RICE FARMERS' PERCEPTION ON TRAINING FOR FERTILIZER MANAGEMENT

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RICE FARMERS' PERCEPTION ON TRAINING FOR FERTILIZER MANAGEMENT

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Dedicated

To

My Beloved Parents

Department of Agricultural Extension and

Information System

Sher-e-Bangla Agricultural University

CERTIFICATE

This is to certify that the thesis is entitled. “Rice farmers’ perception on training for fertilizer management” 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 & Information System, embodies the result of a piece of bonafide research work conducted by RAJIA SULTANA SHARNA, Registration No. 14-05980 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 duly acknowledged by him.

Date: June, 2021

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The Author

LIST OF CONTENTS

LIST OF FIGURES

LIST OF MAPS

LIST OF APPENDICES

RICE FARMERS' PERCEPTION ON TRAINING FOR FERTILIZER MANAGEMENT

-Rajia Sultana Sharna

ABSTRACT

The purpose of the study was to ascertain the impact of training on fertilizer management and also to explore the relationships between training and some of the selected characteristics of the farmers. The study was conducted in four villages (Charjhikari, Kacharipara, Sahamirpur, and Charpara) of Pangsha upazila under the Rajbari district. Data were collected from a sample of randomly selected 103 farmers from 218 farmers. The data were collected using a structured interview schedule from 24 July 2014 to 20 August 2021. To determine the impact of the training on fertilizer management, a t-test was conducted. The result showed that training significantly improved farmers' performance in using fertilizer in crop production. Pearson's Product Moment coefficient of correlation (r) was computed in order to explore relationships between farmers' selected characteristics and the effectiveness of training perceived by them. The findings of the study showed that the highest proportion (65.04%) of the trained farmers belonged to medium effectiveness level compared to 9.71 and 25.24 percent having low and high effectiveness levels of training, respectively. Among nine characteristics farmers' age, education, farming experience, attitude, and training had significant relationships with the effectiveness of training, while the other characteristics showed no significant relationship.

ABBREVIATIONS AND ACRONYMS

DAE	Department of Agricultural Extension
SPSS	Statistical Package for Social Sciences
NGOs	Non-governmental Organizations
NPK	Nitrogen Phosphorus Potassium
SAAO	Sub Assistant Agriculture Officer
AEO	Agricultural Extension Officer
UAO	Upazila Agricultural Officer
et al.	And Others (at elli)
Ha	Hectare
TK	Taka

CHAPTER I

INTRODUCTION

1.1 Background of the Study

Bangladesh is a densely populated (913 per sq. km) country. With her large and rapidly growing population, the demand for food is also increasing proportionately. The country has made significant progress towards food security however food safety still remains a question.

In Bangladesh, due to limited cultivable area, there is little scope for bringing more land under cultivation. As such, the only alternative way to increase agricultural production is to use certain modern agricultural technologies which include better seed technology, better fertilizer application, better pest control measures, and irrigation management.

Knowledge and skills of the farmers in agricultural technologies are important factors for increased agricultural production. However, most of the farmers do not possess adequate knowledge about the methods of modern agriculture. Training can help improve the ability of an individual to do his or her job better. In past years farmers are gradually sensitized and oriented to cultivate crops on organic mode realizing the adverse effects of conventional farming but the yields of organic crops are low. Fertilizers play an important role in increasing food production. Nowadays, fertilizer use is characterized by excessive N application, moderate P use, and neglecting K and micro-nutrients consequently, thus nutrient imbalance occurs in crop plants. Microorganisms can be harmful to human health if consumed in high enough quantities (Carmichael, 2001). Subsidizing N fertilizers resulted in their misuse and increasing losses. High Nitrate concentration was detected in drainage as well as groundwater. The reason for poor performance in yields of farming could be a lack of training and skills. Making crop and location-specific fertilizer recommendations available to farmers helps in increasing high-quality yields, which results in high economic benefits, keeping agricultural production sustainable and decreasing pollution. Using appropriate dose of fertilizers not only saves farmers' excessive costs

for agricultural inputs but also helps to protect the environment from degradation. Therefore, farmers' knowledge of fertilizer management and the effect of training on their fertilizer management knowledge and behavior is a highly important and time-demanding study.

The widespread use of fertilizer has greatly contributed to the huge increases in food production in Bangladesh. Bangladesh is now a larger producer, consumer, and importer of fertilizer. It is estimated that in China the greenhouse gas (GHG) emissions from fertilizer usage contribute around 30% of the GHG emissions in agriculture (Huang et al., 2015). In the past two decades, excessive fertilizer use decreased the potential of hydrogen (pH) of soil by 0.5 units in the major crop production regions (Guo et al., 2010). It is widely acknowledged that inappropriate fertilizer management is the main reason for fertilizer over-application (Smith and Siciliano, 2015).

A primary explanation for fertilizer over-application is that farmers lack adequate knowledge of fertilizer management (Guo et al., 2015; Huang et al., 2015). According to Kaiser and Fuhrer (2003) and Redman (2014), farmers are lacking three different domains of knowledge. The first is the effectiveness knowledge which addresses the awareness associated with impacts of fertilizer over-application. For example, Huang et al. (2008) declared that many farmers in China simply do not know that they are overusing fertilizer. They have insufficient knowledge about the effects of fertilizer over-application. Zhu and Chen (2002) reported that only 20% of farmers know that fertilizer over-application will result in water eutrophication and agricultural system degradation. The second is procedural knowledge which refers to how to use fertilizer in an effective way. Most farmers hold the view that more fertilizer use always leads to higher crop yields and a reduction of overall fertilizer use will result in a definite yield loss (Jia et al., 2015; Huang et al., 2015). The third is declarative knowledge. It refers to the basic knowledge of fertilizer use and how it might work in agricultural systems. Knowledge acquisition is generally considered a prerequisite to the adoption of environmentally-friendly technologies, such as fertilizer management technologies (Feder, 1979). Effectiveness knowledge can enhance farmers' perception about how or even if their fertilizer use behavior really impact the environment, which is assumed

to determine behavioral change. Procedural knowledge correlates closely with the potential inhibiting factors which are important in fostering behavior change regarding fertilizer use. Declarative knowledge reduces farmers' uncertainty regarding fertilizer reduction which allows farmers to reduce fertilizer over-application (Ajzen et al., 2011; Kaiser and Fuhrer, 2003**)**.

Agricultural training provided by extension professionals is a primary channel of farmers' fertilizer management knowledge acquisition (Genius et al., 2014)**.** In fact, the training program should be based on the actual needs of the trainees. But very little research has been conducted to determine the impact of farmers' training on their behavior relating to farming practices. The researcher, therefore, felt the necessity of conducting an investigation to assess the effectiveness of training on the farmers' use of fertilizer in crop production.

1.2 Statement of the Problem

The foregoing discussion leads to the assumption that farmers are needed to develop adequate knowledge and skills through appropriate training programs. This in return will help to have increased food production for the vast and fast-growing population of Bangladesh. To form a research question, it is very much important to determine what type of research will be conducted such as qualitative, quantitative, or mixed study. Answering the research questions may help to address a research problem. It determines where and what kind of research the researcher will be looking for along with the specific objectives of the research paper. This research has been conducted on the effectiveness of training on the farmers' use of fertilizer in crop production.

From the above discussion, the following were raised to complete the research. Which are as follows:

- What are the selected socio-demographic characteristics of the farmers?
- What is impact of training on farmers' management of fertilizer?
- What is the farmers perception of fertilizr management?
- What are the interrelationships between farmers' selected characteristics and the effectiveness of training as perceived by them?

- What were the problems faced by the farmers for fertilizer management?

1.3 Specific Objectives of the Study

In context to the said problem the specific objectives were formulated :

1) To describe the selected characteristics of the farmers.
2) To determine the impact of the training of fertilizer management,
3) To assess farmers perception of fertilizr management,
4) To explore the relationship between farmers' selected characteristics and the effectiveness of the training as perceived by them,
5) To identify the problems faced by the farmers in using fertilizer via crop production.

1.4 Justification of the Study

The major focus of the study is to assess the impact of farmers' training on the use of fertilizer management. Fertilizer management should get adequate attention to meet the growing demand for crops for the increased population of Bangladesh. Different government and non-government organizations (NGOs) are currently putting effort and allocating resources for production-oriented research and also encouraging the rural people oriented towards balanced fertilizer use. However, research shows that most of the farmers in Bangladesh are not farming in a scientific manner. Farmers' adoption of modern farming practices is necessary to plan and implement for more and better crop production. For that, more beneficial training in fertilizer handling is necessary for farmers. To show the necessity of more and more fertilizer-oriented training, an evaluation of training's impact on farmers' fertilizer use rate is necessary. Considering the above findings, the researcher became interested in undertaking a study to determine rice farmers' perception on training for fertilizer management.

1.5 Assumptions of the Study

The following assumptions were in the mind of the researcher while undertaking this study.

- The respondents included in the sample were capable of furnishing proper responses to the questions included in the interview schedule.
- The researcher who acted as the interviewer was well adjusted to the social environment of the study area. Hence, the data collected by her from the respondents were free from bias.
- Views and options furnished by the sample farmers were the representative views and opinions of the study population.
- The responses furnished by the respondents were reliable.
- The findings of the study will have general application to other parts of the country where the physical, geographical, socio-economic and cultural conditions do not differ much from the study area.

1.6 Scope and Limitation of the Study

Limitations of the research are potential weaknesses in a study that is mostly out of the researcher's control**.** The study was undertaken to have an understanding of the the effectiveness of training on the farmers' use of fertilizer in crop production in some of the specific aspects of rice cultivation and its relationships with their selected characteristics. However, considering the time, money, and other resources available to the researcher and to make the study manageable and meaningful, it became necessary to impose certain limitations as noted below:

- The study was confined to the villages of Charjhikari, Kacharipara, Sahamirpur and Charpara in the Habaspur union of Pangsha upazila in Rajbari district.
- The population for this study was kept confined within the heads of the farm families.

- Relationships of the training effectiveness of the farmers could be examined with the various characteristics of the farmers. However, only nine characteristics were selected for investigation.
- The researcher relied on the data furnished by the trained farmers from their memory during the interview
- The reluctance of the farmers to provide information was overcome by establishing proper support.
- There are various aspects to measure the impact of farmers' training on which only the fertilizer use rate in rice cultivation could be studied. This study, however, investigated the impact of farmers' training on the use of fertilizer management in one selected aspect of farmers' fertilizer use rate before and after training in rice cultivation.

The findings of the study will be applicable, particularly at Charjhikari, Kacharipara, Sahamirpur and charpara villages in Habaspur union in Pangsha Upazila. However, the finding may also be applicable to other areas of Bangladesh where the physical, socio-economic and cultural conditions do not differ much from those of the study area. Thus, the findings are expected to be useful to the planners, trainers, and extension workers to plan and improve their techniques and strategies is of action for working effectively with the people.

1.7 Definition of the Important Terms

Age

The age of a respondent was defined as the span of his/her life and was operationally measured by the number of years from his/her birth to the time of the interview.

Education

Education refers to the development of desirable changes in knowledge, skill, attitude, and ability in an individual through reading, writing, working, observing, and other related activities. It was operationalized by the formal education of pond farmers by taking into account the years he/they spent informal educational institutions.

Farm size

It referred to the area of the farm of the farmers. It was expressed in hectares.

