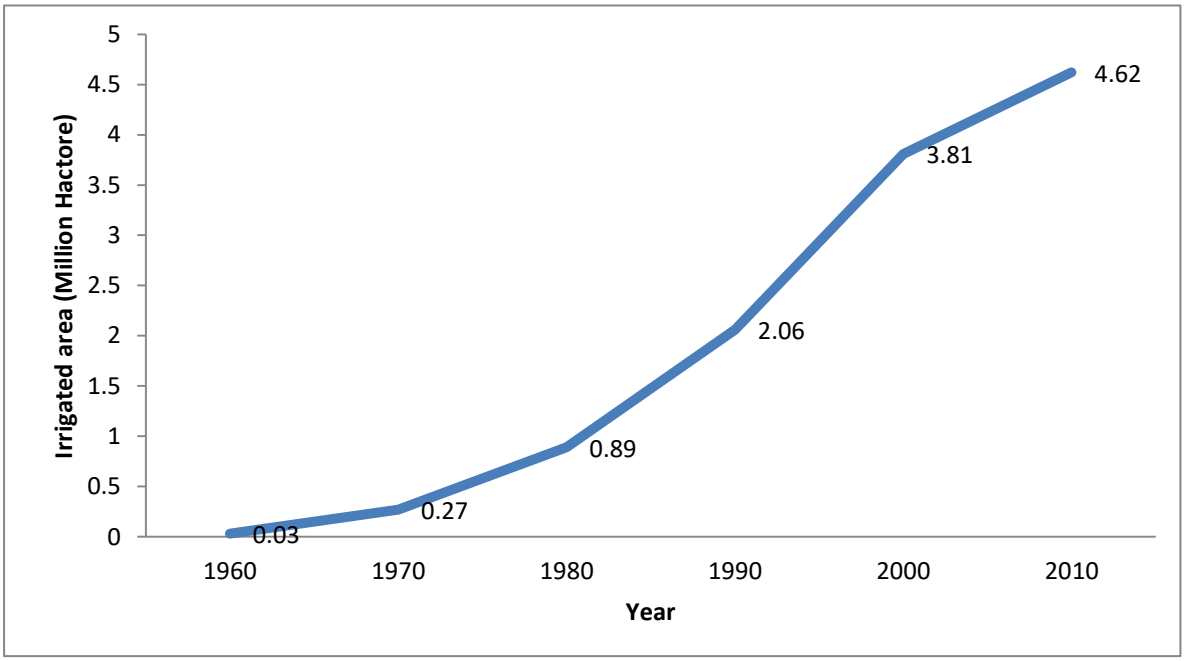
agricultural equipment is estimated at about 1 to 1.5% per annum. (farmech.gov.in/06035-02-15052006.pdf)

1.2 Status of Agricultural Mechanization in Bangladesh:

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

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

Figure 1.1: Irrigated area in different year



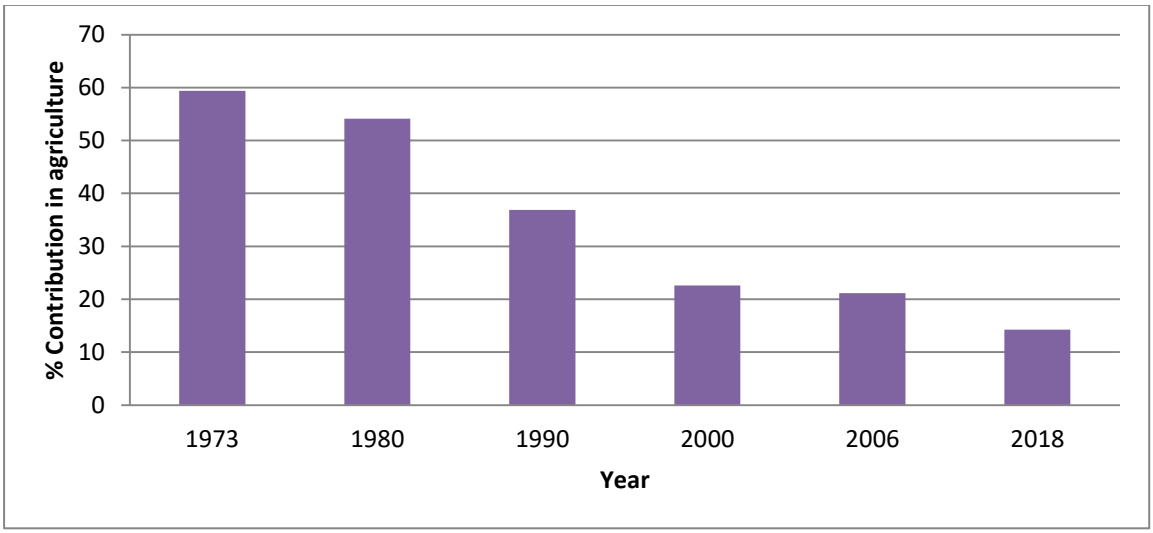
Source: BADC, 2010

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

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

1.3 Statement of the problem

Bangladesh is predominately an agricultural country. To feed her 160 million people from 8 million hectares of cultivable land is a tough task (Hossain, 2016). Every year almost 0.20 million people are being added to the total population whereas the estimated annual shrinkage of agricultural land is about 0.08 million hectares due to various non-agricultural activities like constructions of houses, offices, roads, mills, factories etc. (BRRI, 2015). The contribution to GDP by agriculture is about 13.60% (Bangladesh Economic Review, 2019). Which is decreasing day by day is shown in figure 1.2



. Source: Bangladesh Economic Review, 2019

Figure 1.2: Contribution of Agriculture to GDP over Years

In many developing countries up to 80 per cent of farm power is provided by human beings. In most developed countries human beings are used less and less as a source of power and more for machine operation and control (http://agricoop.nic.in/). At present Bangladesh is a middle income country, to reach in row of developed country there is no better option rather than shift its manpower from agriculture sector to industry and service sector. To fulfillment of our desire to become developed country our present government set "Vision 2021" as following-

Table 1.1: Sector wise manpower contribution at present and targeted vision 2021

Sector	Present contribution (Percent)	Targeted contribution in Vision 2021 (Percent)
Agriculture	40.6	**30**
Industry	20.4	25
Service	39	45

Source: Bangladesh Economic Review, 2019

Mechanization in the country is always associated with some inherent drawbacks like, fragmented lands, poor buying capacity of farmers, lack of quality machines for farm operation, inadequate knowledge of the users about machines and insufficient awareness building activities, tariff difference on machines and spare parts, financial and institutional constraints. Therefore, the researcher has undertaken the study titled "Farmers' Knowledge, Attitude and Practice (KAP) towards Agricultural Mechanization of Babuganj upazilla under Barishal District"

In order to make the study manageable the following research questions were taken into consideration:

I. What were the selected characteristics of the farmers that influence their knowledge, attitude and practice towards agricultural mechanization?
II. What was the extent of knowledge, attitude and practice of farmers concerning agricultural mechanization?
III. Is there any relationship of the farmers' selected characteristics on their a) knowledge, b) attitude and c) practice concerning agricultural mechanization?

1.4 Objectives of the study

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

I. To describe the selected socio-economic profile of the farmers;
II. To determine the extent of farmers' knowledge, attitude and practice towards agricultural mechanization; and
III. To explore the correlation among each of the selected characteristics of farmers and their a) knowledge, b) attitude and c) practice towards agricultural mechanization.

1.5 Justification and scope of the Study

The country is, at present, about to achieve self sufficiency in cereal production. This is due to irrigation development and partial mechanization in other agricultural operations. But to meet up the food requirements of the ever growing population of the country in 2015, an additional 5 million tons of food grain need to be produced from the continuously decreasing agricultural lands. To achieve this target, there is no other better option than to increase production per unit of land as well as cropping intensity. Thus, to increase production and cropping intensity, the most important gain will be the faster development of agricultural mechanization as well as variety development. Replacing the traditional inefficient agricultural tools, efficient mechanized cultivation must be introduced and extended. 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 practice of the concerned farmers is necessary for the further development of agricultural mechanization in Bangladesh.

Considering the above fact, the researcher felt a necessity to undertake a study to determine knowledge, attitude and practice of the farmers concerning agricultural mechanization.

1.6 Assumptions of the Study

An assumption is the supposition that an apparent or principle is true in the light of the available evidence (Goode and Hatt, 1952). An assumption is taken as a fact or belief to be true without proof. The researcher had the following assumptions in mind while undertaking this study:

I. The respondents had the capacity to response the questions furnished in the interview schedule.
II. The responses furnished by the respondents were reliable. They express the truth while passing their opinions and providing information.
III. The sample size was representative to the whole population of the study area.
IV. The items, questions and scale of measurement of the variables were reasonably authentic to represent the actual condition of the respondents.
V. The data collected by the researcher were free from bias.
VI. The researcher was capable to adjust with the social and cultural environment of the study area.

1.7 Limitation 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:

i. The research was conducted to a confined area of Bakerganj Upazila under Dhaka District.
ii. The characteristics of the respondents farmers in the study area were many and varied but only 10 characteristics were selected for examining their contribution on their knowledge, attitude and practice concerning Agricultural Mechanization.
iii. Data were collected from the selected farmers furnished by them from their memory during interview.

iv. 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.

1.8 Definition of the Related Terms

In this section, the terms which have been frequently used throughout the thesis are defined and interpreted below:

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

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

Agricultural machinery using experience: Agricultural machinery using experience referred to the number of years a respondent has been engaged himself in using agricultural machinary and it was expressed in number of years.

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 in Thousand Taka.

Attitude towards agricultural mechanization: Attitude is the mental predisposition of an individual to act in a particular way. In other words, it refers to one's favorable or unfavorable feelings, beliefs, and actions towards an object and concept. Attitude towards the agricultural mechanization refers to one's feeling towards the mechanization in agriculture in various aspects.

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 time of interview. It was measured on the basis of classes a farmer has passed from a formal educational institution.

Extension contact: It referred to respondens exposure to or contact with different communication media, source and personalities being used for dissemination of new technologies.

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

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

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

Practice of agricultural mechanization: It refers to the level of practices by the farmers in various aspects of agricultural mechanization such as land preparation, threshing, plant protection (spraying), milling, transporting, irrigation, fertilizer application, harvesting etc.

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

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

Training received: It referred to the total number of days attended by the farmers in his life in institutional training on agricultural mechanization. It was measured by the number of days of training received by the respondent.

CHAPTER 2

REVIEW OF LITERATURE

Review of literature provides the clear and concise direction of the researcher for conducting the experiment. With aim to get clear and concise direction this chapter deals with the review of past research works that relates to this investigation directly or indirectly. The reviews are conveniently presented based on the major objectives of the study. This study was mainly concerned with farmers' knowledge, attitude and practice towards agricultural mechanization and the contribution of the selected characteristics of the farmers to their knowledge, attitude and practice on agricultural mechanization. Despite frantic search, the researcher found only a few literatures related to this study. The researcher came across with some subject matter specialist opinions and has tried his best to collect necessary information through searching relevant studies, thesis, journal, articles, periodicals, bulletins, leaflets, websites etc.

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 Concept of knowledge, attitude and practice

2.1.1 Concept of knowledge

"Knowledge is a familiarity with someone or something, which can include facts, information, descriptions, or skills acquired through experience or education. It can refer to the theoretical or practical understanding of a subject. It can be implicit (as with practical skill or expertise) or explicit (as with the theoretical understanding of a subject); it can be more or less formal or systematic (Wikipedia)." Bhuiyan, 2012 indicated as "Knowledge may be defined as the scientific fact of an idea which is experimentally or empirically verified." According to Sweiby (2003) "Knowledge is a concept like gravity. We cannot see it, but can observe its effects. Because knowledge is an invisible, intangible asset and cannot be directly observed, many people and organizations do not explicitly recognize the importance of knowledge, in contrast to their more visible financial and capital assets." According to Oxford dictionary "Knowledge is facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject."

Knowledge is the outcome of some activity such as generation, storage, dissemination and utilization of something that entails either information or data. It is generally based on learning, thinking, and proper understanding of the problem area. Knowledge is not information and information is not data. It is derived from information in the same way information is derived from data when processed or patterned in human mind. Knowledge can be thought as the integration of human mind. It can be predicted as the integration of human perceptive processes that helps them to draw meaningful conclusions.

2.1.2 Concept of attitude

The term attitude used by Abate (1999) means "a settled opinion" and "behavior reflecting this". Venes (2001) defined attitude as behavior based on conscious or unconscious mental views developed through cumulative experience.

Zimmerman (2001) defined attitude as

- The posture, action, or disposition of a figure or a statue.
- The posture or position of a person or an animal, or the manner in which the parts of his body are disposed; position assumed or studied to serve a purpose.
- Position as indicating action, feeling, or mood.

According to American Heritage Stedman's Medical Dictionary (2001) attitude is-

1. The position of the body and limbs; posture.
2. A manner of acting.
3. A relatively stable and enduring predisposition to behave or react in a characteristic way

"Attitude may be defined as a person's perspective toward a specific target and way of predisposition to act, perceive, think and feel in relation to something's. It is expressed as one's views regarding an object as positive or negative, favorable or unfavorable, like or dislike etc. with varying degrees" (Bhuiyan, 2012).

2.1.3 Concept of practice

"Practice may be defined as the activities of an individual that he/she performed followed by some instructions in order to fulfill some wants that he/she needed" (Alam, 2003). Karl Sweiby (2003) noted Practice as a method, procedure, process, or rule used in a particular field or profession; a set of these regarded as standard. According to Oxford dictionary "Practice is the actual application or use of an idea, belief, or method as opposed to theories relating to it." From oxford dictionary it is also found that "practice is the facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject". There is a proverb that "practice makes a man perfect" in the same way more practice increase knowledge and attitude (positive or negative) to a specific subjects.

2.2 Concept of agricultural mechanization

Agricultural mechanization (AM) is the application of technology into the field of Agriculture in order to improve agricultural output, as well as deliberate conscious departure from the peasant and subsistence agriculture into a Commercial Agriculture. This process also involves the development and management of machines for field production, water control, material handling as well as post-harvest operation (Rahman and Lawal, 2003). Farm mechanization encompasses in its widest sense hand- tool technology, draught animal technology and mechanical power technology (Maharjan and Cheltri, 2006). Farm mechanization is the process of development and introduction of mechanized assistance of all forms and at any level of technological sophistication in agricultural production in order to reduce human drudgery, improve timeliness and efficiency of various farm operations, bring more land under

cultivation, preserve the quality of produce, improve living condition and markedly advance the economic growth of the rural sector (Akande, 2009). Mechanization is a process through which Agricultural activities can be improved and optimum crop production can be achieved (Chowdhury *et. al*., 2010). Farm mechanization is the application of engineering and technology in agricultural operations to do a job a better way to improve productivity. This includes development, application and management of all mechanical aids for field production, water control, material handling, storing and processing (Vinay *et. al.*, 2010). Agricultural mechanization includes three main power sources: human, animal, and mechanical. The manufacture, distribution, repair, maintenance, management and utilization of agricultural tools, implements and machines is covered under this discipline with regard to how to supply mechanization inputs to farmers in an efficient and effective manner (Zangeneh and Banaeian, 2014).

2.3 Knowledge, attitude and practice of respondents towards Agricultural Mechanization

2.3.1 Knowledge of respondents about Agricultural Mechanization

Singh *et al*. (2007) reported that all categories of farm women had knowledge about the tractor and tractor operated cultivators, seed drills and threshers. Knowledge of farm women about manually operated farm equipment like wheel hoe, seed treatment drum, groundnut decorticator and maize Sheller was 69 per cent, 23 per cent, 17.9 per cent and 14.6 per cent respectively. Tekwa *et al*. (2010) revealed that there were about 5 percent of farmers with knowledge about modern technologies in sugarcane. Vinod *et al.* (2011) stated that majority of the respondents (83.02%) were having knowledge regarding use of transportation and power system and ranked as 1st followed by improved threshing, shelling, crushing and milling machinery (31.32%) rank 2nd; plant protection equipment (59.43%) rank 3rd; weeding intercultural operation implements (54.72%) rank 4th; sowing and planting machines (48.11%) rank 5th; harvesting and digging machinery/ implements (45.28%) rank 6th; soil tillage and cultivating machinery (42.45%) rank 7th; and ridge making and bund implements (21.70%) rank 8th. Deshmukh *et al.*, (2011) disclosed cent per cent of respondents had knowledge on ploughing and 96.66 per cent respondents on harrowing. Kumar and Sharma (2011) revealed that majority of respondents (76.52%) had knowledge gap of 23.48 per cent, followed by 74.21 percent had knowledge gap of 25.79 per cent and

73.35 per cent had knowledge gap of 26.65 per cent on soil and soil preparation. Kumar *et al*. (2011) narrated that 56.25 per cent of farmers are not fully aware of number of ploughings to be done with MB plough for groundnut cultivation while majority of them had complete knowledge about tractor drawn improved thresher. Nagaraj *et al. (*2013) reported that nearly half of the respondents (45.00%) belonged to medium level of overall knowledge category about farm mechanization practices. Majority of the respondents had complete knowledge i.e., on mode of operation, frequency of use and specification of the implements such as mould board plough, harrow, cultivator, power tiller, cage wheel, puddler, sprayer, combine harvester and thresher. Dange *et al*. (2014) reported that half of the small farmers (50.00%) had high knowledge gap about farm machinery and equipment followed by 44.00 per cent of medium farmers and 40.00 per cent of big farmers respectively.

2.3.2 Attitude of respondents towards Agricultural Mechanization

Akila and Chander (2009) disclosed that majority of the overall respondents (89%) had favorable attitude followed by neutral (8.1%) and unfavorable attitude (2.9%). Suryawanshi and Khan (2010) stated that majority (89.59%) felt that farm mechanization is not sustainable followed by sustainable (8.33%) and very much sustainable (2.08%). Takeshima and Salau (2011) revealed that ownership of certain farm implements increased farmers investment in the some implements but reduced their investment in other potentially complementary implements. Ownership of farm equipment may provide a good indicator of farmers potential willingness to invest in the some of different equipment. Oladeji *et al.* (2012) stated that majority (68.0%) of the categories of farmers were undecided on the use of animal traction technology while 15.3 per cent had unfavorable attitude towards its use but few (16.7%) were favorably disposed to its use. Owombo *et al.* (2012) reported that majority (87.6%) non adopters and adopters (38.7%) agreed that mechanization destroys soil quality.

2.3.3 Practice of Agricultural Implements and Machinery by respondents

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%). Shakirullah and Ramzan (2006) in their study on extent of adoption of modern Agricultural machinery in Pakistan concluded that 11.25 per

cent respondents owned tractors. Among the tractor owners, 88.88 per cent also owned threshers, 44.44 per cent owned ridgers and 100 per cent owned chisel ploughs and blades. Mansoor *et al.* (2007) reported that 10 per cent of the respondent farmers had their own tractor and the remaining 90 per cent hired the tractors for ploughing and threshing and 62.5 per cent for transportation purposes. For farm operations cultivator was used by 53.75 per cent of the sampled farmers, mould board plough by 41.25 per cent, disk-plough by 32.5 per cent, harrow by 77.5 per cent, rotavator by 52.5 per cent, and leveling blade by 65 per cent. Singh *et al.* (2007) reported that 22.8 per cent of farm women worked with wheel hoes whereas 14.2 per cent worked with threshers, 8.2 per cent with groundnut decorticators, 5.1 per cent with hand Maize Sheller, 2.4 per cent with seed treatment drums, 1.2 per cent with cleaner graders and 0.7 per cent with tractors. Kumar *et al.* (2008) found that majority (54.00%) of farmers used cultivators and 50.00 per cent used disc harrows.

Tekwa *et al.* (2010) disclosed that there was a higher concentration of traditional technologies among the farmers compared to mechanization. Yohanna *et al.* (2011) in their study on mechanization problems of small farmers found various levels of mechanization tools use in the various farm operations as follows: land clearing (21.54%), tillage (24.62%), planting (3.85%), spraying (86.15%), weeding (3.08%) and harvesting (40%). Musa *et al.* (2012) revealed that 60 per cent of the respondents adopted mechanization and it boosted their crop production and reduced the use of other forms of manual labor. Vinay *et al.* (2012) reported that majority (57.43 %) of the respondents used country plough as a primary tillage implement, 75.56 per cent used cultivator as a secondary tillage implement and 57.43 per cent respondents used traditional sowing methods.

Owombo *et al.* (2012) stated that 72.1 per cent of adopters adopted only mechanized land preparation followed by 19.4 per cent mechanized land preparation and planting and 8.5 per cent mechanized other operation such as processing (shelling). Shamabadi (2012) found that more than 95 per cent of land preparation is done by draft tractors using 3-bottom mouldboard 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 per cent of the farmers used the knapsack sprayer while only 20 per cent used boom sprayer. Nagaraj *et al.* (2013) revealed that

less than half of the respondents (42.50%) belonged to medium level of adoption category. Dange *et al.* (2014) reported that nearly 36.00 per cent of small farmers belonged to high adoption gap category and 26.00 per cent adoption gap was found among the big farmers. Cent per cent of the sugarcane growers expressed that mechanization was most needed in weeding, harvesting and planting operations and 64.00 per cent of the sugarcane growers felt that further mechanization in irrigation is needed.

2.4 Relationship between selected characteristics of the respondents and their Knowledge on innovations

2.4.1 Age and knowledge

Rahman *et al.* (2001), Chandargi (2000) found positive significant relationship between age and knowledge in their research. According to Hanif (2000) age of FFs farmers had significant relationship with IPM knowledge on environmental awareness. Huda *et al.* (1992) concluded of his study that older farmers were more careful in keeping low moisture content of their seed.

But Hossain (2000), Rahman (2001), Saha (2001), Sarkar (2002), Sana (2003), Saha (2003) in their respective studies found no relationship between age and knowledge. Roy (2006) observed age of the farmer had no significant relationship with their knowledge on Boro rice cultivation. Similar results were observed by Khan (2005), Islam (2005) and Rahman (2004) in their respective studies. Islam (2013) also found no significant relationship between age and farmers' knowledge on modern agricultural technologies

However, Amin (2001) found in his study that age of PETRRA and non-PETRRA beneficiaries had negative significant relationship with their knowledge on organic cocoon and skills on production, processing, storing of seeds. Islam (1996) carried out a study on farmers' use of Indigenous Technical Knowledge (ITK) in the context of sustainable agricultural development. He also observed that age of the farmers had significant negative relationship with their extent of use of ITK. Similarly Rayapraddy and Jayaramaiah (2007) studied on Village Extensions Officer's (VEOs) knowledge of rice production technology, and found that age of the VEOs had negative relationship with the knowledge level of VEOs. Kashem (2005) carried out a study on the small farmers constraints to the adoption of modern rice technology in this study

he found that age of the farmers had significant negative correlation with their agricultural knowledge. That means generally younger farmers gained more agricultural knowledge than their older counterpart.

2.4.2 Educational qualification and knowledge

Saha (2003), Sana (2003), Sarker (2002), Saha (2001), Hossain (2000) found that education of the farmers was positively and significantly related with their knowledge in their respective research work. According to Hossain (2003) education of the farmers had significant relationship with modern boro rice cultivation. Amin (2001) observed that education of PETRRA and non-PETRRA beneficiaries had positive significant relationship with their knowledge on organic cocoon and skills on production and storing of rice seeds. Alam (1997) found that the level of education of the farmers had a positive and significant relationship with the use of improve farm practices.

But Islam (2013) observed that the general education of the BSs had no significant relationship with their knowledge on modern agricultural technologies. Huda *et al.* (1992) found that farmers with education and without education had same level of moisture of their seed. Kashem (2005) in his study found that there was no significant relationship between education on the farmer and their agricultural knowledge. Sharma and Sonoria (2003) found no significant differences of education between that contact and non-contact farmers. But they found significant differences in knowledge of both contact and non-contact farmers with their education. However, adoption of innovations varied significantly with the education in case of non-contact farmers only.

2.4.3 Farm size and knowledge

Sarker (2002) stated that there was a positive relationship between farm size of the farmers and their knowledge. Hossain (2003) also observed that farm size of the farmers had significant relationship with modern Boro rice cultivation. Alam (1997) studied the use of improved farm practices in rice cultivation by the farmers. He founded that the farm size had a significant relationship with their use of improved farm practices in rice cultivation. Similar results were observed by Verma and Kumar (2011).

But Sana (2003), Hossain (2000) reported that farm size of the farmers had no significant relationship with their knowledge. Amin (2001) also reported that farm size of PETRRA and non-PETRRA beneficiaries had no significant relationship with knowledge on organic cocoon and skills on production, procession and storing of rice seed.

However, Islam (1996) stated that there was significant and negative relationship between the farm size of the farmers and their extent of use of indigenous technical knowledge. Sharma and Sonoria (2003) observed that both the contact and non-contact farmers were different in their size of operational holdings. However, they observed no significant differences in knowledge of both the contact and non-contact farmers with the size of their operational holdings.

2.4.4 Annual family income and knowledge

Alam (1997) studied the use of improved farm practices in rice cultivation by the farmers. He founded that the farm size had a significant relationship with their use of improved farm practices in rice cultivation. Similar results were observed by Verma and Kumar (2011). Ali (2001) also stated that income of the contact and non-contact farmers differed significantly. He also found that income of the contact and non-contact farmers had significantly contribution to both of their agricultural knowledge and adoption of innovations.

But Hossain (2003) reported that income of the rural women farmers had negative relationships with their knowledge of modern Boro rice cultivation. Islam (1996) also stated that there was significant and negative relationship between the farm size of the farmers and their extent of use of indigenous technical knowledge.

However, Amin (2001) found that annual family income of PETRRA and non-PETRRA beneficiaries had no relationship with knowledge on organic cocoon and skills on production, procession and storing of rice seed. Nurzzaman (2000) also stated that incomes of the rural women farmers had no significant relationships with their knowledge of the FFS and non-FFS farmers.

2.4.5 Area under agricultural mechanization and knowledge

Islam (2008) founded that vegetable cultivation area had a positive and substantial significant relationship with knowledge on vegetables production activities by women members in homestead area under world vision project. Azad (2013) observed that

vegetable cultivation area had a positive and no significant relationship with knowledge on postharvest practices of vegetables.

2.4.6 Training received on agricultural mechanization and knowledge

Manjunatha (2000) reported that the trained farmers had higher knowledge level and adoption behavior compared to untrained farmers. Rayapareddy and Jayarmiah (2007) conducted a study on village extension officers (VEOs) knowledge of rice production technology found that training had significant positive relationship with the knowledge level of VEOs. The length of training exposure of the respondents had positive relationship with their knowledge of crop cultivation (Hossain, 2001). The farmers who received training had a positive significant relationship with their knowledge on food and nutrition (Mannan, 2001).