Annual family income

The term annual family income referred to the total earning of the respondent himself/herself from agriculture, livestock, fisheries, and other accessible sources (business, service, daily labor, etc.) during a year. It was expressed in Thousand Taka.

Training

Training is the act of increasing the knowledge and skills of an employee for performing the job assigned to him. Flippo (1984) said, "training is the act of increasing the knowledge and skills of an employee for doing a particular job." However, since this study adopted a cross-section method to collect data, training in this study was expressed in the number of days a respondent received training on fertilizer management practice.

Knowledge in fertilizer management

It referred to the extent of basic understanding of the farmers in different aspects of fertilizer management i.e, the importance of fertilizer, applying time and method of fertilizer, what happens in case of fertilizer deficiency, what happens in case of water shortage in a farmers field, etc.

Attitude towards fertilizer

Attitude is the manner, disposition, feeling, and position about a person or thing, tendency, or orientation, especially in mind.

In psychology, attitude is a psychological construct, a mental and emotional entity that inherits in or characterizes a person (Richard, 2016).

Extension media contact for fertilizer management

It referred to an individual's (farmer) exposure to or contact with different communication media, sources, and personalities being used for the dissemination of new technologies.

Perceived effectiveness

Perceived effectiveness can be defined as the subjective likelihood that a message will have a persuasive impact on a respondent.

The problem faced in fertilizer management

The problem refers to a difficult situation about which something is to be done. It referred to the extent of problems faced by a respondent in fertilizer management in terms of the training opportunity, quality of fertilizer, price of fertilizer, unavailability of fertilizer, transport facility, and storage.

CHAPTER II

REVIEW OF LITERATURE

This Chapter deals with the review of past research related to this investigation. The reviews were conveniently presented based on the major objectives of the study. In spite of the sincere effort, adequate numbers of directly related literature were not readily available for this study. However, the literature of available studies has been briefly discussed in this chapter as the effectiveness of training.

2.1 Importance of Training

Training is a process of acquisition of new skills, attitude and knowledge in the context of preparing for entry into a vocation or improving one's productivity in an organization or enterprise. Effective training requires a clear picture of how the trainees will need to use information after training in place of local practices that they have adopted before in their situation. Training does not mean knowing more but behaving differently. Training is the acquisition of the best way of utilizing knowledge and skill (Sajeev and Singha, 2010; Ajayi, 1995).

Training of farmers essentially contributes to human resource development in agriculture. The basic needs of farmers are crop wise information viz., improved seed, intercultural operation, fertilizers, soil testing, irrigation, new implements, plant protection measures, mushroom cultivation, poultry, animal husbandry and credit information (Babu and Singh, 1986). Majority of the farmers had low extension contact, poor credit orientation and medium farming knowledge. The farmers had a high need for training in agronomical practices for 2 to 4 days just before the Kharif and rabi season (Chauhan and Kokate, 1986). Bangladesh is an agro-based developing country and sustainability of agricultural production is prerequisite for attaining the rate of overall growth of the economy. Now, the question is how to increase the production. There can be two possible approaches to enhance the production either by increasing the area under the crop and by increasing the productivity per unit area per unit time. Since the crop area expansion is not feasible anymore the only alternative is to adopt the better management practices and use certain modern agricultural

technologies which include better seed technology, better fertilizer application, better pest control measure and irrigation management through imparting need-based training. Training is an integral part of any development activity (Pandey et al., 2015).

Knowledge and skills of the farmers in agricultural technologies are important factors for increased agricultural production. The factors like hard working, dignity of labour and affection for the land are genetically prevailing among them which are considered to be the fundamental assets of farmers. However, in spite of high social values prevailing in these communities, they have remained backward, underdeveloped or neglected due to factors like lack of ambition, lack of initiative, inadequate land holding, limited needs, and orthodox behavior (Barman et al., 2013). Most of the farmers do not possess adequate knowledge about the methods of modern agriculture. They often become frustrated with new practices in agriculture due to a lack of proper understanding of the relevant factors. As a result, they are often skeptical towards new ideas and practices in agriculture. National Agriculture Policy -2013 has asserted the necessity of trained and efficient farmers in order to assure crop production and food security issues of Bangladesh. It also gave forces to facilitate the training of farmers on modern crop production techniques. It identified the paucity of farmers' training as a strong weakness of the agriculture sector in Bangladesh. One of the mandates of the Bangladesh Agricultural Research Institute (BARI) is to provide farmers with information necessary for carrying out their farming business efficiently and profitably. In this respect, farmers' training has no alternative. Different divisions of BARI provide a lot of training to farmers each year in order to disseminate new varieties and technologies at the field level.

The Department of Agriculture Extension (DAE) has been working with a view to providing agricultural knowledge and skills to the farmers in Bangladesh. Training needs assessment is one of the crucial steps towards identifying the area of farmers' interest, design, and development of curriculum that can best suit the existing real conditions of farmers. Pholonngoe and Richard (1995) underscored the necessity of need assessment while stating that if non-formal education trainers hope to foster meaningful development, they should bear in mind that the needs of adults constantly change. Thus, training assessment has to be carried out to design relevant and

need-based training programs that can accommodate changes over time. Barbazett (2006) noted that before any actual training is conducted, the training institution must determine who, what, when, where, why, and how of training. The training needs assessment process helps determine the priority of changes in knowledge, skill, attitude, and behavior that will provide the greatest impact on achieving organizational or individual goals.

Caffarela (2002) noted that a systematic process of farmers' training must include needs assessment, goal and objectives setting, organizing instructional methods and techniques, monitoring and evaluation. Meenambigai and Seetharaman (2003) asserted that training is the most singular factor affecting individuals' attitude, productivity, improvement, minimization of risks. So, adequate training is essential for farmers to acquire the necessary knowledge and skills in different aspects of farming.

Training for farmers has been proven to yield a variety of results. Murshed-E-Jahan and Pemsl (2011) in their study of Bangladeshi small farmers concluded that building the capacity of farmers through training is more valuable than the provision of financial support in terms of raising production and income.

Similarly, a study by Tripp et al., (2005) confirmed the importance of training can contribute to the enhancement of farmers' skills in farming works. Studies on the effectiveness of training for farmers showed that not all programmers meet success as most failures of programs in the developing countries were attributed to the tendency of excessively concentrating on a particular technology transfer rather than a broader spectrum of farmer empowerment including knowledge dissemination (Yang et al 2008).

Training plays an important role to enhance farmers' fertilizer use knowledge. It is argued that not only the training experience, but the sources and trust of training also play a crucial role in farmers' fertilizer use knowledge gaining (Kassie et al., 2015; Jin et al., 2015; Tey et al., 2014).

2.2 Reviews on Study relating to Relationship of Farmer's Selected Characteristics with the Effectiveness of Training

2.2.1 Age

Zhang et al. (2016) found the average treatment effect was the highest in the middle-aged farmers, followed by the older farmers. However, knowledge training had no effect on fertilizer use intensity reduction of the younger farmers. A possible explanation is that the younger farmers often have more off-farm employment opportunities and are busier with their off-farm work, thus reducing fertilizer use intensity does not seem to be appealing to the farmers either with or without knowledge training. Afroz (2014) found no relationship between age of the Boro rice farmers and effectiveness of result demonstration program in the transfer of BRRI dhan50. Azad et al. (2014) also found that the age of the vegetable growers has no significant relationship with problems faced in vegetable cultivation. Roy (2013) concluded that age of the FFS farmers had no significance on the effectiveness FFS for soil and crop management. Kamal (2012) concluded that age of the famers had no significant relationship with the adoption of mushroom cultivation. Zhou (2010) found the older farmers have more experience in farming than the younger farmers and have a lower likelihood to accept new fertilizer technology. Therefore, the likelihood of decreased fertilizer use intensity after knowledge training of the older farmers would be lower. In addition, the older farmers are more risk averse and prudent than the younger farmers and would be reluctant to decrease fertilizer use intensity. On the other hand, Yesmin (2007) concluded that there was significant but negative relationship between age of rural woman and their extent of training needs to participate in income generating activities. Alam (2004) concluded that the age of the respondents had significant negative relationship with their opinion regarding the effectiveness of farm information receive from printed materials. Hossain (2003) found that the knowledge of quality rice seed production and preservation did not vary significantly with age of the farmers. Wase (2001) observed that majority of chili growers (52.50%) were in the age group of 36 to 50 years in the middle age category.

The findings of studies presented above indicate the relationship between age and training. Some studies had a negative relationship, some positive relationship, and

some had no relationship between age and training. However, there was a need to investigate the relationship of age of the farmers and their training impact.

2.2.2 Education

Several studies have shown the importance of education on the behavior of farmers through improved agricultural knowledge which ultimately increased the production of crops per unit. Afroz (2014) indicated that there was no relationship between education of the Boro rice farmers and effectiveness of result demonstration program among farmers in the transfer of BRRI dhan50. But, Azad et al. (2014) also found that education of the vegetable growers has no significant relationship with the problems faced in vegetable cultivation. On the other hand, Roy (2013) concluded that the FFS farmers having more years of schooling perceived FFS for soil and crop management as highly effective. Pandict et al. (2013) conducted a study to identify the relationship between the personal characteristics and constraints facing in vegetable marketing of Trishal Upazila under Mymensingh district found that there was no significant relationship between the education of the farmers and their faced constraints in vegetable cultivation and marketing. Yesmin (2007) concluded that there was significant and positive relationship between education of rural woman and their extent of training needs to participate in income generating activities. Rasel (2004) also concluded that there was a positive significant relationship between education of the adivasi people and their training needs for their income generating activities. Hossain (2003) concluded that education of the farmers had a significant and positive relationship with their adoption of modern Boro rice cultivation practices. And Chowdhury (2003) found that academic qualification of the farmers had positive significant relationship with their attitude towards crop diversification. Jahan (2001) concluded that the education of the farmers had significant relationship with opinion of the farmers on effectiveness of farm forestry towards sustainable agricultural development. But Shah (2001) concluded that there was no relationship between education of the farmers and their knowledge on improved practices of pineapple cultivation.

So, most of the studies reviewed above indicate a positive relationship between the education of the farmers and the training. The training need of the farmers is likely to

have a negative relationship between education and the impact of training of the farmers.

2.2.3 Farming experience

Luo (2016) found that rice planting experience captures farmers' past knowledge about fertilizer use gained through experience. Farmers with more experiences may have higher fertilizer use knowledge. BRAC (2006) observed that individual contact of rural farmers and skill development activities had significant influence on their improvement of knowledge, attitude and skills. Training makes them more confident and realistic through their farming life. Sundaraswamy and Balamatti (1975) reported that the majority of respondents (57.00%) belonged to the medium knowledge level category. Almost equal numbers of respondents had a high and low level of knowledge regarding dryland farming practices.Venkaria et al. (1993) concluded that half of the farmers had a medium level of knowledge regarding agricultural technology. Whereas the majority of the farmers had a favorable attitude towards agricultural technology. Thus, knowledge and attitude towards agricultural technology were positively and significantly related to the inputs use behavior of all the categories of farmers.

2.2.4 Farm Size

Pan (2017) found that households with higher income may imply that less importance is attached to farming, which would reduce the importance of fertilizer management and results in a lower level of fertilizer-use knowledge. Jiang (2016) and Li (2012) observed that the economic benefits of ratio- nalizing fertilizer use behavior are greater for farmers with more cultivated land. Thus, those farmers may have more incentives to learn fertilizer management knowledge and to adopt sustainable fertilizer management practices. Yesmin (2007) concluded that there was significant and positive relationship between farm size of rural woman and their extent of training needs to participate in income generating activities. Rasel (2004) reported that there was significant and negative relationship between farm size of the adivasi people and their training needs in carrying out income generating activities. Mutaleb (1995) showed that the farm size of farmers had a positive relationship with the adoption of

improved potato technologies. But, Basher (1993) revealed that adoption of sugarcane intercropping had no relationship with farmers' farm size.

The findings of studies presented above indicate the relationship between farm size and training. Some studies had a negative relationship, some positive relationship, and some had no relationship between farm size and training. However, there was a need to investigate the relationship of farm size of the farmers and their training impact.

2.2.5 Annual family Income

Pan (2017) found that households with higher income may imply that less importance is attached to farming, which would reduce the importance of fertilizer management and results in a lower level of fertilizer-use knowledge. Roy (2013) concluded that annual family income of the Farmers Field School (FFS) farmers had no significance on the effectiveness of FFS for soil and crop management. Gedikoglu (2011) said that holding off-farm jobs, seasonal and year- round, could cause farmers to spend less time on farm work. It hinders them to upgrade their fertilizer management skills. Thus, farmers with a higher share of off-farm income might have less fertilizer management knowledge. Gedikoglu (2011) found that holding off-farm jobs, seasonal and year- round, could cause farmers to spend less time on farm work. It hinders them to upgrade their fertilizer management skills. Thus, farmers with a higher share of off-farm income might have less fertilizer management knowledge. Alam (2004) reported that the annual income of the farmers had significant relationship with opinion of farmers on effectiveness of farm information receive from printed materials. But Islam (2002) concluded that annual income had no relationships with adoption of modern agricultural technologies by the farmers of Sandip. On the other hand, Aurangozeb (2002) found that there was a positive significant relationship between annual income of the respondent and their adoption of integrated homestead farming technologies by the rural women in RDRS.

The findings of studies presented above indicate the relationship between annual family income and training. Some studies had a negative relationship, some positive relationship, and some had no relationship between annual family income and

training. However, there was a need to investigate the relationship of annual family income of the farmers and their training impact.

2.2.6 Training on fertilizer management

A recent study by Burger et al. (2016) confirmed that trained farmers obtained significantly more fertilizer management knowledge than non-trained farmers. However, Guo et al. (2015) did not find a statistically sig- nificant improvement in the knowledge of fertilizer management among FFS farmers. Huang et al. (2015) also found agricultural training has a positive impact on Chinese farmers' fertilizer manage- ment knowledge acquisition. Training plays an important role to enhance farmers' fertilizer use knowledge. It is argued that not only the training experience, but the sources and trust of training also play a crucial role in farmers' fertilizer use knowledge gaining (Kassie et al., 2015; Jin et al., 2015; Tey et al., 2014). Azad et al. (2014) have found no significant relationship between training received and marketing problem. Van der Walt (2005) as cited by Ortmann and King (2007) indicated that poor management, lack of training, conflict among members (due mainly to poor service delivery), and lack of funds were important contributory factors to the smallholder cooperative failures in Limpopo province. Otherwise, Van der Walt (2005) and Hossain (2001) have found positive significant relationship between training received and marketing problem. Hossain (2001) also found that the length of the training of the respondents had positive relationship with their knowledge of crop cultivation and marketing. So further research should be taken related to this issue.

2.2.7 Knowledge in fertilizer management

Yang et al. (2008) found that farmers' knowledge improves considerably after participating in a farmer field school (FFS), but the knowledge of curriculum-trained farmers has not improved. Fatema (1995) concluded that there was a positive significant relationship between agricultural knowledge of the farm farmers and their training needs in homestead agricultural production. On the other hand Ali (1995) stated that there was no significant effect of agricultural knowledge of the respondents on training needs in ecological agricultural. Otherwise Haider et al. (1990) concluded

that agricultural knowledge of the contact farmers had negative relationship with their training needs in respect of production aspects.

The findings of studies presented above indicate the relationship between knowledge and training. Some studies had a negative relationship, some positive relationship, and some had no relationship between knowledge and training. However, there was a need to investigate the relationship of knowledge of the farmers and their training impact.

2.2.8 Attitude towards fertilizer

Kumar (2016) in his article measures the attitude of farmers towards organic farming. The conclusion is that very much necessary to know the attitude of farmers, and for the same purpose, a scale has been developed comprising of 21 statements that can be used to measure the attitude of farmers towards organic farming. Priyadharshini (2016) in her study designed a scale to measure the attitude of farmers towards organic farming practices in Tamil Nadu. Edward's equally appearing intervals scale was adopted to develop the scale. The final scale comprised ten statements. This scale was standardized for administration. Pagaria Pradeep (2014) conducted a study in the Barmer Panchayat Samiti area of the Barmer district. The study revealed that the majority of the farmers (84%) was having a moderate level of knowledge and a favorable attitude about the advantages of vermicompost technology. The major constraints noticed were the non-availability of worms in nearby markets, lack of knowledge about preparation of vermicompost, and high temperature during the summer season. Wase (2001) observed that majority of the respondents (56.67 %) were at a medium level of adoption of Jayanti chili cultivation technology. The percentage of the respondents having a high level of adoption was 23.33 percent and 20.00 percent of respondents were having a low level of adoption. Jondhale et al., (2000) indicated that the adoption of improved practices of summer groundnut was higher among trained farmers than untrained farmers.

2.2.9 Extension media Contact

Afroz (2014) reported that there was no relationship between extension media contact of the Boro rice farmers and their effectiveness in the transfer of BRRI dhan50. Roy (2013) concluded that extension media contact of the Farmers Field School (FFS)

farmers had significant positive relationship with the effectiveness of FFS for soil and crop management. Kamal (2012) concluded that extension contact of the famers had significant positive relationship with the adoption of mushroom cultivation. Yesmin (2007) concluded that there was non-significant but positive relationship between communication exposure of rural woman and their extent of training needs to participate in income generating activities. Mutiab (1995) showed that extension contact of the farmers had positively related with their use of improved potato technology.

Findings of the studies indicate a positive relationship of extension contact with adoption of agricultural innovations. Such a relationship might be due to the fact that through extension contact farmers became aware of different innovations and learned their methods and procedures.

2.3 Conceptual Framework of the Study

A conceptual framework may be defined as the framework illustrates what one expect to find through a research. It defines the relevant variables for a study and maps out how they might relate to each other. This study tried to focus on effectiveness of training on farmers'use of fertilizer in rice production.

The conceptual framework of Rosenberg and Hovland (1960) was done by framing the structural arrangement for the focus and explanatory variables. This study was expected that effectiveness of training on farmers' as a dependent variable, which was influenced by selected characteristics of the farmers as independent variables. Such as age, level of education, farming experience, farm size, annual family income, training on fertilizer management, knowledge, attitude towards fertilizer, extension media contact, farmers' fertilizer use rate, and problems faced in fertilizer management. The conceptual framework or model of the study has been presented in figure 2.1.