However, Setty (2010) reported that there was no association between overall knowledge about extension program planning and their frequency of in- service training. The farmers differed significantly in their knowledge in sugarcane cultivation based on their exposure to training (Karim and Hossain, 1995).

2.4.7 Agricultural extension media contact and knowledge

Sana (2003), Sarker (2002) and Rahman (2001) reported in their respective study that media exposure of farmers were highly positive significant relationships with their knowledge. Hossain (2000) also found that media exposure of the farmers had a significant relationship with their knowledge. There was a significant positive relationship between extension contact of the farmers and their agricultural knowledge (Ahmed, 1999). Ali (2001) observed that contact and non-contact farmers differed significantly in respect of their media exposure. He found that media exposure of the contact and non-contact fanners had significant contribution towards their agricultural knowledge. Rahman (1995) conducted a research on farmers' knowledge on improved practices on potato cultivation by the farmers of Kajipur upazilla under Sirajganj district. The study concluded a significant relationship between extension contact knowledge of improved practices on potato cultivation. Similarly Nandiwal *et al.* (1999) studied on knowledge and adoption level of the farmers about rice production technologies and indicated that extension contact of the farmers had significantly influenced farmers' knowledge.

2.4.8 Credit availability and knowledge

Hussain (2001) studied on farmers' knowledge and adoption of sugarcane cultivation practices and he observed a significant relationship between credit availability and their knowledge.

2.4.9 Agricultural machinery using experience and knowledge

Rayaparaddy and Jayaranaiah (2007) reported that experience of the farmers had a positive significant relationship with their knowledge. However, Setty (2010) stated that experience of the farmers had no relationship with their knowledge.

2.4.10 Problem faced in agricultural mechanization and knowledge

Problems of the farmers had a significant relationship with their knowledge (Ali, 1999). But Sarker (2002) found that there was a negative significant relationship between poultry knowledge of the farmers and their poultry problem faced in marketing.

However, Anwar (1994) reported that problems of the farmers had no significant relationship with their knowledge. Raha (2007) also stated that problems of the farmers had no significant relationship with their knowledge. Islam (2001) also showed similar result in his study.

2.5 Relationship between selected characteristics of the respondents and their Attitude towards agricultural mechanization

2.5.1 Age and attitude

Mannan (2001), Parveen (2013), Verma and Kumar (2011) reported that age of the respondents had positive relationship with their attitude towards ecological agriculture. Parveen (2013) revealed in his study that age of the modern village women influenced their attitude towards homestead agricultural production. Verma and Kumar (2011) carried out a study on comparison of farmer's attitude towards buffalo management practice in adopted and non-adopted villages. They observed that there was relationship between age and attitude towards buffalo management in case of adopted village and they found no significant relationship between age and attitude of the farmers of non-adopted village.

But in case of the women of the traditional village, age was not associated with their attitude towards homestead agriculture production. Chowdhury (2003) and Sarker

(2002) also reported in their respective study that there was no relationship between age and attitude. Chowdhury (2003) also observed that age of farmers' had no significant relationship with their attitude towards crop diversification. Similarly, Mannan (2001) found in his study that age of Proshika farmers had no significant relationship with their attitude towards the Ecological Agricultural Programs. Habib (2000) observed in his study that age of the BSs had no significant relationship with their attitude towards the use of agro-chemicals. Nurzaman (2000) stated that age of the FFS and non-FFS farmers had no significant relationship with their attitude towards IPM. Bari (2000) revealed that age of the farmers had no significant relationship with their attitude towards hybrid rice AALOK 6201. Kashem (2005) reported that there was no relationship between the age and attitude towards community of the farmers.

However, Ali (2002), Singh and Kunzroo (2000) stated that age of the farmers had negative significant relationship with their attitude in their respective research study. Paul (2000) also stated in his study that there was negatively significant relationship between age of the farmers and their attitude towards the use of USG. Similarly Islam and Kashem (1997) reported that age of the farmers had negative relationship with their attitude towards agrochemical. Singh and Kunzroo (2000) in their study found that there was a negatively significant relationship between age of the farmers and their attitude towards goat and sheep farming.

2.5.2 Educational qualification and attitude

Chowdhury (2003), Shehrawat (2002), Khan (2002), Kumari (2001), Sulakshna (2001) and Kashem (2005) stated their respective study that education of the farmers had a positive significant relationship with their attitude. Rogers and Leuthold (1996) conducted a study on farm demonstration found that the farmer demonstrators, who were characterized by more years of formal education, were characterized by more favorable attitudes towards fertilizer. Singh (2006) observed that family education of the farmers was positively related to their attitude towards agricultural technology and this relationship was statistically significant. Similarly Singh and Kunzroo's (2000) research discovered that there was a positive and significant relationship between education of farmers and attitude towards sheep and farming. Kashem (2005) reported that attitude towards community of the small farmers had significant positive correlation with their educational level. Sulakshna (2001) observed that the

educational qualification of the extension personnel was positively related with their attitude towards extension work. Verma and Kumar (2011) indicated that there was positive and significant relationship between education of farmers and their attitudes towards buffalo management in non-adopted village but the relationship was not significant in adopted village. Noor (1995) found that education of the farmers had positive significant relationship with their attitude towards HYV of potato. Habib (2000) found in his study that education of the BSs had significant positive relationship with their attitude towards agro-chemicals. Nurzaman (2000) reported that education of the FFS and non-FFS farmers were positively correlated with their attitude on IPM. Paul (2000) observed that academic qualification of the farmers had positive significant relationship with their attitude towards the use of USG. Mannan (2001) found that academic qualification of Proshika farmers had a positive relationship with their attitude towards the Ecological Agricultural Program. Chowdhury (2003) revealed in his study that academic qualification of the farmers had positive significant relationship with their attitude towards crop diversification. Sadat (2002) and Haque (2002) found similar relationship towards education and attitude of respondents.

Even though Ali (2002) found that education qualification of Block Supervisor's had negative relationship with their attitude.

2.5.3 Farm size and attitude

Chowdhury (2003), Shehrawat *et al*. (2002) and Sadat (2002) reported that there was a positive and significant relationship between farm size and attitude of farmers in their respective study. Verma and Kumer (2011) and Karim *et al.* (2005) also reported that there was positive and significant relationship between farm size and attitude of farmers. Karim *et al.* (2005) conducted a study on attitude of farmers towards use of urea in jute cultivation and revealed that farm size of the farmers had significant and positive relationship with their attitude towards the use of urea. Paul (2000) also pointed out in his study that there was positive and significant relationship between farm size and attitude of farmers towards the use of USG on rice cultivation. Mannan (2001) reported that the farm size of Proshika farmers had positive significant relationship with their attitude towards the Ecological Agriculture Programs.

But Ali (2002), Nurzaman (2000) and Noor (1995) found in their respective study that farm size had no significant relationship with the attitude of respondents. Habib (2000) also found in his study that farm size of the BSs had no relationship with their attitude towards the use of agrochemicals. Nurzaman (2000) found in his study that farm size of the FFS and non-FFS farmers had no significant relationship with their attitude on IPM.

2.5.4 Annual family income and attitude

Chowdhury (2003), Shehrawat (2002), and Das (2003) found in their respective study that family income of farmers had positive significant relationship with their attitude. Mannan (2001) also found in his study that there was positive significant relationship between the annual family income and their attitude towards the Ecological Agriculture Programs. Akanda (2001) revealed that there was a significant relationship with income and attitude towards rice fish program CARE in Muktagacha upazila of Mymensingh district. Paul (2000) indicated that annual family income of the farmers had positively significant relationship with their attitude towards use of USG. Similarly Karim *et al. (*2005) found that income of the farmers had significant and positive relationship with their attitude towards the use of urea.

However Siddique (2002), Nurzaman (2000) and Parveen (2013) reported that annual income had no significant relationship with the attitude of farmers in their studies. Nurzaman (2000) also found in his study that there was no significant relationship between family income of the FFS and non-FFS farmers with their attitude on IPM. Similarly Kashem (2005) reported that income of the small farmers had no significant relationship with their attitude towards community of the farmers.

But Habib (2000) reported in his study that income of the BSs has significant negative relationship with their attitude towards agro-chemicals. Bari (2000) also reported that there was significant negative relationship between family income and attitude of farmers towards hybrid rice AALOK 6201.

2.5.5 Area under agricultural mechanization and attitude

No literature was found related to relationship between cultivation area under mechanization and attitude.

2.5.6 Training received on agricultural mechanization and attitude

Paul (2000) found in his study that training exposure of the farmers had a positive significant relationship with their attitude. Habib (2000) also reported in his study that training experience of the BSs had a positive significant relationship with their attitude towards agrochemicals. Sarker (2002) found that training experience of the farmers had a positive significant relationship with their attitude towards organic homestead gardening. Rahman (2010) found that there was positive and significant relationship between training exposure and attitude of the farmers towards IPM practices. Bhuiyan (2008) reported that farmers' training experience had positive significant relationship with their attitude towards farmers' information need assessment. Islam (2007) observed in his study that there was a significant positive relationship between training received by the farmers' and their attitude modern jute cultivation.

But Bari (2001) reported that training exposure of the farmers had no relationship with their attitude. Sadat (2002) also found in his study that training exposure had no relationship with the attitude of both PROSHIKA beneficiaries and non-beneficiaries towards PROSHIKA. Similarly Chowdhury (2003) reported that training exposure had no relationship with the attitude towards crop diversification.

2.5.7 Agricultural extension media contact and attitude

Shehrawat (2002), Sadat (2002) and Siddique (2002) stated in their respective study that there was a significant and positive relationship between extension contact and attitude of farmers. Ajore (2007) and Vidyashanker (2005) also reported in their study that mass media exposure had a significant relationship with their attitude towards chemical fertilizer.

But Chowdhury (2003) found in his study that there was no relationship between extension media contact and attitude of farmers towards crop diversification. Bari (2000) also found that there was no relationship between extension media contact and attitude of farmers towards hybrid rice ALOK 6201.

2.5.8 Credit availability and attitude

Karim *et al.* (2005) indicated that commercialization, income and credit availability of the farmers had significant and positive relationship with their attitude towards the use of urea.

2.5.9 Agricultural machinery using experience and attitude

Sarker (2002) found in his study that experience of the farmers had a positive significant relationship with their attitude. Habib (2000) also found that experience of the farmers had a positive significant relationship with their attitude.

2.5.10 Problem faced in agricultural mechanization and attitude

Muttaleb *et al.* (1998) reported in his study that problems of the farmers had a significant relationship with their attitude. Karim *et al.* (1997) also reported that problems of the farmers had a significant relationship with their attitude.

2.6 Relationship between selected characteristics of the respondents and their practice on innovations

2.6.1 Age and Practice

Rahman (2004) reported in his study that practice on Boro rice cultivation has no relationship with farmers age. Akhter (2003) also reported that practice on agricultural activities has significant and positive relationship with their age. But Sana (2003) found in his study that practice on shrimp culture has negative relationship with their age. Saha (2003) also found that practice on poultry production has no relationship with their age

2.6.2 Educational qualification and Practice

Rahman (2006) reported in his study that practice of prawn culture has significant and positive relationship with their level of education. Roy (2006) revealed that practice of croping with flood condition has significant and positive relationship with their level of education. Islam (2005) also revealed that practice of Boro rice cultivation has significant and positive relationship with their level of education. Hossain (2003) reported in his study that practice of modern Boro rice cultivation has significant and positive relationship with their level of education.

But Islam (2005) found that practice of IPM in crop production has significant and negative relationship with their level of education. Akhter (2003) also found in his study that practice of agricultural activities has Significant and negative relationship with their level of education

However Rahman (2004) reported that practice of poultry production has no relationship with their level of education. Similarly Saha (2003) reported that practice of rice cultivation has no relationship with their level of education.

2.6.3 Farm size and Practice

Rahman (2006) reported in his study that there was significant and positive relationship with farm size and practice of prawn culture. Islam (2005) also reported that there was significant and positive relationship with farm size and practice of IPM in crop production. Similarly Rahman (2004) reported in his study that there was significant and positive relationship with farm size and practice of Boro rice cultivation

But Khan (2005) revealed in his study that there was no relationship with farm size and practice of maize cultivation. Islam (2005) also revealed that there was no relationship with farm size and practice of coping with flood condition.

2.6.4 Annual family income and Practice

Rahman (2006) reported in his study that there was significant and positive relationship with annual family income and practice of prawn culture. Roy (2006) also concluded that there was significant and positive relationship with annual family income and practice of boro rice cultivation. Similarly Islam (2005) found that there was significant and positive relationship with annual family income and practice of IPM in crop production

But Rahman (2004) observed in his study that there was no relationship with annual family income and practice of vegetable cultivation.

2.6.5 Area under agricultural mechanization and practice

No literature was found related to relationship between strawberry cultivation area and practice.

2.6.6 Training received on agricultural mechanization and practice

Rahman (2006) observed in his study that there was a significant and positive relationship with training exposure and practice of prawn culture. Sana (2003) also observed significant and positive relationship with training exposure and practice on shrimp culture. Similarly Hossain (2001) observed significant and positive relationship with training exposure and practice of crop cultivation.

But Islam (2005) found no relationship with training exposure and practice of IPM in crop production.

2.6.7 Agricultural extension media contact and Practice

Roy (2006) reported in his study that there was a significant and positive relationship with extension contact and practice of Boro rice cultivation. Sana (2003) also reported significant and positive relationship with extension contact and practice on shrimp culture. Similarly Hossain (2001) concluded significant and positive relationship with extension contact and cultivation practices. But Islam (2005) conducted a study, in which he found negative relationship with extension contact and Practice of IPM in crop production.