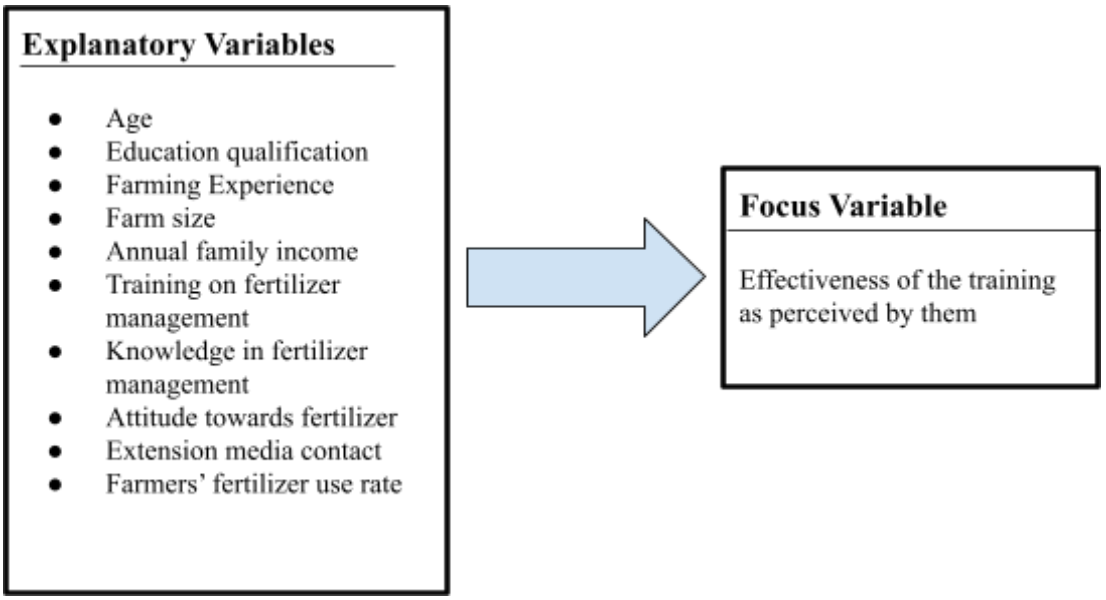


Figure 2.1 The conceptual framework of the study

CHAPTER III

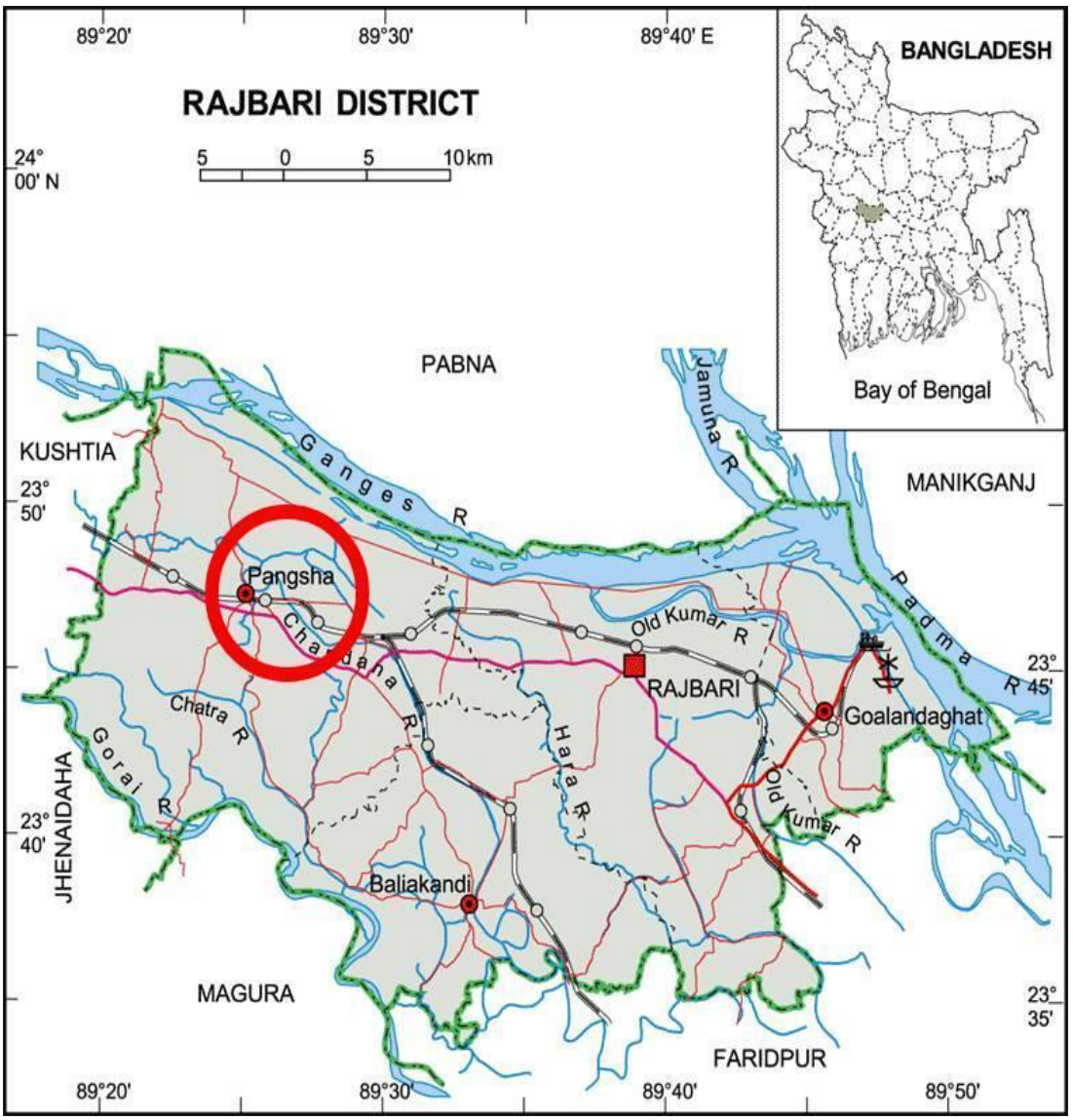
METHODOLOGY

Methods and procedures used for the collection and analysis of data are very important in any scientific investigation that requires very careful consideration on the part of the researcher. The methodology should be such as would enable the researcher to collect valid and reliable data and to analyze the same properly to arrive at the correct decision. Methods and procedures used in this piece of research will be discussed in this Chapter**.**

3.1 Research Design

3.1.1 Locale of the Study

The location of the study was Rajbari District of Dhaka Division. That district was selected or chosen due to some reasons such as limitation of time, easy accessible, financial shortage, etc. Farmers of this area had scope to be well exposed about various agricultural development and latest technologies. Also, Rice is the main crop of this area. This is also the reason behind the selection of this area as the locale of the study. This study was conducted at four villages in Habaspur union in Pangsha upazila of Rajbari District which were selected randomly. For clarity of understanding, map of Rajbari district that showing Pangsha upazila and map of Pangsha upazila that showing the study area have been shown in the Figure 3.1 and Figure 3.2.



Map 3.1 A map of Rajbari district showing Pangsha upazila

Map 3.2 A map of Pangsha upazila indicating study area

3.1.2 Population and sampling techniques

For the determination of the effectiveness of training on farmers' use of fertilizer in crop production in Pangsha upazila, a survey was conducted. An update list of all training farmers who was trained on fertilizer management were collected from the Department of Agricultural Extension, Deputy Director's Office, Pangsha, NGOs and other different upazila agricultural offices with the help of Sub-Assistant Agriculture Officers (SAAOs). The total numbers of trained farmers in the four villages of Habaspur union in Pangsha upazila were 212. Data were collected from 103 trained farmers based on their availability on the working places. Farmers were selected using convenient sampling technique for the study which is a non-probability sampling method where the sample is taken from a group of people easy to contact or to reach.

Table 3.1 Population and sample distribution

Union	Village	Population of fertilizer trained farmers	No. of farmers included in sample
Habaspur	Charjhikari	63	30
	Kacharipara	55	27
	Sahamirpur	45	22
	Charpara	49	24
Total		212	103

3.1.3 Selection of the study variables

In social research, selection and measurement of variables is a significant task. Ezekiel and Fox (1959) defined, a variable as any measurable characteristic which can assume varying or different values in successive individual area. It is essential to delineate the problem and decide the variable where relationships are involved, because relationships are fundamental staff out of which all sciences are built. In all relationships, two kinds of variables are identified, one is the focus variable and the other is the explanatory variable. An explanatory variable is that factor manipulated by the experiment in its attempt to ascertain its relationships to an observed

phenomenon. A focus variable, on the other hand, is that factor which appears, disappears or varies as the experiment introduces, removes or modifies (l.e independent variable (Townsend, 1953).

3.1.4 Data Collection Instruments

A cross section survey strategy was operationalized for the study to test the hypotheses and to measure the variances. Through a pre-organized meeting plan, data was gathered. A pre-test was conducted with the previously prepared interview schedule, which was made in accordance with the objectives of the study. Some correction, alterations, additions and rearrangements were taken place in the schedule wherever it is needed because of experiences of the pre-test. Closed forms of questions were used in maximum time and these questions were arranged systematically so that it becomes very easy to understand to the farmers. Appropriate scales of each construct were adopted from prior literature, whenever possible and were exhibited in an English version of the interview schedule attached in the Appendix-A.

3.1.5 Collection of Data

Required data were collected from the randomly selected farmers in Charjhikari, Kacharipara, Sahamirpur, Charpara villages of Habaspur union under Pangsha upazila of Dhaka district by the investigator herself using the interview schedule.

Before going to the respondents for an interview, they were duly informed earlier with the help of SAAO so that they might be available at their respective residences during the scheduled time. In order to remove any suspicion of the farmers towards the interview, all possible efforts were made to explain the purpose of the interview to the respondents.

At the time of the interview, the respondents showed a little hesitancy in the beginning. This was mainly due to the reason that the interview schedule contained some questions on their personal and family affairs. However, when the purpose of the study was explained, the respondents became readily agreeable in furnishing responses to different questions in the schedule. Whenever any respondent faced

difficulty in understanding a particular question, the researcher took care to explain the same clearly.

Despite facing some difficulties, overall an excellent cooperation was received from all the respondents at the time of the interview. Collection of data took thirty days from 20th January, 2021 to 21th February, 2021.

3.1.6 Summarization, tabulation and analysis of data

Crosschecking was done for the collected data before shifting them to the main sheet. Data were classified and tabulated very carefully. It was then analyzed by special software named SPSS (Statistical Package for the Social Sciences) computer program, version 23 to bring out the specific objectives of this study. Data were tabulated in such a way that it becomes simple to calculate and easy to understand.

3.1.7 Variables of the study

The researcher employed adequate care in selecting the variables of the study. Considering personal, economic, social and psychological factors of the rural community, time and resources availability to the researcher, reviewing relevant literature and discussing with relevant experts, the researcher selected the variables for the study.

The effectiveness of training for fertilizer management was the main focus of this study. The researcher selected the following few characteristics of the respondents as the explanatory variables. These were: age, educational qualification, farming experience, farm size, annual family income, training, knowledge on fertilizer management, attitude, extension media contact, and farmers' fertilizer use rate.

3.2 Measurement of Variables

This section contains procedures for measurement of both explanatory and focus variables.

3.2.1 Measurement of explanatory variables

The explanatory variables of the study were 9 selected characteristics of the trained farmers. These were age, educational qualification, farming experience, farm size, annual family income, training, knowledge on fertilizer management, attitude, extension media contact. The procedures followed in measuring the variables are presented below:

3.2.1.1 Age

Age of an individual refers to a period of time from his birth to the day of the interview. The age was measured in terms of years on the basis of the response of the farmers.

3.2.1.2 Education

Education was measured in terms of classes of formal education passed by an individual. If any individual received education outside the school, his education was also expressed in terms of grade of formal education by considering his knowledge. When the respondent was able to sign only, he was given a score of 0.5.

3.2.1.3 Farming experience

The farming experience was determined by the duration of each farmer's engagement in the agricultural work. It was measured and expressed in year. For example, a farmer has 5 years of agricultural working experience, the farmer was assigned 5 points score for agricultural working experience. This variable took place in item no. 5 in the interview schedule given in the Appendix part.

3.2.1.4 Farm size

It refers to the cultivated area either owned by a fanner or cultivated on a borga system, the area being estimated in terms of full benefit to the farmer. The full area of land taken on lease by a farmer was taken into consideration for computing his effective farm size. This was done in consideration that the farmer gets full benefit from such land. The farm size was measured in terms of hectare by using the following formula:

Lt = A1+A2+½(A3+A4)+A5 = Total land possessed.

A1 = Homestead area,

A2 = Own land under own cultivation,

A3 = Land taken from others on the borga system,

A4 = The land was given to others on the borga system,

A5 = The land was taken from others on lease.

3.2.1.5 Annual family income

A respondent's income was measured in thousand Taka on the basis of his and his family members total yearly earnings from agriculture and non-agricultural sources during 2020. Crop cultivation, Livestock, Poultry, Fisheries, Homestead earning involved in Agricultural sources. Other sources such as service, business, labor, remittance, and others (if any) were involved in non-agricultural sources. Annual earnings from agriculture and Non-agricultural sources were added together to obtain the total income of respondents. Income was expressed in Taka. One thousand takas got one point of the score for this variable (Akter, 2003). This variable took place in item no. 13 in the interview schedule given in the Appendix part.

3.2.1.6 Training on fertilizer management:

Training on fertilizer management of a farmer was measured by asking them how many days of training they took from the different training programs on agriculture. A unit score of one was assigned for each day of training attended (Akter, 2003). If he/she takes 3 days of training, he/she gets 3 points of score. This variable took place in item no. 15 in the interview schedule given in the Appendix part.

3.2.1.7 Knowledge on fertilizer management:

In measuring the knowledge on fertilizer management each respondent was asked ten questions. Those questions cover different aspects of fertilizer knowledge. Knowledge of fertilizer management was measured on the basis of respondents acquiring marks. Possible scores ranged from 0-20. On the basis of obtaining a score, the respondents were divided into three categories i.e. poor (up to 7), medium (>7-14), and high (above 14).

3.2.1.8 Attitude towards fertilizer

For measuring the attitude of the farmers toward fertilizer use, five points Likert scale (Likert, 1932) was used. Each farmer was asked to reveal his extent of agreement or disagreement against each statement along a 5 points scale: strongly agree, agree, neutral, disagree, and strongly disagree. The total score of a farmer was determined by summing up the weights for responses against all statements using the following formula.

Attitude score = Σ (5×SA+4×A+3×N+2×DA+1×SDA)

Where,

SA= Farmer expressed his/her attitude 'strongly agree' for the statement and assigned a score of 5 points;

A= Farmer expressed his/her attitude 'agree' for the statement and assigned a score of 4 points;

N= Farmer expressed his/her attitude 'Neutral' for the statement and assigned a score of 3 points;

DA= Farmer expressed his/her attitude 'disagree' for the statement and assigned a score of 2 points;

SDA= Farmer expressed his/her attitude 'strongly disagree' for the statement and assigned a score of 1 point.

So, the total score could range from 0 to 28 for the attitude towards fertilizer where the score "0" refers to the unfavorable attitude and the score "28" refers to a favorable attitude towards fertilizer of farmers. This variable took place in item no. 10 in the interview schedule given in the Appendix part.

3.2.1.9 Extension media contact

The extent of contact with the following information sources for receiving farm-related information was the measurement of extension media contact. It was measured in point scale. The farmers were asked how many contacts they kept with different information sources such as SAAO, AEO/AAEO, UAO, NGO Worker, Peer

farmers, Agriculture Fair/Workshop/Meeting, Farm Radio Listening, Farm TV Program and Others (e.g. ICTs, Krishi Call Centre, UISC and AICC) or vice-versa.