2.6.8 Credit availability and practice

Beal and Sibley (1967) in their combined study observed that there was a positive correlation between the credit availability and practice of agricultural technology. In determining the factors associated with the adoption of three farming practice namely, cocos, poultry and maize; Clark and Akinbodo (2006) conducted a study in Nigeria and opined that the most important single factor regarding extensions of the maize adopters was the non-availability of capital or credit. Credit was also the most important determinant of cocoa farm expansion. Rahman (2000) conducted a study in which he also revealed that there was a substantial positive relationship between the credit availability and adoption of IR-20 by the farmers. Similarly Hossain (2004) found a significant relationship between credit availability and adoption of improved practices. Haque (2014) opined that there was a significant positive relationship between credit availability and adoption of improved cane cultivation technologies.

But Reddy and Kivlin (2006) conducted a study on three Indian villages concluded that credit availability was not significantly related to adoption of HYV.

2.6.9 Agricultural machinery using experience and practice

There is no related review on agricultural machinery using experience and attitude as this variable has not been conducted in research yet.

2.6.10 Problem faced in agricultural mechanization and Practice

Saha (2001) in his study reported that there was a significant and positive relationship with practice of pineapple cultivation and problem faced in pineapple cultivation. Islam (2005) also found a positive and significant relationship between farmers practice of IPM in crop production with problem faced. Similarly Rahman (2001) found on relationship between farmers practice on Alok 6201 hybrid rice with problem faced in cultivation.

2.7 Research Gap

According to the review of literature of the present study the researcher has established the following research gaps:

- Very few researches have been conducted on farmers' attitude towards agricultural mechanization. No specific research has so far been conducted combinedly on farmers' knowledge, attitude and practice towards agricultural mechanization. Hence the researcher carried out the present study to determine farmers' knowledge, attitude and practice towards agricultural mechanization.
- Farmers' level of problem faced in agricultural machinery using has been identified in very few research. The researcher carried out to crosscheck the level of problem faced by the farmers in using agricultural machinery.
- Very few researches have been conducted on farmers' practice towards agricultural mechanization. So the researcher carried out the study to find the relationship between each of selected characteristics of the farmers with their practice of agricultural mechanization.

2.8 Conceptual framework of the study

In scientific research, conceptual framework is selection and measurement of variables. Properly constructed hypothesis of a research contains “dependent variable” and “independent variable”. This study is concerned with the farmers’ knowledge, attitude and practice towards agricultural mechanization. So the knowledge, attitude and practice were the main focus and the dependent variables of the study. Farmers’ knowledge, attitude and practice towards agricultural mechanization may be influenced and affected through interacting forces of many independent variables. It is not possible to deal with all the variables in a single study. After consulting with the relevant experts and reviewing of past related literatures, 10 selected characteristics of the farmers’ were considered for the study as the independent variables, which might have contribution on knowledge, attitude and practice regarding agricultural mechanization. Based on this discussion the conceptual framework of this study has been formulated as shown in figure 2.1.

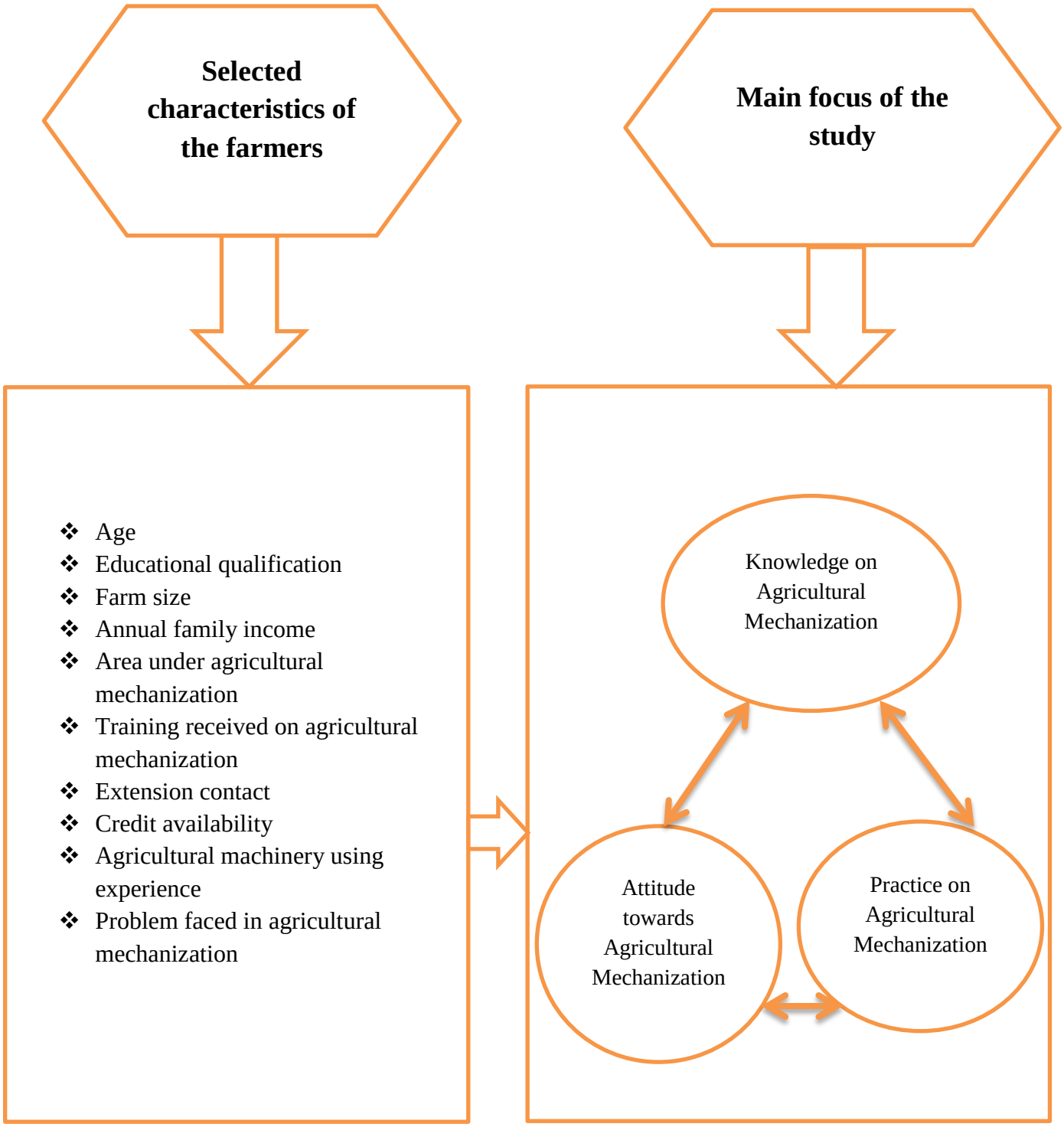


Figure 2.1 A schematic diagram representing farmers' knowledge, attitude and practice towards agricultural mechanization

CHAPTER 3

METHODOLOGY

The methodology used in conducting any scientific research is critically important and deserves careful consideration. According to Mingers (2001), research method is a structured set of guidelines or activities to generate valid and reliable research results. Appropriate methodology directs the researcher to collect valid and reliable information in terms of hypothesis or research instrument and to analyze the information rightly to reach at valid results. The methods and operational procedures will be followed in conducting this study has been discussed in this chapter. Further, this chapter includes the operational format, statistical methods and their use have been mentioned in the later section of this chapter.

3.1 The Locale of the Study

The study was conducted at Babuganj upazilla of Barishal district. Out of 6 unions, three villages of three unions were purposively selected. This was because agricultural machineries are used comparatively more in this area than other area. The reasons of more practices in this area are there are two research stations (i.e. BARI, BADC) situated in study area, communication system is well with Upazilla Agriculture Office etc. The selected villages were Gajalia of Madhabpasha union, Rampotti of Rahampur union, Rakudia of Dehergati union. A map of Babuganj upazilla showing the study area presented below in figure 3.1

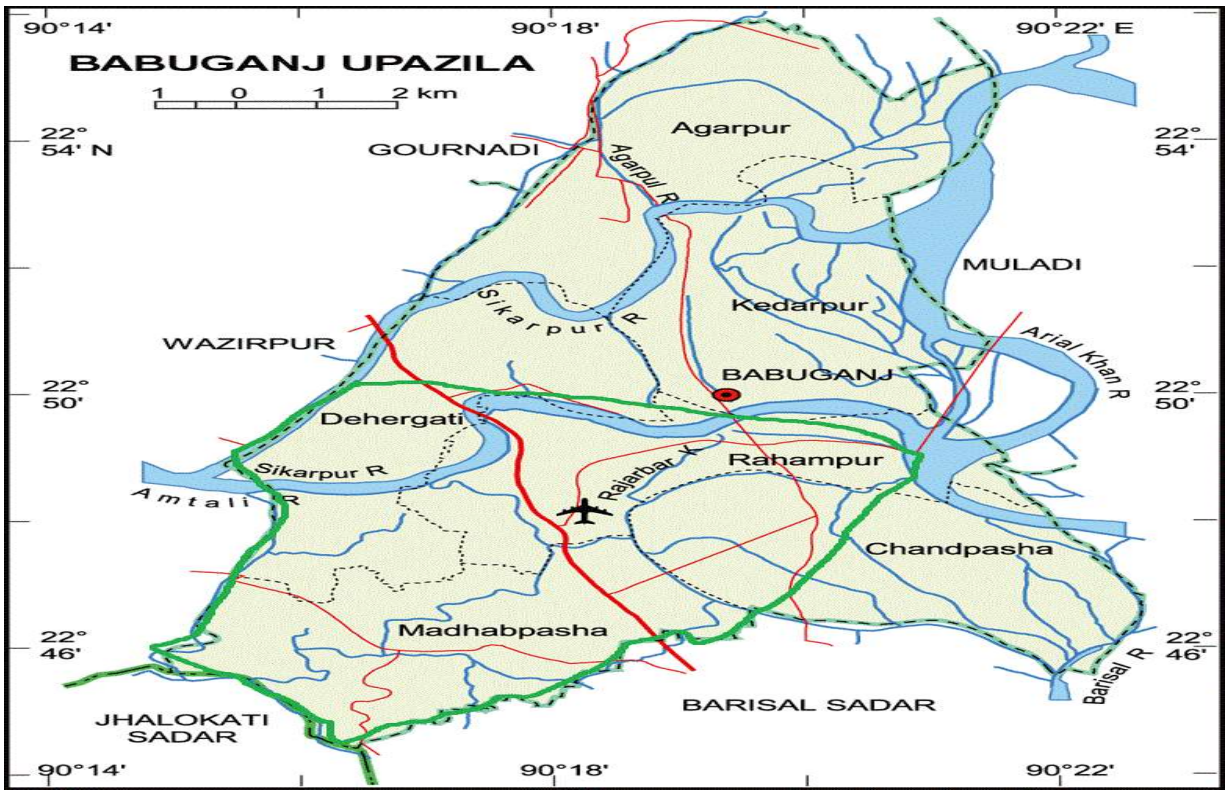


Figure 3.1 A map of Babuganj Upazila showing the study area

3.2 Population and Sampling

The farmers who are engaged with mechanized agriculture of selected three villages under Babuganj Upazilla of Barishal district were considered as the population of the study. Lists of farmers who are involved in mechanized agriculture of these villages were prepared with the help of Sub Assistant Agriculture Officers (SAAO) of that area. Total farmers of this area who are completely or partly involve in farm mechanization were 146, which constituted the population of this study. To make a respective sample from the population following formula was used as developed by Kothari (2004).

$$n = Z^2 P Q N / (N-1) e^2 + Z^2 P Q$$

Where,

n = Sample size

Z = the value of the standard normal variable at the chosen (99%) confidence level (1.96)

P = Probability (assume .5)

Q = Remaining from probability (1-P)

N = Total population

e = the level of precision (5%)

By using this formula, 106 farmers were selected by proportionate random sampling from three villages of study area. Beside this, a reserved list of 10 farmers was prepared who were supposed to be interviewed only when a respondent in the original sample list was unavailable during data collection. The distribution of the population and sample is shown in Table 3.1

Table 3.1 Distribution of the population and sample including reserve list

Study area (Villages)	Population size	Sample size	Reserve sample size
Gajalia	47	34	3
Rampotti	53	39	4
Rakudia	46	33	3
Total	146	106	10

3.3 Development of Data Collecting Instrument

In a social research, interview schedule is the instrument for collecting valid and reliable information. It was carefully designed keeping the objectives in mind. So, a structured interview schedule was prepared for collection of relevant data for the study. Both closed and open form questions were used to collect information. Simple, direct questions and scales were included in the interview schedule for collecting information regarding the focus on farmers' knowledge, attitude and practice towards agricultural mechanization. The interview schedule was pre-tested in actual field situations before using it for final data collection among 10 farmers from the study area excluded from the sample. Necessary corrections, additions and modification were made in the interview schedule based on the results of the pre-test and expert opinion. The modified and corrected interview schedule was then printed in final form and multiplied as required. An English version of this interview schedule is furnished in Appendix-A.

3.4 Data Collecting Procedure

Before data collection, the researcher met with the Upazilla Agriculture Officer (UAO), Agriculture Extension Officer (AEO) and Sub-Assistant Agriculture Officer (SAAO) of that block for necessary support and cooperation. Data was collected from respondent by the researcher himself through face to face interview. Interview was conducted in respondent's farm and home during their leisure period. Before starting interview, the researcher took all possible care to establish rapport so that the respondent did not hesitate to furnish proper response to the questions and statements included in the interview schedule. However if any respondent perceived difficulty in understanding any questions, the researcher took utmost care to explain and clarify the question.

3.5 Selection of Variables

The fruitful selection of variables results is success of a research. Inappropriate and incompatible selection of variables may lead to faulty results. The researcher employed enough care in selecting the variables of the study. Considering personal, economic, social and psychological factors of the rural community, time and resources availability to research, reviewing relevant literature and discussing with relevant expert, the researcher selected the variables for the study.

Farmers' knowledge, attitude and practice towards agricultural mechanization were the main focus of this study. The researcher selected ten causal variables as follows-

- Age
- Level of education
- Farm size
- Annual family income
- Area under agricultural mechanization
- Training received on agricultural mechanization
- Agricultural extension media contact
- Credit availability
- Agricultural machinery using experience
- Problem faced in agricultural mechanization

3.6 Measurement of causal Variables

This section contains procedures for measurement of causal variables of the study as presented below:

3.6.1 Age

Age of a respondent was measured in terms of years from his/her birth to the time of interviewing. It was expressed in terms of complete years.

3.6.2 Level of Education

Level of education of a respondent measured by the number of years of schooling completed in formal educational institution. A score of one (1) was given for each year of schooling completed. If a respondent didn't know how to read and write, his/her education score was assigned as zero (0), while a score of 0.5 was given to a strawberry farmer who could sign his/her name only.

3.6.3 Farm size

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

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

Where,

A = Homestead area including pond

B= Own land under own cultivation

C= Land given to others as borga

D= Land taken from others as borga

E= Land taken from others as lease

3.6.4 Annual family income

Annual family income of respondent was measured in Thousand Taka. It is the annual gross income of a respondent family from agricultural production, business, service and income from other family members during the last one year. A score of one was given for each Tk. 1,000 to compute the annual income scores of the respondents.

3.6.5 Area under agricultural mechanization

Area under agricultural mechanization of a respondent was measured by total land area of his farm under farm machinery management. Cultivation area under mechanization of a respondent was measured in hectors.

3.6.6 Training received on agricultural mechanization

Training received on agricultural mechanization was measured by the total number of days of training received by the respondent from any organization on agricultural mechanization. A score of one (1) was assigned for each day of training received. A zero (0) score was assigned for no training.

3.6.7 Agricultural extension 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 never basis and scores were assigned as 3, 2, 1 and 0 respectively. The extension 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 30, where zero (0) indicated no extension contact and 30 indicated the highest level of extension contact.

3.6.8 Credit availability

Credit availability of a respondent referred to the degree to which his credit requirement for farm mechanization was fulfilled by the amount of credit actually received by him. During interview each respondent was asked to indicate whether he taken any credit for agricultural mechanization during last year or not. If applicable

total credit received was calculated by adding the entire received amount from different sources. A score of 1 (one) was assigned for Tk. 1000.

3.6.9 Agricultural machinery using experience

Agricultural machinery using experience of the respondent was measured by the number of years a respondent engaged in using farm machinery. The measurement included from the year of first used agricultural machinery till the year of data collection. The respondents were asked to respond to different agricultural machinery using experience of Power tiller, Diesel operated low lift pump, Hand operated sprayer, Fan for winnowing, Power thresher, Tractor, Trans planter, Drum seeder, Electric pump, Knapsack sprayer, Combine harvester. Scores were assigned to those alternative responses as 1,2,3,4,5,6,7,8,9,10,11 respectively for each year of experience using agricultural machinery.

3.6.10 Problem faced in agricultural mechanization

There are many problems in agricultural mechanization but ten major problems were selected for the research after consultation with supervisor and relevant experts. The respondents were asked to respond to five alternative responses as not at all, low, medium, high and very high problem for each of ten selected problems. Scores were assigned to those alternative responses as 0, 1,2,3,4 respectively. Extent of problem faced score of the respondents was measured by summing up all the response to all the problems. The extent of problem faced score could range from 0-40 where o indicating no problem and 40 indicating very high problem.

3.7 Measurement of Focus Variables

Measurement of the focus variables are discussed in the following subsection.

3.7.1 Knowledge on agricultural mechanization

After through consultation with relevant experts and reviewing of related literature, 15 questions regarding farm machinery were selected and those were asked to the respondents to determine their knowledge on agricultural mechanization. Two (2) score was assigned for each correct answer and zero (0) for wrong or no answer. Partial score was assigned for partially correct answer. Thus the knowledge on agricultural mechanization score of the respondent could range from 0 to 30, where

zero (0) indicating very poor knowledge and 30 indicate the very high knowledge on agricultural mechanization.

3.7.2 Attitude towards agricultural mechanization

Attitude of a respondent towards agricultural mechanization was measured by developing an attitude scale. Five-point Likert scale method of summated ratings was used to find out the respondents' attitude towards agricultural mechanization. Sixteen (16) statements expressing positive and negative feelings towards farm machinery were constructed. A statement was considered positive if it indicated a favorable attitude towards agricultural mechanization. If the case was reverse, it was considered as a negative statement. Out of these sixteen statements ten were positive and six were negative. Scoring was done by assigning 4, 3, 2, 1 and 0 scores to the five alternative responses as "strongly agreed", "agreed", "no opinion", "disagreed", and "strongly disagreed" respectively in case of a positive statement. Reverse score was assigned for a negative statement. However, attitude towards agricultural mechanization of a farmer was obtained by summing up his/her scores for all sixteen (16) statements in item no. 12 of the interview schedule. Attitude score, thus, obtained for a respondent could range from zero (0) to 64, where zero (0) indicate very unfavorable attitude, 32 indicate neutral attitude and 64 indicate highest level of favorable attitude.

3.7.2 Practice on agricultural mechanization

A good number of innovations are being practice now- a -days by the farmer who engaged in farm mechanization. Based on pre-test experience and through consultation with relevant experts, 11 innovations regarding farm mechanization were considering for this study. The respondents were asked to indicate their extent of practice of these 11 innovations with four alternative responses as regularly, occasionally, rarely and never at all and weights were assigned to the alternative responses as 3, 2, 1 and 0 respectively. Practices of farm machinery score of the respondents were computed by summing up all the scores obtained by them from all the 11 innovation. Thus the possible range of practice on agricultural mechanization score was 0-33, while 0 indicated no practice and 33 indicated highest practice on agricultural mechanization.

3.8 Statement of the Hypothesis

According to Kerlinger (2010), a hypothesis is a conjectural statement of the relation between two or more variables. Hypothesis is always in declarative sentence form and they relate either generally of specifically variables to sentences from and relative either generally or specifically variables to variables. Hypothesis may be broadly divided into two categories, namely research hypothesis and null hypothesis.

3.8.1Research hypothesis

The following research hypothesis was formulated to explore the relationship-

- "Each of the ten selected characteristics (age, level of education, farm size, annual family income, cultivation area under mechanization, training received on agricultural mechanization, extension contact, credit availability, agricultural machinery using experience, problem faced in agricultural mechanization) of the respondents has significant relationship within i) knowledge , ii) attitude and iii) practice on agricultural mechanization."

3.8.2 Null hypothesis

A null hypothesis states that there is no relationship between the concerned variables. The following null hypothesis was undertaken for the present study-

- "There is no relationship of the selected characteristics (age, level of education, farm size, annual family income, cultivation area under mechanization, training received on agricultural mechanization, extension contact, credit availability, agricultural machinery using experience, problem faced in agricultural mechanization) of the respondents with their i) knowledge, ii) attitude and iii) practice regarding agricultural mechanization."

3.9 Data Processing

3.9.1 Editing

The collected raw data were examined thoroughly to detect errors and omissions. As a matter of fact, the researcher made a careful scrutiny of the completed interview schedule to make sure that necessary data were entered as complete as possible and

well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

3.9.2 Coding and tabulation

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

3.9.3 Categorization of data

Following coding operation, the collected raw data from respondents were classified into various categories to facilitate the description of the variables. These categories were developed for each of the variables by considering the nature of distribution of the data and extensive literature review. The procedures for categorization have been discussed while describing the variables under consideration in Chapter 4.

3.10 Statistical Procedures

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

CHAPTER 4

RESULTS AND DISCUSSION

The findings of the study and interpretations of the results have been presented in this Chapter. These are presented in seven sections according to the objectives of the study. The first section deals with the selected characteristics of the farmers, while the second section deals with Knowledge, attitude, practice towards agricultural mechanization. In the third section deals with relationship between the Selected Characteristics of the farmers' and their Knowledge on agricultural mechanization. In the fourth section relationship between the Selected Characteristics of the farmers' and their attitude towards agricultural mechanization have been discussed. Relationship between the Selected Characteristics of the farmers' and their practice of agricultural mechanization have been discussed in fifth section. In sixth section the inter correlation among the farmers' knowledge, attitude and practice towards agricultural mechanization have been discussed. The final section deals with the problem faced by the farmers for practicing agricultural mechanization.

4.1 Selected Characteristics of the Farmers

Ten characteristics of the farmers were selected to find out their relationships with their knowledge, attitude and practice towards agricultural mechanization. The selected characteristics included their age, educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, credit availability, agricultural machinery using experience, problem faced in agricultural mechanization. These characteristics of the farmers are described in this section.

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

The salient features of the selected characteristics of the farmers are shown in the following table.

Table 4.1 Salient features farmers with their selected characteristics

Sl. No.	Characteristics	Unit of measurement	Possible range	Observed range	Mean	S.D.	C.V.
1	Age	Year	Unknown	23-66	44.56	9.69	21.75
2	Educational qualification	Schooling years	Unknown	0-12	5.73	3.59	62.65
3	Farm size	Hectare	Unknown	0.20-3.20	0.78	0.47	60.25
4	Annual family income	'000' Taka	Unknown	80-350	155.90	54.07	34.68
5	Area under agricultural mechanization	Hectare	Unknown	0.25-2.10	0.67	0.34	50.75
6	Training received on agricultural mechanization	Number of days	Unknown	0-4	0.92	0.91	98.91
7	Agricultural extension media contact	Score	0-30	14-23	18.20	2.20	12.09
8	Credit availability	'000' Taka	Unknown	0-60	21.89	16.79	76.70
9	Agricultural machinery using experience	Score	Unknown	65-274	139.14	42.08	30.24
10	Problem faced in agricultural mechanization	Score	0-40	21-35	29.21	2.66	9.10

4.1.1 Age

Age of the respondents ranged from 23 to 66 years, the average being 44.56 years, the standard deviation was 9.69, and the coefficient of variation was 21.75. Regarding age, the farmers were classified into three categories according to Ministry of Youth and Sports, Bangladesh, 2008, such as “young aged” (up to 35), “middle aged” (36-50) and “old aged” (above 50 years). Table 4.2 contains the distribution of the respondents according to their age.

Table 4.2 Distribution of the farmers according to their age

Categories	Farmers		Mean	SD	CV
	Number	Percent			
Young aged (Up to 35)	26	24.5	44.56	9.69	21.75
Middle aged (36-50)	56	52.8			
Old aged (>50)	24	22.6			
Total	106	100			

(Ministry of Youth and Sports, Bangladesh, 2008)

Data presented in Table 4.2 indicated that the highest proportion (52.8 percent) of the respondents fell in the middle aged category compared to 24.5 percent young and 22.6 percent old aged category. It may also be revealed that overwhelming majority (77.3%) of the respondents of the study area comprised younger to middle-aged categories. Ahmmed (2016) found almost similar findings.

It may 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 farm mechanization in the study area is being managed by young to middle aged farmers.

4.1.2 Educational qualification

Education of a respondent was measured by the level of his/her formal education i.e. the number of class passed by him. The education score of the respondents ranged from 0 to 12, the average being 5.73, the standard deviation was 3.59, and the coefficient of variation was 62.65. Based on their level of education, the respondents were grouped into five categories according to Hoque, 2016 and Masud, 2007 such as- “Illiterate” (0), “Can sign only” (0.5), "Primary education" (1-5), "Secondary education" (6-10), “Higher secondary and above” (>10).

Table 4.3 Distribution of the farmers according to their educational qualification

Categories (Schooling years)	Farmers		Mean	SD	CV
	Number	Percent			
Illiterate (0)	1	0.9	5.73	3.59	62.65
Can sign only (0.5)	22	20.8			
Primary (1-5)	44	41.5			
Secondary (6-10)	34	32.1			
Higher secondary and above (>10)	5	4.7			
Total	106	100			

(Hoque, 2016 and Masud, 2007)

According to Table 4.3 express that about three fourth (73.6%) of the respondents had primary to secondary education, while 21.7% were illiterate and only 4.7% had higher secondary and above higher secondary level. Ahmmed (2016), Hasan (2015) found almost similar findings. Educations increase our knowledge and help to face adverse condition. The findings thus, indicate that the current literacy rate in the study area is higher than that of the national average of 63 percent (BBS, 2008). It may due to the area was adjacent to Barishal division, as well as primary schools, high schools and college are located in the study area.