Following scores were allotted for each of the information sources:

Information Sources	Allotted Scores
Not at all	0
Regularly	1
Often	2
Occasionally	3
Rarely	4

Therefore, the total score could be range from 0 to 44 for the extension media contact of trained farmers where the score "0" refers to no contact with extension media and the score "44" refers to high contact with extension media. This variable took place in item no. 11 in the interview schedule given in the Appendix part.

3.2.2 Measurement of the focus variable

The effectiveness of training on farmers' was the focus variable. Five relevant statements were carefully constructed to develop the effectiveness scale. Basically, the "Likert-Scale" of summated ratings was used to serve the purpose. There were 5 positive statements in the scale. These statements were randomly arranged. A respondent was asked to indicate her/his degree of agreement about each of the statements along with a five point scale as very effective, effective, moderately effective, less effective, not effective. Scores were assigned to these five alternate responses as 5,4,3,2 and 1 respectively for each positive statement. However, the score of a respondent was obtained by adding her/his scores for all the five statements. This score could range from 0-20, where, 0 indicates most unfavorable effectiveness towards training and 20 indicates most favorable attitude towards training.

3.2.3 Measurement of the impact of training of fertilizer management

To determine the impact of training on farmers' fertilizer management an independent sample t-test was performed. First, farmers use of fertilizer (N, P, K, Boron, Manganese, Zinc ond others) before and after training were collected. Then farmer fertilizer use rate were recorded against the optimal fertilizer use rate for rice cultivation in the study area. The optimal rate of the rice farming had been collected from locale extension office. Use efficiency for each fertilizer was calculated using farmer actual use rate from the optimal use rate. Overall use of fertilizer was determine using that mean score of each fertilizer. Thus fertilizer use efficiency for before and after training were calculated using t- test.

3.3 Measurement of problem faced by the farmers in fertilizer management

Farmers in the study area might have faced various types of problems in the way of adopting fertilizer management. But the investigator gained an experience through personal contact regarding common problems faced by the respondents before collection of data. Besides, the researcher gained experience through consultation with experts, pre-testing experience and reviewing previous research findings. Finally, she prepared a list of sixt possible problems in this regard. A scale was prepared to indicate the extent to which each of the six problems was applicable in the case of a respondent. The responses were obtained through a 5-point scale:

'Very high','High', 'medium', 'low' and 'not at all' and wights were assigned to these responses as 4, 3, 2, 1, and 0 respectively.

In order to determine the comparative importance of the six problems, a problem facing index (PFI) was. computed for each of the problems by summing up the weights assigned for responses of all the respondesnts against each problem. Problem facing index of any problem could range from 0 to 24, where, 0 indicated no problem and 24 indicated high problem. Extent of PFI was computer by using the following formula:

Extend of problem facing index (PFI) = 4*Pv + 3*Ph + 2*Pm + 1*Pl + 0*Po

Where,

Pv = Number of respondent with “Very high problem”

Ph = Number of respondent with “High problem”

Pm = Number of respondent with “Medium Problem”

Pl = Number of respondent with “Low Problem”

Po = Number of respondent with “Not at all problem”

Problem facing index of any problem could range from 0 to 24, where, 0 indicated no problem and 24 indicated high problem.

3.4 Hypothesis of the Study

There are two types of hypotheses used in this research: these are

i. Research Hypothesis; and

ii. Null Hypothesis.

3.4.1 Research hypothesis

Based on a review of literature and the conceptual framework developed, the following research hypothesis was formulated:

Each of the selected characteristics (age, educational qualification, farming experience, farm size, annual family income, training on fertilizer management, knowledge in fertilizzer management, attitude towards fertilizer, extension media contact, farmers’ fertilizer use rate, effectiveness of the training, the problem faced in fertilizer management had a significant relationship to the effectiveness of the training.

Nevertheless, when a statistical test is tried to be performed by the researcher, it deserves to formulate a null hypothesis.

3.4.2 Null hypothesis

The null hypothesis reflects that there will be no observed effects of a research or it states that there is no contribution between the concern variables. Therefore, in order to conduct tests, the previously formed research hypothesis was converted into null form as given below:

“There is no relationship of the selected characteristics (age, educational qualification, farming experience, farm size, annual family income, training on fertilizer management, knowledge in fertilizer management, attitude towards fertilizer, extension media contact, farmers’ fertilizer use rate) of the effectiveness of farmers’ training.

CHAPTER IV

RESULTS AND DISCUSSION

The results of the findings of this study and its explanation or illustration have been presented here in this Chapter. According to the objectives of the study, collected data were surveyed, analyzed, tabulated and statistically treated which were obtained from the respondents. These are presented in two sections according to the objectives of the study. The first section deals with the socio-economic determination of the farmers and the second section deals with the effectiveness of training on farmers' use of fertilizer.

4.1 Selected characteristics of the farmers

Decisions related to farming activities are being influenced largely by different characteristics of an individual. The characteristics of the farmers were selected to find out their relationships with the effectiveness of training on the use of fertilizer in crop production. Table 4.1 have been shown the salient features of the respondents with their eleven selected characteristics.

Table 4.1 Salient features of the selected characteristics of the farmers

Categories	Measuring unit	Range		Mean	S.D
		Possible	Observed		
Age	Actual year	-	17- 75	43.77	14.81
Education	Year of schooling	-	0-18	5.06	4.46
Farming Experience	Year of farming	-	4-55	20.32	14.39
Farm size	Ha	-	.184-6.32	1.69	1.63
Annual family income	000' Taka	-	70-1100	368.79	236.33
Training on fertilizer management	No. of days	-	1-4	1.93	1.01

Knowledge on fertilizer management	Score	4-19	0-20	10.22	3.54
Attitude towards fertilizer	Score	0-28	14-28	22.90	3.91
Extension media contact	Score	0-44	8-40	24.65	6.97
Effectiveness of training	Score	0-20	5-20	16.33	3.27
Problem faced in fertilizer management	Score	0-24	3-23	12.04	4.06

4.1.1 Age

Age scores of the farmers ranged from 17 to 75 have an average of 43.77 with a standard deviation of 14.81. On the basis of the age scores of the farmers, they were classified into three categories: "young" (<35), "middle-aged" (35-50), and "old" (above 50). The highest proportion (50.48 percent) of the rice growers fell into the “middle-aged" category while 30.09 percent fell into the “old" category and only 19.42 percent of them fell into the "young" category. The distribution of the rice growers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	**Farmers (n = 103)**		**Mean**	**Standard Deviation**
	Number	**Percent**		
Young (<35)	30	29.13	43.77	14.81
Middle-aged (35-50)	41	39.80		
Old (above 50)	32	31.06		

The findings indicate that a large proportion (39.80%) of the farmers were middle-aged compared to 31.06% and 29.13% being in the old and young category respectively. The young to middle aged group normally show more positive attitude

towards trying new ideas. The extension providers can target those farmers in planning their extension activities.

4.1.2 Education

The education scores of the farmers ranged from 0 to 18 have an average of 5.04 and the standard deviation was 4.64. On the basis of their educational scores, the rice growers were classified into four categories, namely "illiterate/can sign only" (0-0.5), "primary" (1-5), "secondary" (6-10), and "upper secondary" (above10). The distribution of the farmers according to their education is shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their education

Categories	Farmers (n = 103)		Mean	Standard Deviation
	Number	Percent		
Illiterate/can sign only (0-0.5)	38	36.89	5.06	4.64
Primary level(1-5)	21	20.39		
Secondary level (6-10)	34	33.01		
Upper secondary level (above 10)	10	9.71		

The majority (36.89 percent) of the trained (on fertilizer) rice growers are illiterate and large numbers (33.01 percent) of farmers have a secondary level of education compared to 20.39 and 9.71 percent primary, and upper secondary levels of education respectively. Higher percent of respondent were in illiterate/ can sign only level and very few were in upper secondary level of education. So, it might be a crucial factor for farmers training because less literate farmers may desire for receive more training to improve their production.

4.1.3 Farming experience

The farming experience scores of the respondents ranged from 4-55 with an average of 20.32 and a standard deviation of 14.39. Based on their farming experience scores, the respondents were classified into three groups: ''low" (< 6), "medium" (6-34), and "high" (above 34). The distribution of the farmers is shown according to their classified groups in Table 4.4.

Table 4.4 Distribution of the farmers according to their farming experience

Category	Farmers (n= 103)		Mean	Standard Deviation
	Number	Percent		
Low (<6)	14	13.59	20.32	14.39
Medium (6 to 34)	69	66.99		
High (above 34)	20	19.42		

The majority (66.99 percent) of the farmers had medium farming experience while 13.59 percent had low farming experience and only 19.42 percent of the respondents had high farming experience. Farming experience of a farmer might be a leading factor in case of training program. An experienced farmer suggests to the other farmers. On the other hand some time they show indifference in receiving training.

4.1.4 Farm size

The farm size of the respondents varied from 0.184 to 6.32. The average farm size was 1.69 hectares with a standard deviation of 1.63. The respondents were classified into the following the categories recommended by the DAE (1999): "marginal" (up to 0.2), "small" (0.21 - 1.00), and "medium" (1.01 - <3), and large (above 3). The distribution of the farmers according to their farm size is shown in Table 4.5.

Table 4.5 Distribution of the farmers according to their farm size

Categories	Farmers (n = 103)		Mean	Standard Deviation
	Number	Percent		
Marginal (up to 0.2)	2	1.94	1.69	1.63
Small (0.21-1.00)	34	33.01		
Medium (1.01-3.00)	60	58.25		
Large(above 3)	7	6.79		

It was found that 58.25 percent of the farmers possessed medium farms compared to 33.01, 6.79, and 1.94 percent having small, large and marginal farms respectively. It indicates that very few respondents were in the large farm size category. It is a general trend in Bangladesh that farm size of the people is being decreased day by day to land fragmentation through generation to generation. Therefore, it is expected that the farmers of the study might be seen to harvest more yields by using improved technologies and to receive more trainings to learn those technologies.

4.1.5 Annual family income

The observed annual gross income of the respondents ranged from 70-1100 having an average of 368.79 and a standard deviation was 236.33. Based on their income scores, the farmers were classified into three categories: "low" (up to 150.00), "medium" (150.01-350.00), and "high" (350.01 and above). The distribution of the farmer's according to their annul family income are shown in Table 4.6.

Table 4.6 The distribution of the rice growers according to their annual family income

Categories	Farmers (n = 103)		Mean	Standard Deviation
	Number	Percent		
Low (>150)	18	17.47	368.79	236.33
Medium (150-300)	32	31.07		
High (above 300)	53	51.45		

From the Table, it was observed that the highest portion (51.45%) of the respondents had high income while 31.07 percent of respondents had medium income and 17.47 percent had a low income. So, it was expected that the farmers of high income category would likely to participate in training program to a greater extent to increase their knowledge.

4.1.6 Training on fertilizer management

The range of farmers' training was found between 1 to 4 days and the average of training was 1.93 days with a standard deviation of 1.01. Farmers were classified into three categories based on their training days: low training (up to 2 days), medium training (3 to 4 days), and high training (above 4 days). The categorization and the distribution of the farmers done according to their training on fertilizer management are shown in Table 4.7.