4.1.3 Farm size

Farm size varied from 0.20 to 3.20 hectares with an average of 0.78 hectares, standard deviation was 0.47 and coefficient of variation was 60.25. Based on their farm size the farmers were classified into three categories as suggested by DAE (1999) which shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their farm size

Categories (ha)	Farmers		Mean	SD	CV
	Number	Percent			
Small farm (<1.0)	70	66	0.78	0.47	60.25
Medium farm (1-3)	28	26.4			
Large farm (>3)	8	7.6			
Total	106	100			

(DAE, 1999)

The data in the Table 4.4 revealed that more than majority of the respondents (66 percent) had small farm while 26.4 percent had medium farm, and 7.6 percent had large farm. The findings again revealed that most (92.4%) of the respondents had small to medium farm size. This small farm size or fragmented land is one of the major problems for farm mechanization. The average farm size of the farmers of the study area (0.78 hectare) was higher than that of national average (0.60 hectare) of Bangladesh (BBS, 2008).

4.1.4 Annual family income

Annual family income of the farmers ranged from Taka 80-350 thousand, the mean being 155.90 thousand, standard deviation of 54.07 thousand and coefficient of variation was 34.68. On the basis of their annual income scores, the farmers were divided into three categories according to BBS, 2010 such as- "Low income" (<128) "medium income" (128-182) and "high income" (above 182). The distribution of the farmers according to their annual family income is shown in Table 4.5.

Table 4.5 Distribution of the farmers according to their Annual family income

Categories ('000' Taka)	Farmers		Mean	SD	CV
	Number	Percent			
Low income (<128)	38	35.8	155.90	54.07	34.68
Medium income (128-182)	47	44.3			
High income (>182)	21	19.8			
Total	106	100			

(Household Income and Expenditure Survey, BBS, 2010)

The data is presented in table 4.5 indicate that the majority (44.3 percent) of the farmers had medium income compared to 35.8 percent had low family income and 19.3 percent had high family income. As well as mean annual income of locale was higher than the national average of $1909 USD. Its indicating that agricultural mechanization is usually practiced by the farmers having comparatively higher economic condition.

4.1.5 Area under agricultural mechanization

Area under agricultural mechanization varied from 0.25-2.10 hectares with an average of 0.67 hectares, standard deviation of 0.34 and coefficient of variation 50.75. Based on their area under agricultural mechanization the farmers were classified into three categories according to Tewari *et al.*, 2012 that were shown in Table 4.6.

Table 4.6 Distribution of the farmers according to their area under agricultural mechanization

Categories (ha)	Farmers		Mean	SD	CV
	Number	Percent			
Small mechanized area (<0.33)	7	6.6	0.67	0.34	50.75
Medium mechanized area (0.33-1)	90	84.9			
Large mechanized area (>1)	9	8.5			
Total	106	100			

(Tewari *et al.*, 2012)

From the data furnished in the Table 4.6 revealed that the majority of the respondents (84.9 percent) had medium mechanized area, compared to 6.6 percent small mechanized area, and 8.5 percent large mechanized area. The findings again revealed that overwhelming majority (93.4%) of the farmers had medium to large area under agricultural mechanization. Tewari *et al.* (2012) also found similar findings. Therefore, it is difficult to adopt farm mechanization in small area so, medium to large area were always easy for adopting agricultural mechanization.

4.1.6 Training received on agricultural mechanization

Training received on agricultural mechanization ranged from 0 to 4 with a mean of 0.92, standard deviation of 0.91 and coefficient of variation 98.91. Based on the training received scores, the farmers were classified into three categories according to Amin, 2011 such as- “no training received” (0), “low training received” (1-2) and “high training received” (>2). The distribution of the farmers according to their training experience is presented in Table 4.7.

Table 4.7 Distribution of the farmers according to their training received on agricultural mechanization

Categories (days)	Farmers		Mean	SD	CV
	Number	Percent			
No training received (0)	47	44.3	0.92	0.91	98.91
Low training received (1-2)	52	49.1			
High training received (>2)	7	6.6			
Total	106	100			

(Amin, 2011)

Data contained in the table 4.7 express 49.1 percent of the respondents had low training of 1-2 days, compared to 44.3 percent did not receive any training while the rest 6.6 percent of them received high training exposure. Chowdhury (2003) also found similar findings. 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 farm 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, unwillingness of the farmers to receive and adopt training on agricultural mechanization etc. So it is badly needs attention of the authorities of extension services (GOs and NGOs) in the country. Providing adequate training on appropriate subject matter is likely to increase the knowledge, attitude and practice towards agricultural mechanization.

4.1.7 Agricultural extension media contact

The observed agricultural extension media contact scores of the farmers engaged in farm mechanization ranged from 14 to 23 against the possible range from 0 to 30, the mean, standard deviation and coefficient of variation were 18.20, 2.20 and 12.09 respectively. Based on this score, the farmers were classified into three categories according to BRRI, 2015 which is presented in Table 4.8

Table 4.8 Distribution of the farmers according to their agricultural extension media contact

Categories (Score)	Farmers		Mean	SD	CV
	Number	Percent			
Low contact (Up to 16)	29	27.4	18.20	2.20	12.09
Medium contact (17-21)	69	65.1			
High contact (22-30)	8	7.5			
Total	106	100			

(BRRI, 2015)

Data presented in table 4.8 showed that majority proportion (65.1 percent) of the farmers had medium extension contact compared to 27.4 percent of them had low media contact and 7.5 percent of them had high media contact.

Thus, majority (92.5 percent) of the farmer had low to medium extension contact. Bhuiyan (2008) found almost similar findings. This may be due to socio-economic conditions of the farmers. It was found that low income farmers had low extension media contact in the study area. Their involvement in day labor, small vendors, reluctance to extension media contact, etc. may be some reasons behind small to medium extension contact. Extension contact is a very effective and powerful source of receiving information about various new and modern technologies. So extension contact should be increased for betterment of our agriculture.

4.1.8 Credit availability

The observed credit availability scores of the farmers engaged in farm mechanization ranged from 0 to 60 thousand taka. The mean, standard deviation and coefficient of variation were 21.89, 16.79 and 76.70 respectively. According to this score, the farmers were classified into four categories is presented in Table 4.9

Table 4.9 Distribution of the farmers according to their credit availability

Categories ('000' Taka)	Farmers		Mean	SD	CV
	Number	Percent			
No credit (0)	28	26.4	21.89	16.79	76.70
Low credit (<14)	4	3.8			
Medium credit (14-30)	55	51.9			
High credit (>30)	19	17.9			
Total	106	100			

(Mean ± 0.5SD)

Data presented in table 4.9 showed that majority proportion (51.9 percent) of the farmers had medium credit available compared to 26.4 percent of them had no credit availability, 17.9 percent had high credit availability and 3.8 percent of them had low credit availability. It also revealed that the farmers received credit from different sources like Bangladesh Krishi Bank, Grameen Bank, BRDB, Polly Sonchoy Bank, NGOs like BRAC, ASA, Nabojug etc. It may be concluded that financial institutions provided credit on agricultural mechanization thus could be helped the farmers to change their attitude and practice towards agricultural mechanization. Hasan (2015) also found similar findings.

4.1.9 Agricultural machinery using experience

The observed scores of the farmers' agricultural machinery using experience ranged from 65 to 274. The mean, standard deviation and coefficient of variation were 139.14, 42.08 and 30.24 respectively. Based on this score, the farmers were classified into three categories according to Dange *et al.*, 2014 which is presented in Table 4.10

Table 4.10 Distribution of the farmers according to their agricultural machinery using experience

Categories (Score)	Farmers		Mean	SD	CV
	Number	Percent			
Low experience (<118)	33	31.1	139.14	42.08	30.24
Medium experience (118-160)	38	35.8			
High experience (>160)	35	33			
Total	106	100			

(Dange *et al.*, 2014)

Data presented in table 4.10 showed that majority proportion (35.8 percent) of the farmers had medium experience compared to 33 percent of them had high experience and 31.1 percent of them had low experience. The findings again revealed that overwhelming majority (68.8%) of the farmers had medium to high experience. This may be due to availability of power tiller, diesel operated low lift pump, hand operated sprayer, fan for winnowing, pedal thresher, power thresher, sprayer for many years in study area. Farouk *et al.* (2015) found almost similar findings.

4.1.10 Problem faced in agricultural mechanization

The observed range of the farmers problem faced in agricultural mechanization ranged from 21 to 35 against the possible range from 0 to 40. The mean, standard deviation and coefficient of variation were 29.21, 2.66 and 9.10 respectively. Based on this score, the farmers were classified into three categories according to Shamabadi, 2012 which is presented in Table 4.11

Table 4.11 Distribution of the farmers according to their problem faced in agricultural mechanization

Categories (score)	Farmers		Mean	SD	CV
	Number	Percent			
Low problem (<28)	30	28.3	29.21	2.66	9.10
Medium problem (28-31)	54	50.9			
High problem (>31)	22	20.8			
Total	106	100			

(Shamabadi, 2012)

Data presented in table 4.11 revealed that overwhelming majority (71.7%) of the farmers had medium to high problem and 28.3% of the farmers faced low problem in practicing agricultural mechanization. Farmers stated that fragmented land & small farm size, lack of tillage implements (tractor/ power tiller), lack of quality machines, higher prices of agricultural machinery, non-availability of Repair centers or technicians, overhead cost is higher were the major problems faced by them. Hossain (2016) also found similar findings.

4.2 Knowledge, attitude, practice towards agricultural mechanization

4.2.1 Knowledge on Agricultural Mechanization

Farmers' knowledge scores could theoretically range from 0 to 30. But their observed knowledge scores ranged from 16 to 26, the mean being 20.30, standard deviation 2.12 and coefficient of variation 10.44. Based on the theoretical scores, the farmers were classified into three categories according to Vinod *et al.,* 2012 such as "poor knowledge", "moderate knowledge" and "good knowledge". The distribution of the farmers according to their knowledge level is shown in Table 4.12.

Table 4.12 Distribution of the farmers according to their knowledge on agricultural mechanization

Categories (score)	Farmers		Mean	SD	CV
	Number	Percent			
Poor knowledge (<19)	25	23.6	20.30	2.12	10.44
Moderate knowledge (19-22)	67	63.2			
Good knowledge (>22)	14	13.2			
Total	106	100			

(Vinod *et al.,* 2012)

Data contained in table 4.12 showed that majority (63.2%) of the farmers possessed moderate knowledge and 23.6 and 13.2 percent of the farmers possessed poor and good knowledge on agricultural mechanization respectively. It means that overwhelming majority (86.8%) of the farmers had poor to moderate knowledge. Farouk *et al.* (2015) found almost similar findings. Lack of education, agricultural extension media contact, training exposure, credit availability to agricultural mechanization may the reason behind this. But to perform better in agricultural

mechanization, farmers should have adequate knowledge on different aspects of agricultural mechanization.

4.2.2 Attitude towards Agricultural Mechanization

Attitude score of the respondents towards agricultural mechanization could theoretically range from 0 to 64. However, the observed ranged was 34 to 50 with an average of 39.59, standard deviation of 3.20, coefficient of variation 8.08. Based on the attitude scores, the respondents were placed under three categories namely low favorable, medium favorable and high favorable. As neutral favorable attitude contain score 32 but observed range was 34 to 50, so researcher omitted unfavorable and neutral attitude classes. The distribution of the respondents under each of the three categories has been shown in Table 4.13.

Table 4.13 Distribution of the farmers according to their attitude towards agricultural mechanization

Categories (score)	Farmers		Mean	SD	CV
	Number	Percent			
Low favorable (32-39)	67	63.21	39.59	3.20	8.08
Medium favorable (40-48)	36	33.96			
High favorable (>48)	3	2.83			
Total	106	100			

(Ahmmed, 2016 and Alam, 2003)

Data presented in Table 4.13 reveal that majority (70.7%) of the respondents had favorable attitude towards agricultural mechanization. Out of which 56.6 percent, 11.3 percent and 2.8 percent of the respondents had low favorable, medium favorable and high favorable attitude towards agricultural mechanization. Rest 17 percent and 12.3 percent of the respondents had neutral and unfavorable attitude towards agricultural mechanization. For betterment of our agriculture, improvement of our farmer health and livelihood, improvement of socio economic condition, to cope up with modern era there is no other option than favorable attitude towards agricultural mechanization. Rahman (2010) found almost similar findings.

4.2.3 Practice of Agricultural Mechanization

Practice of agricultural mechanization ranged from 0 to 33. But their observed practice scores ranged from 10 to 19, the mean being 14.42, standard deviation 2.29 and coefficient of variation 15.88. Based on the practice scores, the farmers were classified into three categories according to Kumar *et al.,* 2008 which is shown in Table 4.14.

Table 4.14 Distribution of the farmers according to their practice of Agricultural mechanization

Categories (score)	Farmers		Mean	SD	CV
	Number	Percent			
Low practice (<12)	12	11.3	14.42	2.29	15.88
Medium practice (12-17)	82	77.4			
High practice (>17)	12	11.3			
Total	106	100			

(Kumar *et al.,* 2008)

Data presented in table 4.14 showed that majority proportion (77.4 percent) of the farmers had medium practice compared to 11.3 percent of them had high practice and 11.3 percent of them had low practice. As majority farmers of the study area have favorable attitude towards agricultural mechanization and majority of respondents have medium practice of agricultural mechanization, that indicates if farmer's get proper training, available credit, easy terms and condition for buying agricultural machinery they will practice more and highly. Rahman (2010) found almost similar findings.

4.3 Relationship between the Selected Characteristics of the Farmers and their Knowledge on agricultural mechanization

The purpose of this section is to explore the relationships of the selected characteristics of the farmers with their knowledge on agricultural mechanization. Pearson's Product Moment co-efficient of correlation (r) was used to test a null hypothesis concerning the relation between any two variables. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis. Results of the test of co-efficient of correlation between each of the selected characteristics of

the farmers and their knowledge on agricultural mechanization are shown in table 4.15.