Table 4.7 Distribution of the farmers according to their training on fertilizer management

Category	Farmers (103)		Mean	Standard Deviation
	Number	Percent		
Low Training (Up to 1 days)	45	43.69	1.93	1.01
Medium Training (2 to 3 days)	47	45.63		

Categorization was based on Standard Deviation calculated from the collected data. Data presented in Table 4.8 indicates that the highest proportion (45.63%) of the farmers fall under the category of medium training whereas 43.69% of the farmers fall under the category of low training and 10.68% of the farmers in the high training category. Generally, GOs and NGOs offered some training programs for 2 or 3 days on fertilizer management and its related field. Therefore, a large number of farmers took their training from GOs and NGOs. However, some of them took training from their friend's or neighbor's farms.

4.1.7 Knowledge on fertilizer management

Knowledge on fertilizer management scores of the respondents ranged from 4 to 19 against the possible range of 0 to 20. The average and standard deviation were 10.22 and 3.54 respectively. Based on the observed knowledge on irrigation scores, the farmers were classified into the following three categories: "poor" (up to 7), "medium" (>7 to 14), and "high" (>14). The distribution of the rice growers according to their knowledge of fertilizer management is shown in Table 4.8.

Table 4.8 Distribution of the farmers according to their knowledge on fertilizer management

Categories	Farmers (n = 103)		Mean	Standard Deviation
	Number	Percent		
Poor (up to 7)	15	14.56	10.22	3.54
Medium (>7 to 14)	70	67.96		
High (> 14)	18	17.48		

The highest proportion (67.96 percent) of the trained farmers had medium knowledge on fertilizer management compared to 17.48 percent having high knowledge and 14.56 percent having poor knowledge on fertilizer management. The findings lead to the conclusion that training programme was effective in respect of increasing knowledge of the farmers.

4.1.8 Attitude towards fertilizer

Attitude towards fertilizer scores of the respondents ranged from 14 to 28 against the possible range of 0 to 28. The average and standard deviation were 22.90 and 3.91 respectively. Based on the observed scores on attitude towards fertilizer, the farmers were classified into the following three categories: "poor" (<19), "medium" (19 to 26), and “high" (>26). The distribution of the rice growers according to their attitude on fertilizer management is shown in Table 4.9.

Table 4.9 Distribution of the farmers according to their attitude towards fertilizer use

Categories	Farmers (n=103)		Mean	Standard Deviation
	Number	Percent		
Poor (< 19)	13	12.62	22.90	3.91
Medium (19-26)	62	60.19		
High (above 26)	28	27.18		

The highest proportion (60.19 percent) of the trained farmers had a medium attitude on fertilizer management compared to 27.18 percent having a high attitude and 12.62 percent having a poor attitude on fertilizer management. The formation of medium to high positive attitude towards fertilizer might be due to their knowledge on fertilizer management through training programme.

4.1.9 Extension media contact

The extension media contact scores of the respondents ranged from 8-40 against the possible range of 0 to 44 with an average of 5.51 and a standard deviation of 2.10. Based on the observed extension contact scores, the respondents were classified into three categories: “low” (up to 20), “medium” (21-30), and “high” (31 and above). The distribution of the respondents according to their extension contact scores is shown in Table 4.10.

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

Categories	Farmers (n=103)		Mean	Standard Deviation
	Number	Percent		
Low (0 - 20)	30	29.13	24.65	6.97
Medium (21 - 30)	54	52.43		
High (31 - 44)	19	18.44		

Data presented in Table 4.10 show that the highest proportion (52.43 percent) of the rice growers belonged to medium extension contact as compared to 29.13 and 18.44 percent having low and high extension contact respectively. With different extension media increases the opportunity of farmers in getting information about farming activities. So, it can be mentioned that the respondents were aware about different aspects of fertilizer management.

4.2 Determination of the impact of the training of fertilizer management

We calculated mean of each major fertilizer application rate by the respondent before and after training (Table: 4.11) which were used to compare with the optimum rate of fertilizer for rice in the study area. The optimum rate was collected from the local extension office.

Table 4.11. Mean of fertilizer before and after training

Fertilizer name	Before training mean	After training mean	Optimum rate
N fertilizer	214.53	178.73	160
P fertilizer	85.12	114.17	130
K fertilizer	82.19	116.95	120
Boron	0.72	3.21	4
Manganese	0.59	3.07	4
Zinc	56.65	90.59	100
Others	16.03	20.15	65

Table 4.11 shows that the average use of N fertilizer was 214.53 before training and after the training it was drop 178.73. While the average of P, K, Boron, Manganese, zinc and other fertilizer use to increased after receiving the training.

So, overall we see that the farmers use more N fertilizer than the optimal rate which however decreased after receiving training. They used to other fertilizers less before training yet they started use more after receiving the training.

To determine the impact of training on farmers' fertilizer management an independent sample t-test was performed. Therefore, farmers efficiency of fertilizer (N, P, K, Boron, Manganese, Zinc, and others) before and after training received was computed. Fertilizer use efficiency before and after training received were calculated by comparing their use rates against the optimum rate of fertilizers in that locality for rice farming. The optimum rate was collected from the local extension office.

A paired samples t-test was used to compare two related means i.e., before and after efficiency of training to know the change in application of fertilizer of farmers in their rice field. The t statistic (t) is-12.347, and p-value (Sig. (2-tailed)) is 0. Therefore we may reject the null hypothesis (of no difference between the means of the two groups) with 99% confidence and conclude that training helped to improved farmers fertilizer use efficiency. The paired t-test shown in table 4.12.

Table 4.12. Paired sample t-test

Before and after efficiency	Paired differences					t	df	Sig. (2 tailed)
	Mean	Std. deviation	Std. error mean	95% confidence interval				
				Lower	upper			
	-.18777	.15434	.01521	-.21793	-.15760	-12.347	102	0.00

Results were analyzed at 0.05 critical level and showed the statistically significant result (P< 0.01) so results are statistically significant and there is a difference in before and after efficiency of training (Table 4.12). So, Fertilizer application by farmers in their field definitely improved after training.

Training is an important instrument for the dissemination of technologies and to build up and improve human skills and abilities regarding the developmental process (Prasad, 1994). Analysis revealed that training has equipped the participants with skills and capabilities for installation and functioning of the mentioned technologies and improved the technical knowledge of the participants. These results get support from the literature that training impacts people very positively in building capacity and accelerating the development process (Ahmed et al., 2007; Siddiqui et al., 2012; Hoque and Usami, 2008).

4.3. Perceived effectiveness of the training

The perceived effectiveness of the training scores of the respondents ranged from 5-20 against the possible range of 0 to 20 with an average of 16.33 and a standard deviation of 3.27. Based on the observed perceived effectiveness scores, the respondents were classified into three categories: “low” (up to 13), “medium” (14-18), and “high” (19-20). The distribution of the respondents according to their perceived effectiveness scores is shown in Table 4.11.

Table 4.13 Distribution of the farmers according to their perceived effectiveness of the training

Categories	Farmers (n=103)		Mean	Standard Deviation
	Number	Percent		
Low (up to 13)	10	9.71	16.33	3.27
Medium (14 - 18)	67	65.04		
High (19 - 20)	26	25.24		

Data presented in Table 4.11 show that the highest proportion (65.04percent) of the trained farmers belonged to a medium perceived effectiveness level as compared to

25.24 and 9.71 percent having high and low perceived effectiveness levels respectively. The findings also reveal that training programme on fertilizer management was found medium to high effective among most of the trained farmers. This happened mostly due to increased knowledge and attitude development towards fertilier management by the trained farmers through training programme.

4.4 Relationships between the Selected Characteristics of the Farmers and Effectiveness of Training as Perceived by Them

This section deals with the relationships of the nine selected characteristics of the farmers and the effectiveness of training among farmers. The selected characteristics constituted the independent variables. The focus variable was the effectiveness of of training. The purpose of this section was examining the relationships of each independent variable with the dependent variable.

Pearson's Product Moment Correlation Co-efficient (r) has been used to test the hypothesis concerning the relationships between two variables. Five percent (0.05) and one percent (0.01) levels of significance were used as the basis for acceptance or rejection of a hypothesis. The table value of "r" was calculated at (103-2) =101 degrees of freedom. Co-efficient of correlation "r" between the selected characteristics of the farmers and their perceived effectiveness of the result demonstration program of training have been presented in Table 4.13. The correlation matrix has been presented in Appendix A.

Table 4.14 Co-efficient of correlation of the selected characteristics and effectiveness of result demonstration program of training as perceived by farmers

Focus variable	Explanatory variables	Computed value of 'r'	Table value of 'r' with 101 d.f.	
			0.05 level	0.01 level
Effectiveness of training program	Age	-.227*	1.96	2.30
	Education	.242*		
	Farming experience	-.315**		
	Farm size	.017^{NS}		
	Annual family income	.154^{NS}		
	Training on fertilizer management	.237*		
	Knowledge in fertilizer management	.135^{NS}		
	Attitude towards fertilizer	.414**		
	Extension media contact	.170^{NS}		

Here,

- NS = Non Significant
- *= Significant at 5 percent (0.05) level of probability
- ** = Significant at 1 percent (0.01) level of probability

4.4.1 Relationships between age and effectiveness of training as perceived by farmers

The relationships between age of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between the age of the farmers and the effectiveness of training.

The computed value of co-efficient of correlation between the concerned variables was found to be -.227 as shown in Table 4.13. The following observation were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a negative trend.
- The computed value of r = -.227 was smaller than the tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variables was significant at 0.05 level of probability.

The findings imply that the age of the farmers had a negative significant effectiveness of training. Age of the farmers was an important factor for their training need. Hence, the concerned null hypothesis was rejected. When farmers' age increased, they showed little interest in receiving training. Farmers who had over 58, showed negative attitude on attain training.

4.4.2 Relationships between education and effectiveness of training as perceived by farmers

The relationships between education of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between education of the farmers and effectiveness of training among farmers".

The computed value of co-efficient of correlation between the concerned variables was found to be 0.242 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.242 was smaller than then tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variables were significant at 0.05 level of probability.

It might be concluded that the education of the farmers had a positive significant effectiveness of training. This means that educated farmers are more willing to follow training guide. They thought they need more knowledge on cultivation methodology. They felt encouraged to join the training program with other farmers. So education level of the farmers kept an important role for their training need.

4.4.3 Relationships between farming experience and effectiveness of training as perceived by farmers

The relationships between farming experience of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between farming experience of the Boro rice farmers and effectiveness of training among farmers."

The computed value of co-efficient of correlation between the concerned variables was found to be -.315 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a negative trend.
- The computed value of r=-.315 was smaller than tabulated value (r=2.30) with 101 degrees of freedom at 0.01 level of probability.

- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variables were significant at 0.01 level of probability.

The findings reveals that the farming experience of the farmers were negatively significant for the effectiveness of training among farmers. This means that both of the variables were dependent to each other. So, training program is more effective among low experienced farmers because highly experienced farmers always want to apply fertilizer from their own before experienced.

4.4.4 Relationships between farm size and effectiveness of training as perceived by farmers

The relationships between farm size of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between farm size of the Boro rice farmers and effectiveness of training among farmers".

The computed value of co-efficient of correlation between the concerned variables was found to be 0.060 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.017 was greater than the tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was rejected
- The co-efficient of correlation between the concerned variables were not significant at 0.05 level of probability.

The findings reflect that the rice farmers had a positive but no significant relationship with effectiveness of training among farmers. Farm size of the farmers was not an important factor for their training effectiveness. Hence, large farmers have more scope than the small farmers as they can invest money for the effectiveness of training.

4.4.5 Relationships between incomeand effectiveness of training as perceived by farmers

The relationships between income of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between income of the farmers and effectiveness of training among farmers."

The computed value of co-efficient of correlation between the concerned variables was found to be 0.154 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.154 was smaller than then tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis could not be rejected.
- The co-efficient of correlation between the concerned variables were not significant at 0.05 level of probability.

It might be concluded that the income of the farmers were not an important for effectiveness of training. This means that both the variables were independent to each other. Hence, the concerned null hypothesis was accepted. The findings indicate that annual income of the farmers had no significant relationship with their effectiveness of training.

4.4.6 Relationships between training exposure and effectiveness of training as perceived by farmers

The relationships between training exposure of the farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between training exposure of the farmers and effectiveness of training among farmers" .

The computed value of co-efficient of correlation between the concerned variables was found to be 0.237 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.237 was greater than then tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables were significant at 0.05 level of probability.

The findings demonstrate that the training exposure of farmers had a positive significant relationship to their effectiveness of training. Training exposure plays a vital role in effectiveness of training among farmers.

4.4.7 Relationships between farmers knowledge in fertilizer management and effectiveness of training as perceived by farmers

The relationships between farmers knowledge in fertilizer management and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between farmers knowledge in fertilizer management and effectiveness of training among farmers".

The computed value of co-efficient of correlation between the concerned variables was found to be .135 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.135 was greater than then tabulated value (r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis was rejected

- The co-efficient of correlation between the concerned variables were not significant at 0.05 level of probability.

The findings reflect that the farmers knowledge in fertilizer management had a positive effectiveness of training among farmers. Hence, there is more scope to convince high knowledged farmers than low knowledged farmers towards appropriate fertilizer management. If they had sound knowledge in agriculture they showed interest in receiving training spontaneously. They realized the importance of training in rice cultivation. So it may be an important factor in this aspect.

4.4.8 Relationships between attitude and effectiveness of training as perceived by farmers

The relationships between attitude of farmers and effectiveness of training among farmers were examined by testing the following null hypothesis.

"There is no relationship between attitude of farmers and effectiveness of training among farmers."

The computed value of co-efficient of correlation between the concerned variables was found to be 0.414 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.414 was greater than then tabulated value (r=2.30) with 101 degrees of freedom at 0.01 level of probability.
- The concerned null hypothesis was rejected.
- The co-efficient of correlation between the concerned variables were significant at 0.01 level of probability.

The findings demonstrate that the attitude of the farmers had a positive significant relationship to the effectiveness of training among farmers. Farmer‟s higher attitudeness played a role for higher effectiveness of training.

4.4.9 Relationships between extension media contact and effectiveness of training as perceived by farmers

The relationships between extension media contact of the farmers and their perceived effectiveness of training were examined by testing the following null hypothesis.

"There is no relationship between extension media contact of the farmers and their perceived effectiveness of training".

The computed value of co-efficient of correlation between the concerned variables was found to be 0.132 as shown in Table 4.13. The following observations were made regarding the relationships between these variables on the basis of co-efficient of correlation:

- The relationships showed a positive trend.
- The computed value of r=0.170 was smaller than then tabulated
- value(r=1.96) with 101 degrees of freedom at 0.05 level of probability.
- The concerned null hypothesis could not be rejected.
- The coefficient of correlation between the concerned variables were not significant at 0.05 level of probability.

The findings seems that the extension media contact of the farmers were not an important for the effectiveness of training among farmers. This means that both the variables were independent to each other.

4.5 The Problem Faced in Fertilizer Management

The problem faced scores of the respondents ranged from 3-23 against the possible range of 0 to 24 with an average of 12.04 and a standard deviation of 4.06. Based on the observed problem scores, the respondents were classified into three categories: "low" (up to 7), "medium" (8-16), and "high" (above 16). The distribution of the respondents according to their problem face scores is shown in Table 4.14.

Table 4.15 Distribution of the farmers according to their problem faced in fertilizer management

Categories	Farmers (N=1030		Mean	Std. deviation
	Number	Percent		
Low (up to 7)	10	9.71	12.04	4.06
Medium (8 to 16)	80	77.67		
High (above 16)	13	12.62		

Data presented in Table 4.9 show that the highest proportion (77.67%) of the trained farmers belonged to the medium problem faced level as compared to 12.62 and 9.71 percent having high and low problem faced levels respectively. It indicates that the farmers are intermingled with diversified problems in fertilizer management. In order to measure the problems regarding fertilizer management, open questionnaire were used. The purpose of this section was to have an understanding on the problems faced by the farmers in fertilizer management. However, six selected problems in this regard were investigated and they have been ranked in Table 4.15 according the descending order of the problem facing index (PFI).

Table 4.16 Ranking of the problems faced by the farmers in fertilizer management

SI. NO.	Problems	Extent of problems					PFI	Rank Order
		Very high (4)	High (3)	Medium (2)	Low (1)	Not at all (0)		
1.	Insufficient training opportunities on fertilizer management	15	24	32	21	8	217	3
2.	Lack of good quality fertilizer	24	45	27	4	0	289	1
3.	High price of fertilizer	21	48	28	3	0	287	2
4.	Unavailability of fertilizer	5	25	50	16	4	211	4
5.	Poor transport facility of fertilizer	3	4	22	33	38	101	6
6.	Storage problem of fertilizer at home	2	3	26	41	28	110	5

Data contained in Table 4.15 indicate that “Lack of good quality fertilizer” ranked first with PFI value of 289. The second most importante problem of the farmers was “High price of fertilizer” with PFI of 287. The third important problem of the farmers was “Insufficient training opportunities on fertilizer management” with the PFI of 217. The gowers of the study area did not get sufficient governments help, SAAOs help and other related information regarding fertilizr management. Unavailability of fertilizer was another important problem with the PFI of 211. However, poor transport

facility of fertilizer, storage problem of fertilizer at home were also some important problems which are needed to pay attention. No program for the farmers cannot be successful unless these problems are not properly addressed and triggered to be eliminated or at least diimnished.

CHAPTER V

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This Chapter summarizes the significant empirical results of the selected characteristics of the trained farmers, the effectiveness of training programme on mushroom cultivation and relationships between selected characteristics of the trained farmers and effectiveness of training programme. It also draws some conclusions and recommendations for policy actions as further steps in improving the existing curricula and dimensions of training programme on mushroom cultivation. This Chapter finally recommends probable research endeavors that can be carried out in future:

5.1 Summary of the findings

Interpretation of the results and the findings of the study have been presented elaborately in Chapter 4. The summarized findings of the study are now described below:

5.1.1 Objectives of the study

To conduct the study in proper direction the following specific objectives had been set forth:

1. To determine and describe the selected characteristics of the farmers.
2. To determine the impact of the training of fertilizer management,
3. To assess farmers' perception of training
4. To explore the interrelationship between farmers' selective characteristics and the effectiveness of the training as perceived by them,
5. To identify the problem faced by the farmers of using fertilizer for crop production.

5.1.2 Methodology

Methodology was very important in any scientific research. It deserved a very careful consideration for conducting research. Methods and procedures followed in this study have been described below:

5.1.2.1 Locale of the study: Two villages namely Charjhikari, Kacharipara, Sahamirpur and Charpara at Pangsha upazila under Rajbari district were purposively selected.

5.1.2.2 Population and sampling Procedure: All trained farmers of the selected four villages of Habaspur union in Pangsha upazila were constituted the population of the study. Farmers were selected using convenience sampling technique for the study which is a non-probability sampling method where the sample is taken from a group of people easy to contact or to reach.

5.1.2.3 Data collection instrument and data analysis: As a research instrument a set of interview schedule was prepared keeping in view the objective of the study. Data was collected through face to face interview. SPSS computer program was used for analyzing the data in order to explore the relationships between the effectiveness of training among farmers and their selected characteristics. Pearson's Product Moment Correlation(r) was used. Five percent (0.05) level of significance was used as basis for rejecting any null hypothesis.

5.1.3 Major findings

According to the objectives of the study, the followings findings were summarized as follows:

5.1.3.1 Selected characteristics of the trained farmers

Age

The middle-aged trained farmers covered the highest proportion (39.80%) whereas 31.06% of farmers were of old aged and the rest 29.13% of farmers were of the young aged category.

Level of Education

The highest proportion (36.89%) of the farmers fall under the category of illiterate and can sign only followed by 33.01% of the farmers under the category of secondary level of education. On the other hand, 20.39% were at the primary level of education compared to 9.71% were of the upper secondary category.

Farming Experiences

Farmers having medium experience of farming occupied the Supreme proportion (66.99%) compared to 19.42% occupied by the farmers having high experienced and the rest 13.59% of the farmers had low experiences in farming.

Farm Size

The highest proportion (58.25%) of the farmers fall under the category of medium farm size whereas 33.01% and 6.79% of the farmers fall under the category of Small farm size and large farm size. And the rest 1.94% fall under the marginal categories.

Annual family income

The highest portion (52.45%) of the farmers fall under the category of high-income whereas 31.07% and 17.47% of the farmers fall under the category of medium and low income.

Training on fertilizer management

The highest proportion (45.63%) of the farmers had medium training on fertilizer management compared to 43.69% with low training and 10.68% with highly training.

Knowledge in fertilizer management

Findings revealed that 67.96% of the farmers had medium knowledge followed by 17.48% of the farmers who had high knowledge and 14.56% had lower knowledge on fertilizer management.

Attitude towrads fertilizer

Findings revealed that the highest 60.19% of the farmers had a medium attitude towards fertilizer management followed by 27.18% of the farmers had high attitude and 12.62% had a low attitude towards fertilizer management.

Extension Media Contact

The highest proportion (52.43%) of the farmers had medium media contact with different GOs and NGOs followed by 29.13% of the farmers had low media contact and 18.44% had higher media contact.

Effectiveness of training

The highest proportion (65.04%) of the farmers had medium perceived effectiveness towards fertilizer management followed by 25.24% of the farmers had high and 9.71% had low perceived effectiveness towards fertilizer management.

5.1.3.2 Problem faced

The highest portion (77.67%) of the farmers faced medium problems whereas (12.62%) faced high and (9.71%) faced low problems towards fertilizer management.

5.2 Conclusions

On the basis of the findings and logical interpretations of the study the following conclusions could be drawn:

1. Findings of the study indicate that fertilizer application by farmers in their field definitely improved after training. These results indicate that training impacts people very positively in building capacity and accelerating the development process. This happened due to increased knowledge and attitude development towards fertilizer management by the trained farmers through training programmes through knowledge that showed no significant relationship with the effectiveness of training.
2. More than half (65.04%) of the trained farmers perceived that the training program had medium effectiveness (65.04 percent) among farmers compared to 25.24 percent being high effectiveness and 9.71 percent had low effectiveness in the fertilizer management. It also played an important role in related aspects like transferring information for improved knowledge, developing skill, changing outlook.

3. Age of the respondents had negative significant relationships with the effectiveness of training. It seems that most of the old aged farmers are more likely to follow their own experience.

4. Farm size and annual income of the respondents had no significant relationships with the effectiveness of training. Therefore, it may be concluded that farm size and income are not very important factors for the effectiveness of training.

5. Education of the respondents had positive significant relationships with the effectiveness of training. This seems that, higher the education of the respondent‟s that leads to higher effectiveness of training.