Table 4.15 Co-efficient of correlation (r) between selected characteristics and farmers' knowledge on agricultural mechanization (n=106)

Causal variable	Predicted vriable	Correlation of coefficient (r) with Knowledge	Tabulated value of 'r' with 104 df	
			0.05 level	0.01 level
Knowledge on Agricultural Mechanization	Age	-0.204*	0.191	0.249
	Educational qualification	0.693**		
	Farm size	0.338**		
	Annual family income	0.329**		
	Area under agricultural mechanization	0.334**		
	Training received on agricultural mechanization	0.403**		
	Agricultural extension media contact	0.579**		
	Credit availability	0.190		
	Agricultural machinery using experience	0.626**		
	Problem faced in agricultural mechanization	-0.820**		

*Significant at 0.05 level & **significant at the 0.01 level of probability

Age and knowledge on agricultural mechanization

The computed value of 'r' (-0.204) was larger than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.15. Hence, the concerned null hypothesis was rejected. The findings indicate that age of farmers had a significant negative relationship with their knowledge on agricultural mechanization.

Educational qualification and knowledge on agricultural mechanization

The computed value of 'r' (0.693) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the

relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that educational qualification of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Farm size and knowledge on agricultural mechanization

The computed value of 'r' (0.338) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that farm size of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Annual family income and knowledge on agricultural mechanization

The computed value of 'r' (0.329) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that annual family income of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Area under agricultural mechanization and knowledge on agricultural mechanization

The computed value of 'r' (0.334) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that area under agricultural mechanization of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Training received on agricultural mechanization and knowledge on agricultural mechanization

The computed value of 'r' (0.403) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that training received on agricultural mechanization of

farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Agricultural extension media contact and knowledge on agricultural mechanization

The computed value of 'r' (0.579) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that agricultural extension media contact of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Credit availability and knowledge on agricultural mechanization

The computed value of 'r' (0.190) was smaller than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.15. Hence, the concerned null hypothesis could not be rejected. The findings indicated that credit availability of farmers had no significant relationship with their knowledge on agricultural mechanization.

Agricultural machinery using experience and knowledge on agricultural mechanization

The computed value of 'r' (0.626) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that agricultural machinery using experience of farmers had a significant positive relationship with their knowledge on agricultural mechanization.

Problem faced and knowledge on agricultural mechanization

The computed value of 'r' (-0.820) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15. Hence, the concerned null hypothesis was rejected. The findings indicate that problem faced of farmers had a significant negative relationship with their knowledge on agricultural mechanization.

4.4 Relationship between the Selected Characteristics of the Farmers and their attitude towards agricultural mechanization

The purpose of this section is to explore the relationships of the selected characteristics of the farmers with their attitude towards agricultural mechanization. Pearson's Product Moment co-efficient of correlation (r) was used to test a null hypothesis concerning the relation between any two variables. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis. Results of the test of co-efficient of correlation between each of the selected characteristics of the farmers and their knowledge on agricultural mechanization are shown in table 4.16.

Table 4.16 Co-efficient of correlation (r) between selected characteristics and farmers' attitude towards agricultural mechanization (n=106)

Causal variable	Predicted variable	Correlation of coefficient (r) with attitude	Tabulated value of 'r' with 104 df	
			0.05 level	0.01 level
Attitude towards Agricultural Mechanization	Age	-0.224*	0.191	0.249
	Educational qualification	0.467**		
	Farm size	0.345**		
	Annual family income	0.282**		
	Area under agricultural mechanization	0.358**		
	Training received on agricultural mechanization	0.295**		
	Agricultural extension media contact	0.468**		
	Credit availability	0.215*		
	Agricultural machinery using experience	0.622**		
	Problem faced in agricultural mechanization	-0.735**		

*Significant at 0.05 level & **significant at the 0.01 level of probability

Age and attitude towards agricultural mechanization

The computed value of 'r' (-0.224) was larger than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.16. Hence, the concerned null hypothesis was rejected. The findings indicate that age of farmers had a significant negative relationship with their attitude towards agricultural mechanization.

Educational qualification and attitude towards agricultural mechanization

The computed value of 'r' (0.467) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that educational qualification of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Farm size and attitude towards agricultural mechanization

The computed value of 'r' (0.345) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that farm size of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Annual family income and attitude towards agricultural mechanization

The computed value of 'r' (0.282) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that annual family income of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Area under agricultural mechanization and attitude towards agricultural mechanization

The computed value of 'r' (0.358) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was

rejected. The findings indicate that area under agricultural mechanization of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Training received on agricultural mechanization and attitude towards agricultural mechanization

The computed value of 'r' (0.295) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that training received on agricultural mechanization of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Agricultural extension media contact and attitude towards agricultural mechanization

The computed value of 'r' (0.468) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that agricultural extension media contact of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Credit availability and attitude towards agricultural mechanization

The computed value of 'r' (0.215) was greater than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.16. Hence, the concerned null hypothesis was rejected. The findings indicated that credit availability of farmers had significant relationship with their attitude towards agricultural mechanization.

Agricultural machinery using experience and attitude towards agricultural mechanization

The computed value of 'r' (0.622) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.16, while the relationship showed a positive trend. Hence, the concerned null hypothesis was

rejected. The findings indicate that agricultural machinery using experience of farmers had a significant positive relationship with their attitude towards agricultural mechanization.

Problem faced and attitude towards agricultural mechanization

The computed value of 'r' (-0.735) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.15. Hence, the concerned null hypothesis was rejected. The findings indicate that problem faced of farmers had a significant negative relationship with their attitude towards agricultural mechanization.

4.5 Relationship between the Selected Characteristics of the Farmers and their practice of agricultural mechanization

The purpose of this section is to explore the relationships of the selected characteristics of the farmers with their practice of agricultural mechanization. Pearson's Product Moment co-efficient of correlation (r) was used to test a null hypothesis concerning the relation between any two variables. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis. Results of the test of co-efficient of correlation between each of the selected characteristics of the farmers and their knowledge on agricultural mechanization are shown in table 4.17.

Table 4.17 Co-efficient of correlation (r) between selected characteristics and farmers' practice of agricultural mechanization (n=106)

Causal variable	Predicted variable	Correlation of coefficient (r) with attitude	Tabulated value of 'r' with 104 df	
			0.05 level	0.01 level
Practice of Agricultural Mechanization	Age	-0.188	0.191	0.249
	Educational qualification	0.415**		
	Farm size	0.466**		
	Annual family income	0.451**		
	Area under agricultural mechanization	0.456**		
	Training received on agricultural mechanization	0.489**		
	Agricultural extension media contact	0.557**		
	Credit availability	0.192*		
	Agricultural machinery using experience	0.788**		
	Problem faced in agricultural mechanization	-0.608**		

*Significant at 0.05 level & **significant at the 0.01 level of probability

Age and practice of agricultural mechanization

The computed value of 'r' (-0.188) was smaller than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.17. Hence, the concerned null hypothesis could not be rejected. The findings indicate that age of farmers had no significant negative relationship with their practice of agricultural mechanization.

Educational qualification and practice of agricultural mechanization

The computed value of 'r' (0.415) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the

relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that educational qualification of farmers had a significant positive relationship with their practice of agricultural mechanization.

Farm size and practice of agricultural mechanization

The computed value of 'r' (0.466) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that farm size of farmers had a significant positive relationship with their practice of agricultural mechanization.

Annual family income and practice of agricultural mechanization

The computed value of 'r' (0.451) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that annual family income of farmers had a significant positive relationship with their practice of agricultural mechanization.

Area under agricultural mechanization and practice of agricultural mechanization

The computed value of 'r' (0.456) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that area under agricultural mechanization of farmers had a significant positive relationship with their practice of agricultural mechanization.

Training received on agricultural mechanization and practice of agricultural mechanization

The computed value of 'r' (0.489) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that training received on agricultural mechanization of

farmers had a significant positive relationship with their practice of agricultural mechanization.

Agricultural extension media contact and practice of agricultural mechanization

The computed value of 'r' (0.557) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that agricultural extension media contact of farmers had a significant positive relationship with their practice of agricultural mechanization.

Credit availability and practice of agricultural mechanization

The computed value of 'r' (0.192) was greater than the tabulated value (r=0.191) with 104 degrees of freedom at 0.05 level of probability as shown in Table 4.17. Hence, the concerned null hypothesis was rejected. The findings indicated that credit availability of farmers had significant relationship with their practice of agricultural mechanization.

Agricultural machinery using experience and practice of agricultural mechanization

The computed value of 'r' (0.788) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that agricultural machinery using experience of farmers had a significant positive relationship with their practice of agricultural mechanization.

Problem faced and practice of agricultural mechanization

The computed value of 'r' (-0.608) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.17. Hence, the concerned null hypothesis was rejected. The findings indicate that problem faced of farmers had a significant negative relationship with their practice of agricultural mechanization.

4.6 Inter correlation among the farmers' knowledge, attitude and practice towards agricultural mechanization

The purpose of this section is to explore the inter correlation among the farmers' knowledge, attitude practice towards agricultural mechanization. Pearson's Product Moment co-efficient of correlation (r) was used to test a null hypothesis concerning the relation between any two variables. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis. Results of the test of co-efficient of correlation among the farmers' knowledge, attitude and practice towards agricultural mechanization are shown in table 4.18.

Table 4.18 Co-efficient of correlation (r) among the farmers' knowledge, attitude and practice towards agricultural mechanization (n=106)

	Farmers' knowledge on Agricultural Mechanization	Farmers' attitude towards Agricultural Mechanization	Farmers' practice of Agricultural Mechanization
Farmers' knowledge on Agricultural Mechanization	-		
Farmers' attitude towards Agricultural Mechanization	0.696**	-	
Farmers' practice of Agricultural Mechanization	0.677**	0.716**	-

**significant at the 0.01 level of probability

Relationship between knowledge on agricultural mechanization and attitude towards agricultural mechanization

The computed value of 'r' (0.696) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.18, while the relationship showed a positive trend. Hence, the concerned null hypothesis was

rejected. The findings indicate that knowledge on agricultural mechanization had a significant positive relationship with attitude towards agricultural mechanization.

Relationship between knowledge on agricultural mechanization and practice of agricultural mechanization

The computed value of 'r' (0.677) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.18, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that knowledge on agricultural mechanization had a significant positive relationship with practice of agricultural mechanization.

Relationship between attitude towards agricultural mechanization and practice of agricultural mechanization

The computed value of 'r' (0.716) was larger than the tabulated value (r=0.249) with 104 degrees of freedom at 0.01 level of probability as shown in Table 4.18, while the relationship showed a positive trend. Hence, the concerned null hypothesis was rejected. The findings indicate that attitude towards agricultural mechanization had a significant positive relationship with practice of agricultural mechanization.

4.7 Problem facing index (PFI) along with rank order

The extent of problems faced by the farmers in agricultural mechanization in terms of Problem Facing Index (PFI) along with their rank order based on the PFI values have been presented in table 4.19. Data furnished in the table indicate that the problem which ranked first was "Fragmented land & small farm size" followed by second ranked "Lack of quality machines" and third ranked "Lack of training program on new farm machinery", "Overhead cost is higher" was the least important problem among those faced by the farmers for practicing agricultural mechanization.

A five point rating scale was used for computing the problem score of the farmers.

PFI = (Pvh ×4)+ (Ph × 3) + (Pm × 2) + (Pl × 1) + (Pn × 0)

Where,

PFI = Problem Facing Index;

Pvh = Number of farmers having very high problem;

Ph = Number of farmers having high problem;

Pm = Number of farmers having moderate problem;

Pl = Number of farmers having low problem;

Pn= Number of farmers having no problem at all

Table 4.19 Ranking of problems according to descending order

Sl. No.	Problems	PFI	Rank Order
1.	Fragmented land & small farm size	352	1st
2.	Lack of quality machines	322	2nd
3.	Lack of training program on new farm machinery	321	3rd
4.	Inadequate knowledge on using agricultural machinery	316	4th
5.	Lack of tillage implements (tractor/ power tiller)	312	5th
6.	Higher price of fuel	311	6th
7.	Higher price of agricultural machinery	304	7th
8.	Lack of resources to purchase the machinery	298	8th
9.	Non availability of Repair centers or technicians	296	9th
10.	Overhead cost is higher	264	10th

The problems faced by farmers in practicing agricultural mechanization according to descending order through the analysis of the received data from farmers are fragmented land & small farm size, lack of quality machines, lack of training program on new farm machinery, inadequate knowledge on using agricultural machinery, lack of tillage implements (tractor/ power tiller), higher price of fuel, higher price of agricultural machinery, lack of resources to purchase the machinery, non-availability of Repair centers or technicians, Overhead cost is higher respectively.

The result shows that the highest problem faced by farmers' for practicing agricultural mechanization is fragmented land & small farm size. May be this is caused due to higher population and smaller farm area in our country. The lowest problem faced by farmers' for agricultural mechanization is overhead cost is higher. This happens because farmers' get enough good output by using agricultural mechanization.

CHAPTER 5

SUMMARY OF FINDINGS AND CONCLUSIONS

5.1 Summary of the Findings

Findings different aspects of the study are summarized below:

5.1.1 Selected characteristics of the farmers

Age: The highest proportions (52.8 percent) of the respondents were in the middle aged category compared to 24.5 percent young and 22.6 percent old aged category.