6. Farming experience of the respondents had negative significant relationships with effectiveness of training among farmers. Therefore, it may be concluded that farming experience can not affect the effectiveness of training among farmers.

7. Extension media contact of the respondents had no significant relationships with the effectiveness of training among farmers. Extension media contact helps the farmers to become more experienced helps to develop the idea and become effective motivator. In this study, extension media contact did not play any role for effectiveness of training among farmers.

8. Training exposure had positive significant relationships with the training among farmers. Training plays a vital role for the development of knowledge, skill and attitude of a person which leads her/him to be more capable and competent.

9. Attitude had positive significant relationships with the effectiveness of training among farmers. So, it is concluded that a farmer's higher positive attitude is more receptive to new innovations and technologies.

10. Knowledge of the farmers had no significant relationships with the effectiveness program of training. So, it is concluded that the person who has

better knowledge but he/she doesn't justify or apply it in time, that knowledge is not so valuable.

5.3 Recommendation

Recommendations have been divided into two sub-sections, viz. recommendation for policy implication and recommendation for further study.

5.3.1 Recommendations of policy implication

1. Findings of the study indicate that Fertilizer application by farmers in their field definitely improved after training. These results indicate that training impacts people very positively in building capacity and accelerating the development process. So, It is recommended that massive and relevant training program should be conducted for the farmers to upgrade their awareness and understanding of the use of different production technologies. The various GOs and NGOs should be involved in the conduction of training programs.
2. Education of respondents had a significant positive relationship with the effectiveness of training. Therefore it may be recommended that attempts should be taken by DAE and NGOs to establish adult learning centers to increase educational level as well as to increase the role of training.
3. Majority (85.44 %) of the trained respondents had medium to high knowledge on fertilizer management. But knowledge had no significant relationship with the effectiveness of training. So it is recommended that attempts should be taken by the Department of Agricultural Extension (DAE) and other extension providers to arrange training and motivational campaigns so that farmers can understand how to use their knowledge on farm practices.
4. Farm size and annual family income of the farmers had no relationship to the effectiveness of training among farmers. It implies that extension services have to increase farm size by organizing co-operative farming practices and have to increase annual income by farm management advice to the farmers. It

is recommended that DAE should start cooperative farming practice by organizing small and marginal farmers.

5. In the context of available results on the effectiveness of training,it is recommended that special care should be taken to make a successful result. It may be kept in view that failures in one result demonstration may lead to loss of faith in some subsequent innovations which may take a long time to overcome because of psychological resistance to demonstrations.
6. About 62.14% farmers faced medium to high problems in fertilizer management. Therefore, it was recommended that steps should be taken by the Government to reduce problems like lack of good quality fertilizer, high price of fertilizer, insufficient training opportunities on fertilizer management etc.

5.3.2 Recommendations for Further Study

A small piece of study has been conducted which cannot provide all the information for the proper understanding of the effectiveness of training on farmers' fertilizer management. Future studies should be undertaken covering more dimensions of the effectiveness of result demonstration program of training. Therefore the following recommendations were made for further study:

1. The present study was conducted in Pangsha upazila under Rajbari district. It is recommended that similar studies should be conducted in other areas of Bangladesh.
2. This study investigated the relationships of nine characteristics of the farmers with their perception on effectiveness of training. Therefore, it is recommended that further study may be conducted with different Explanatory and focus variable.
3. More research should be conducted to investigate the comparative effect with other extension methods and also for identifying factors influencing the effect on the basis of the characteristics pattern of Bangladesh and its farming population.

4. In the present study farm size, annual income, knowledge, and media contacts had no significant relationship with the effectiveness of training. In this connection, further verification is necessary.
5. To measure the effectiveness of the training programme in fertilizer management, the researcher developed a scale and the validity of the scale may be verified by further studies. This would help for improvement and generalization of the scale.
6. Similar study may also be replicated in future for studying any change of pattern regarding effect among the same population of the present study area.

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APPENDIX-A

(English version of the interview schedule)

Department of Agricultural Extension and Information system

Sher-E-Bangla Agricultural University, Dhaka-1207

Interview schedule for data collection for the Research on

Impact of farmers' training on the use of fertilizer management

(This interview schedule is entitled to a research study. Collection data will only be used for research purposes and will be published aggregately)

Respondent No.

Name: **Father/Spouse Name:**

Village: **Union:**

Upazila: **Cell:**

1. **Age**: ..... Years

2. **Education Qualification**: Please mention the following information about your education.
    a. Can't read and write
    b. Can sign only

c. Did not go to school but read and write which is equal to ……. years

d. I have studied up to …… class

3. Farming Experience: Please mention the following information about your farming Experience.

a. How long have you been engaged in farming? …… years

4. Farm size: Please mention here your farm size.

SI. No.	**Use of land**	**Measuring unit**	
		Local unit	**Hectare**
1.	Homestead area (A1)		
2.	Own land under own cultivation (A2)		
3.	The land was taken from others on the Borga system (A3)		
4.	The land was given to others on the Borga system (A4)		
5.	The land was taken from others on the lease (A5)		

Total farm size = A1+A2+½(A3+A4)+A5=

5. Annual Family Income:

SI. NO.	**Sources of income**	**Amount (Tk.)**
A) Agricultural sources		
i.	Crop Cultivation	
ii.	Livestock	
iii.	Poultry	
iv.	Fisheries	
v.	Homestead	

Sub Total A		
B) Non- Agricultural sources		
i.	Services	
ii.	Business	
iii.	Labour	
iv.	Remittance	
v.	Others (if any)	
Sub Total B		
Total (A+B)		

6. Training on fertilizer management: Have you ever received any training on fertilizer management? If yes, please mention the following.

SI. No.	Name of the training	Name of the organization	No. of Days
1.			
2.			
3.			
4.			
5.			

7. Knowledge in fertilizer management: Please answer the following question regarding fertilizer management……..

SI. No.	Questions	Full Marks (2)	Marks Obtain
A. Remembering			
1.	Mention the name of major fertilizer		
2.	How many times do we normally apply urea fertilizer in rice?		

B. Understanding			
1.	What is the importance of applying fertilizer for plant growth?		
2.	How can biofertilizers help crop health?		
C. Applying			
1.	Explain to me how to use Guti Urea?		
2.	Explain to me how to do top dressing?		
D. Analyzing			
1.	In case of Nitrogen deficiency which part of the leaves will turn yellow first?		
2.	Are there any different substitutes for chemical fertilizer that can be used to protect vegetables from pests?		
E. Evaluating			
1.	What will happen if rice is lacking zinc?		
2.	What will you do if there is a shortage of water in your land?		
Total			

8. Attitude towards fertilizer:

SI.NO.	Statement	The extent of agreement/disagreement				
		SA	A	NO	D	SD
1.	Fertilizer application increases production					
2.	Timely application of fertilizer is important for good production					
3.	The recommended dose of fertilizer is helpful for better production					
4.	The proper method for fertilizer application help to reduce fertilizer cost					
5.	The recommended dose of fertilizer help to reduce the production cost					
6.	Excessive use of urea fertilizer has a bad effect on rice production					
7.	Fertilizer over-application has a negative impact on the environment					

N.B: SA= Strongly Agree; A= Agree; NO= No Opinion; D= Disagree; SD=Strongly Disagree

9. Extension media contact: Please mention your extent of contact with the following sources for receiving fertilizer-related information.

SI.NO.	Communication media	Extent of participation				
		Regularly (4)	Often (3)	Occasionally (2)	Rarely (1)	Never (0)
A. Personal Contact						
1.	Meet with ideal/ progressive farmers (per 3 months)	>6 ( )	5-6 ( )	3-4 ( )	1-2 ( )	

2.	Meet with Agricultural input dealer (per 3 months)	>6 ( )	5-6 ( )	3-4 ( )	1-2 ( )	
3.	Meet with NGO or development worker (per 3 months)	>6 ( )	5-6 ( )	3-4 ( )	1-2 ( )	
4.	Meet with SAAO (per 3 months)	>6 ( )	5-6 ( )	3-4 ( )	1-2 ( )	
5.	Meet with Agriculture Extension Officer (per year)	>6 ( )	5-6 ( )	3-4 ( )	1-2 ( )	
	B. Group Contact					
1.	Participation in farmers field day (per year)	More than 5 times ( )	4-5 times ( )	2-3 times ( )	1 time ( )	
2.	Participation in Group meeting (per year)	More than 5 times ( )	4-5 times ( )	2-3 times ( )	1 time ( )	
3.	Participation in Agriculture fair (per year)	More than 5 times ( )	4-5 times ( )	2-3 times ( )	1 time ( )	
	C. Mass Media Contact					
1.	Listening to agricultural programs or Radio	Multiple times a week ( )	Once a week ( )	Multiple times a month ( )	Once a month ( )	
2.	Watching agricultural programs on television	Multiple times a week ( )	Once a week ( )	Multiple times a month ( )	Once a month ( )	
3.	Reading agricultural Publications like newspapers, posters, leaflets, etc.	Multiple times a week ( )	Once a week ( )	Multiple times a month ( )	Once a month ( )	

Total (A+B+C)	

12. Farmers' fertilizer use rate: Farmers' fertilizer use rate in Rice field

Fertilizer name	Before training	After training	Optimum rate
N fertilizer (kg/ha)			
P fertilizer (kg/ha)			
K fertilizer (kg/ha)			
Boron (kg/ha)			
Manganese (kg/ha)			
Zinc (kg/ha)			
Others (kg/ha)			

13. Perceived effectiveness of the training

SI.NO.	Statement	VE	E	ME	LE	NE
1.	Learning the new skill in fertilizer management					
2.	Update the knowledge in fertilizer management					
3.	Inhance the capacity in fertilizer application					
4.	To obtain the better yield					
5.	To minimize the cost					

N.B: VE= Very Effective; E= Effective; ME= Moderately Effective LE= Less Effective; NE=Not Effective;

14. The problems faced in fertilizer management:

SI.NO.	Problems	Extent of problems				
		Very high (4)	**High (3)**	**Medium (2)**	**Low (1)**	**Not at all (0)**
1.	Insufficient training opportunities on fertilizer management					
2.	Lack of good quality fertilizer					
3.	High price of fertilizer					
4.	Unavailability of fertilizer					
5.	Poor transport facility of fertilizer					
6.	Storage problem of fertilizer at home					

Thank you for your kind cooperation

Respondent's contact no.:

..……

……..

Name and Signature of the Enumerator

Appendix -B.

Correlation Matrix of the Dependent and Independent Variables (n=103)

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
X1	1.000									
X2	-.548**	1.000								
X3	.114	-.022	1.000							
X4	.818**	-.491**	-.012	1.000						
X5	.013	.184	.235*	-.043	1.000					
X6	-.413**	.430**	-.036	-.363**	.168	1.000				
X7	.187	-.169	.168	.029	.167	.003	1.000			
X8	-.062	.258**	.363**	-.016	.108	.184	.093	1.000		
X9	.016	.101	.174	.005	.215*	.090	.070	.215*	1.000	
X10	-.227*	.242*	.060	-.315**	.135	.414**	.170	.154	.237*	1.000

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

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

X1 = Age

X2 = Education

X3 = Farm size

X4 = Farming experience

X5 = Knowledge in fertilizer management

X6 = Attitude

X7 = Media contact

X8 = Income

X9 = Training

X10 = Perceived effectiveness