Educational qualification: A large proportion (41.5 percent) of the respondents fell under the category of "primary education" compared to 0.9 percent "illiterate", 20.8percent having "can sign only", 32.1 percent having "secondary education", 4.7 percent having "higher secondary and above higher secondary education".

Farm size: More than half of the respondent (71.7 percent) had small farm, 26.4 percent had medium farm, and 1.9 percent had large farm. The average farm size of the farmers of the study area (0.78 hectares) was higher than that of national average (0.60 hectare) of Bangladesh (BBS, 2008).

Annual family income: The majority (44.3 percent) of the farmers had medium income compared to 35.8 percent low income and 19.8 percent had high income.

Area under agricultural mechanization: The majority of the respondents (84.9 percent) had medium agricultural mechanized area, compared to 6.6 percent small farm, and 8.5 percent large farm area for agricultural mechanized area.

Training received on agricultural mechanization: The highest proportion (49.1percnt) had low training exposure for 1 to 2 days, 44.3 percent had no training and 6.6 percent had high training.

Agricultural extension media contact: A proportion of 65.1 percent of the farmers had medium extension media contact compared to 27.4 percent of them having low media contact and 7.5 percent of them having high media contact.

Credit availability: The majority of the respondents (51.9 percent) had medium credit availability, compared to 26.4 percent had no credit, 3.8 percent had low credit and 17.9 percent had high credit availability.

Agricultural machinery using experience: The highest proportion (35.8 percent) of the respondents had medium experience on using agricultural machinery, while 33 percent of them had high experience and 31.1 percent had low experience on using agricultural machinery.

Problem faced in agricultural mechanization: About 50.9 percent of the respondents had medium problem compared to 28.3 percent of them having low problem, 20.8 percent had high problem.

5.1.2 Knowledge on agricultural mechanization: Majority (63.2 percent) of the farmers possessed medium knowledge while 23.6 and 13.2 percent of the farmers possessed low to high knowledge respectively.

5.1.3 Attitude towards agricultural mechanization: All respondents had favorable attitude towards agricultural mechanization. Out of which 63.21 percent, 33.96 percent and 2.83 percent of the respondents had low favorable, medium favorable and high favorable attitude towards agricultural mechanization.

5.1.4 Practice of agricultural mechanization: Majority (77.4 percent) of the farmers had medium practice, while 11.3 percent farmers had high practice and 11.3 percent farmers had low practice of agricultural mechanization.

5.1.5 Relationship between each of the selected characteristics of the farmers and their knowledge on agricultural mechanization

It was observed that out of ten selected characteristics of the farmers, educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, agricultural machinery using experience of the farmers had significant positive relationship with their knowledge on agricultural mechanization, while age and problem faced in agricultural mechanization had significant negative relationship with their knowledge on agricultural mechanization. Rest one characteristics i.e. credit

availability had no significant relationship with their knowledge on agricultural mechanization.

5.1.6 Relationship between each of the selected characteristics of the farmers and their attitude towards agricultural mechanization

It was observed that out of ten selected characteristics of the farmers, educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, credit availability, agricultural machinery using experience of the farmers had significant positive relationship with their knowledge on agricultural mechanization, while age and problem faced in agricultural mechanization had significant negative relationship with their knowledge on agricultural mechanization.

5.1.7 Relationship between each of the selected characteristics of the farmers and their practice of agricultural mechanization

It was observed that out of ten selected characteristics of the farmers, educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, credit availability, agricultural machinery using experience of the farmers had significant positive relationship with their practice of agricultural mechanization, while problem faced in agricultural mechanization had significant negative relationship with their practice of agricultural mechanization. Rest one characteristics i.e. credit availability had no significant negative relationship with their knowledge on agricultural mechanization.

5.2 Conclusions

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

1. Knowledge has significant relationship with attitude and practice. Overwhelming majority (86.8%) of the farmers had poor to moderate knowledge on agricultural mechanization. But the situation will be changed if concerned authorities (DAE, BADC, BARI, BRRI and different NGOs) arranged training, motivational campaigns,

result demonstration, method demonstration, etc. to provide farm mechanization knowledge.

2. Attitude of the farmers towards agricultural mechanization had significant relationship with their knowledge on agricultural mechanization. Majority (70.7 percent) of the respondents had favorable attitude towards agricultural mechanization. Therefore it may be concluded that the farm mechanization would not be possible to improve a significant extent unless the concerned authorities take proper steps to improve farmers' attitude towards agricultural mechanization.

3. Practice of agricultural mechanization has significant relationship with their knowledge on agricultural mechanization. Overwhelming majority (88.7 percent) of the strawberry farmers had low to medium practice on various aspects of agricultural mechanization. Appropriate practices are very important for agricultural mechanization. Therefore it may be concluded that the agricultural mechanization would not be possible to improve a significant extent unless the concerned authorities (DAE, BADC, BARI, BRRI and different NGOs) take proper steps to improve farmers overall practices on agricultural mechanization.

4. Age of farmers had a significant negative relationship with their knowledge and attitude towards agricultural mechanization. It may be concluded that young farmer had more knowledge and favorable attitude than old aged farmer. Age of the farmers had no significant relationship with their practice of agricultural mechanization. It was thus proved that farmers' practice is independent with their age. In other words it may be concluded that the age of the farmers was not an important factor in practice of agricultural mechanization.

5. Educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, agricultural machinery using experience had significant and positive relationship with their knowledge, attitude and practice of agricultural mechanization. It was thus proved that farmers' knowledge, attitude and practice is dependent with their educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, agricultural machinery using experience.

6. Credit availability had no significant relationship with their knowledge on agricultural mechanization. It was thus proved that farmers' knowledge is independent with their credit availability. Credit availability had significant and positive relationship with their attitude and practice of agricultural mechanization. It may be concluded that the credit availability was not an important factor in attitude and practice of agricultural mechanization.

7. Problem faced by the farmers had significant and negative relationship with their knowledge, attitude and practice of agricultural mechanization. It may be concluded that farmers' knowledge, attitude and practice is dependent with their problem faced.

5.3 Recommendations for further research

1. The study was conducted on the farmers of selected area of Babuganj upazilla of Barishal district. Findings of this study need verification by similar research in other parts of the country.

2. Relationships of ten characteristics of farmers and their knowledge, attitude and practice have been investigated in this study. Further research should be conducted to explore relationships of other characteristics of the farmers with their knowledge, attitude and practice.

3. Educational qualification, farm size, annual family income, area under agricultural mechanization, training received on agricultural mechanization, agricultural extension media contact, agricultural machinery using experience had significant and positive relationship with their knowledge, attitude and practice of agricultural mechanization. So, further investigation may be undertaken to verify the result.

4. Similar studies can be conducted in other areas of the country where farm mechanization practiced largely which will be helpful for effective policy implementation.

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APPENDIX-A

(English version of the interview schedule)
Department of Agricultural Extension and Information system
Sher-E-Bangla Agricultural University, Dhaka-1207

An interview schedule for a research study entitled -
FARMERS' KNOWLEDGE, ATTITUDE AND PRACTICE (KAP) TOWARDS AGRICULTURAL MECHANIZATION OF BABUGANJ UPAZILA UNDER BARISHAL DISTRICT

Respondent No. ……

Name of the respondent:

Village : Upazila :

Union : District :

Mobile No.

(Please answer following questions. Your information will be kept confidential and will be used for research purpose only)

1. Age

What is your present age? ……. Years

2. Educational qualification

a) Can't read and write: ……

b) Can sign only: ……..

c) I read up to class: …….

d) I took non-formal education up to class …….. equivalent

3. Farm size

Please furnish information about your farm size:

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

4. Annual family income

Please state the income from following specific sources during the last year

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

5. Area under agricultural mechanization

Please indicate your cultivation area under agricultural mechanization……..…….. hectare.

6. Training received on agricultural mechanization

Please give the following information (if applicable):

Sl. No.	Name of the training course	Duration of training (Days)
1.		
2.		
3.		
4.		
5.		
Total		

7. Agricultural extension media contact

Please indicate the nature of your contact with the following communication media

Sl. No.	Communication media	Extent of participation			
		Regularly (3)	**occasionally(2)**	**Rarely (1)**	**Never (0)**
A) Personal Contact					
1	Meet with Agriculture Extension Officer (per year)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
2	Meet with SAAO (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
3	Meet with ideal farmers (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
4	Meet with NGO or development worker (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
5	Meet with agricultural input dealer (per 3 month)	≥6 ( )	3-5 ( )	1-2 ( )	0 ( )
B) Mass Media Contact					
1	Listening agricultural program on Radio	Daily ( )	Weekly ( )	Monthly ( )	0 time/year ( )
2	Watching agricultural program on Television	Daily ( )	Weekly ( )	Monthly ( )	0 time/year ( )
3	Reading agricultural Publications like newspaper, poster, leaflet etc.	Daily ( )	Weekly ( )	Monthly ( )	0 time/year ( )
C) Group Contact					
1	Participation in farmers field day (per year)	3 ( )	2 ( )	1 ( )	0 ( )
2	Participation in Focused Group Discussion (FGD) program (per year)	3 ( )	2 ( )	1 ( )	0 ( )
Total (A+B+C)					

8. Credit availability

Please mention sources of credit with it amount received from each organization (if applicable)

Sl. No.	Source	Amount (Tk.)
1	NGO	
2	Money lenders	
3	Bank	
4	Relatives/Friends/Neighbor	
Total		

9. Agricultural machinery using experience

Mention your experience in using agricultural machinery –

Machinery name	Experience (years)	Machinery name	Experience (years)
Power tiller (1)		Trans planter (7)	
Diesel operated low lift pump (2)		Drum Seeder (8)	
Hand operated sprayer (3)		Electric pump (9)	
Fan for winnowing (4)		Knapsack sprayer (10)	
Power thresher (5)		Combine harvester (11)	
Tractor (6)			

10. Problem faced in agricultural mechanization

Please mention the extent of the following problems faced in agricultural mechanization:

Sl. No.	**Problems**	**Extent of problem**				
		Very High (4)	**High (3)**	**Medium (2)**	**Low (1)**	**Not at all(0)**
1	Fragmented land & small farm size					
2	Lack of tillage implements (tractor/ power tiller)					
3	Lack of quality machines					
4	Lack of training program on new farm machinery					
5	Lack of resources to purchase the machinery					
6	Higher price of agricultural machinery					
7	Non availability of Repair centers or technicians					
8	Higher price of fuel					
9	Overhead cost is higher					
10	Inadequate knowledge on using agricultural machinery					
Total						

11. Knowledge on Agricultural Mechanization

Please answer the following questions

Sl. No.	Questions	Assigned Score	Obtained Score
1.	Mention two machineries name that is used in land preparation & sowing	2	
2.	Mention two importance of mechanization	2	
3.	Mention two company that is worked with Agricultural Mechanization	2	
4.	Mention two major problems to adopt farm machinery	2	
5.	State application procedure of different form of herbicides & pesticides	2	
6.	State two major functions of tractor	2	
7.	Mention two major functions of combine harvester	2	
8.	Mention two machineries name that is used in harvesting & post harvesting	2	
9.	Mention two disadvantages of agricultural mechanization	2	
10.	Mention two major functions of thresher?	2	
11.	State two precautions of spraying	2	
12.	Mention two locations where farm machinery and tools are sell	2	
13.	Mention two location of repair center	2	
14.	Mention two sprayer name	2	
15.	State two major functions of diesel engine?	2	
Total		30	

12. Attitude towards Agricultural Mechanization

Please mention your degree of agreement with the following statements

Sl. No.	Statements	Extent of agreement/disagreement				
		SA	A	NO	D	SD
1. (+)	The latest implements and machinery in agriculture are useful.					
2. (+)	Operation of implements and machinery in agriculture is easy.					
3. (-)	Agricultural mechanization is harmful for environment.					
4. (+)	Using of farm implements and machinery increases crop yields.					
5. (+)	Using of farm implements and machinery reduces labor cost.					
6. (-)	There is a lack of spare parts and service facilities.					
7. (+)	The cost of farm implements and machinery is affordable to purchase.					
8. (+)	Introduction of farm mechanization is a boon to the small and medium farmers.					
9. (-)	Using of farm implements and machinery is more risky compared to traditional implements and machinery.					
10. (+)	Farm implements and machinery are easily available to me to purchase.					
11. (+)	Agricultural mechanization modifies social structure in rural areas.					
12. (-)	Maintenance and repairing cost of agricultural implements and machinery is higher.					
13. (+)	Agricultural mechanization solves the problem of labor shortage.					
14. (-)	It causes human health hazard.					
15. (+)	Mechanization results in a shift from subsistence farming to commercial farming.					
16. (-)	There is a existence of shortage of power (Kerosene, Petroleum, Diesel oil)					

N.B: SA= Strongly Agreed; A= Agreed; NO= No Opinion; D= Disagreed; SD=Strongly Disagreed

13. Practices on Agricultural Mechanization

Mention your level of practices of agricultural machinery from land preparation to post harvest operation-

Sl. No.	Operation	Name of the implement or machinery	Extent of practice			
			Regularly (3)	Occasionally (2)	Rarely (1)	Never at all (0)
1.	Land preparation and sowing	Power tiller				
		Tractor				
		Trans planter				
		Drum Seeder				
2.	Irrigation	Electric pump				
		Diesel operated low lift pump				
3.	Spraying	Hand operated sprayer				
		Knapsack sprayer				
4.	Harvesting & post harvesting	Combine harvester				
		Fan for winnowing				
		Power thresher				
Total						

Thank you for your kind cooperation

…….

Signature of the interviewer